United Nations Development Programme
Country: Samoa
PROJECT DOCUMENT

Project Title: ***Economy-wide integration of climate change adaptation and disaster risk management to reduce climate vulnerability of communities in Samoa***

UNDAF Outcome:
Outcome 1.1. By 2017 the most vulnerable communities across the PICTs are more resilient and select government agencies, civil society organizations and communities have enhanced capacity to apply integrated approaches to environmental management, climate change adaptation/mitigation, and disaster risk management.

UNDP Strategic Plan Outcome:
Outcome 5. Countries are able to reduce the likelihood of conflict, and lower the risk of natural disasters, including from climate change.

UNDAF Results Matrix:
Output 3.1.2. Strengthened national capacity to develop and upgrade the national environmental policy and the implementation of relevant gender and climate change policy responses.

Output 3.2.2. Strengthened capacity support for community disaster risk reduction and school-based DRM.

Output 3.2.4. Strengthened government and UN planning and coordination of humanitarian responses, including post disaster employment and livelihood options for women and men.

Output 3.2.7. Improve monitoring of climate change through centralised collection of data.

Implementing Agency: United Nations Development Programme (UNDP)

Executing Agency/Implementing Entity: Ministry of Natural Resources and Environment (MNRE)

Responsible Parties: Ministry of Finance, Ministry of Women, Communities and Social Development; Land Transport Authority

Brief Description

The predicted effects of climate change on Samoa include: i) increased frequency and severity of extreme rainfall events; ii) increased frequency and duration of droughts; iii) rising sea levels; and iv) increased frequency of extreme wind events such as gusts and cyclones. The problem that the proposed LDCF project seeks to address is that **climate change is expected to result in losses to lives, livelihoods and assets for local communities in Samoa**. Cyclone Evan – which struck Samoa in December 2012 – resulted in at least five deaths, displacement of 7,500 people and damage to over 2,000 houses. Losses to livelihoods (e.g. crops), damage to road infrastructure and disruption of water and electricity supplies also occurred. The Post-Disaster Needs Assessment (PDNA) estimated the costs of reconstruction at US$200 million with a further US$70 million required for human capital.

The solution to the above-mentioned problem is to adopt an economy-wide approach to climate change adaptation in Samoa. This will allow for increased integration of climate change adaptation and disaster risk management into national development planning and programming across all sectors. In addition, the climate resilience of local communities – including their physical assets and livelihoods – must be strengthened. Barriers to climate change adaptation in Samoa include: i) fragmentation of efforts on climate change adaptation; ii) focus on "project-by-project" approaches rather than "programmatic" approaches; iii) limited capacity at the local level for climate change adaptation; iv) inherent vulnerabilities of communities, their assets and their livelihoods; and v) weak monitoring and evaluation of past and on-going projects.

The project will contribute to overcoming these barriers by: i) strengthening institutional capacity within the government; ii) enhancing inter-ministerial coordination of climate change adaptation; iii) promoting the inclusion of climate change concerns into development strategies across all sectors; iv) climate-proofing of communities' physical assets; v) introducing more climate-resilient livelihoods options; and vi) sharing lessons learned and best practice on climate change adaptation across the Pacific region. The Implementing Entity is the Ministry of Natural Resources and the Environment. Responsible parties include the Ministry of Finance, Ministry of Women, Communities and Social Development, the Land Transport Authority and the UNDP.

Programme Period:	72 Months
Atlas Award ID:	00079044
Project ID:	00089160
PIMS #	5264
Start date:	August 2014
End Date	July 2019
Management Arrangements	NIM
PAC Meeting Date	15 August 2014

Total resources required	102,322,936
Total allocated resources:	102,322,936
GEF	12,322,936
In-kind contributions	90,000,000

Agreed by (Government):

Date: 7/11/2014

Lavea Tupa'imatuna Iulai Lavea
Chief Executive Officer
Ministry of Finance

Agreed by (Implementing Partner):

Date: 7/11/2014

For Honorable Faamoetauloa Ulaitino Dr. Faale Tumaali'i
Minister of Natural Resources and Environment

Agreed by (UNDP):

Date: 7/11/2014

Lizbeth Cullity
UN Resident Coordinator/UNDP Resident Representative,
MCO Cook Islands, Niue, Samoa & Tokelau

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List of Acronyms

AMAT	Adaptation Monitoring and Assessment Tool
CBOs	Community-based Organisations
CCA	Climate Change Adaptation
CPAP	Country Programme Action Plan
CPEIR	Climate Public Expenditure and Institutional Review
CRICU	Climate Resilience Investment Coordination Unit
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSOs	Civil Society Organisations
DRM	Disaster Risk Management
ENSO	El Niño Southern Oscillation
EPPD	Economic Policy and Planning Division
GDP	Gross Domestic Production
GEF	Global Environment Facility
GoS	Government of Samoa
ICCRAHS	Integrating Climate Change Risks in the Agriculture and Health Sectors in Samoa
INC	Initial National Communication
IWMP	Integrated Watershed Management Plan
LDCF	Least Developed Countries Fund
M&E	Monitoring and Evaluation
MDG	Millennium Development Goals
MNRE	Ministry of Natural Resources and Environment
MoF	Ministry of Finance
MOH	Ministry of Health
MWCSD	Ministry of Women, Community and Social Development
NAPA	National Adaptation Program of Action
NBSAP	National Biodiversity Strategy and Action Plan
NCCCT	National Climate Change Country Team
NGO	Non-governmental Organisation
NIM	National Implementation Modality
NRP	National Recovery Plan
PER	Public Expenditure Review
PDNA	Post-Disaster Needs Assessment
PPCR	Pilot Program for Climate Resilience
SBAA	Standard Basic Assistance Agreement
SCCF	Special Climate Change Fund
SDS	Strategy for the Development of Samoa
SIDS	Small Island Developing State
SNC	Second National Communication
SOF	Source Of Funds
SPC	Secretariat of Pacific Community
SPREP	Secretariat of the Pacific Regional Environment Programme
SPTO	South Pacific Tourism Organisation
SWA	Samoa Water Authority
UNDAF	United Nations Development Assistance Framework
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
VDRMP	Village Disaster Risk Management Plan

1. Situation analysis

1. The Independent State of Samoa (hereafter Samoa) is a small island developing state (SIDS) located in the Polynesian region of the South Pacific. In 2012, Gross Domestic Product (GDP) was estimated to be US$683.7 million[1] with a growth rate of 1.2%[2]. The economy of Samoa relies strongly on agriculture, fisheries, development aid and remittances. The service sector – notably tourism – contributes 25% of the GDP[3]. While agriculture only contributes ~10% of the GDP, the agricultural sector employs ~68% of the labour force[4] – mostly in subsistence agriculture.

2. Samoa has achieved mixed success in achieving its Millennium Development Goals (MDG) relating to reducing extreme poverty[5]. Of particular concern is the increase in hardship and poverty between 2002 and 2008. Further economic growth is at risk from the effects of natural disasters. For example, a tsunami in 2009 caused at least 135 deaths, 3,500 people to be displaced and ~$150 million in damages[6]. Samoa also experiences frequent tropical cyclones that threaten the achievement of socio-economic and development goals (see Section 1.1).

1.1. Climate change – induced problem

1.1.1 Climate Change Scenarios and Climate Variability

3. Samoa has a tropical climate with a rainy season from November to April, and a dry season from May to October[7]. Average temperatures vary little with a typical daily range of 24–32°C. Severe tropical cyclones tend to occur in the period from December to February[8]. The islands are also affected by dry spells that coincide with the El Niño Southern Oscillation (ENSO).

4. Climate change in Samoa is expected to lead to: i) more frequent and extreme rainfall events; ii) more frequent and longer drought events; iii) increased air and water temperatures; iv) sea level rise; and v) more frequent extreme wind events. An extreme daily rainfall of 400 mm – currently a 60-year event – will likely become a 40-year event by 2050. Similarly, an extreme six-hourly rainfall of 200 mm – that is currently a 30-year event – will likely become a 20-year event by 2050. Furthermore, the CSIRO model projected an 8% increase in the wind speed for a 50-year storm by 2059[9].

5. Observations[10] and modelling[11] have shown that climate change is likely to result in increased peak wind speeds, precipitation and flooding associated with severe cyclones. The overall intensity of cyclones is predicted to increase by 2–11% by 2100. Moreover, cyclones are expected to increase in frequency. A review of historical climate trends indicates that the frequency of tropical cyclones in the Southwest Pacific has increased[12]. This trend is expected to continue as a result of climate change[13].

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[1] WB.2014. *Samoa*. http://data.worldbank.org/country/samoa. Accessed on 10 March 2014.
[2] Asian Development Bank. 2012. *Asian Development Bank & Samoa: Fact Sheet*. http://www.adb.org/sites/default/files/pub/2013/SAM.pdf. Accessed on 10 March 2014.
[3] Central Intelligence Agency (CIA). 2014. *The World Factbook*.https://www.cia.gov/library/publications/the-world-factbook/geos/ws.html.
[4] Samoa Bureau of Statistics. 2009. *Agriculture Census Analytical Report 2009.*
[5] Pacific Islands Forum Secretariat. 2012. *Pacific Regional MDGs Tracking Report.*
[6] United Nations Office for the Coordination of Humanitarian Affairs. 2009. *Samoa/Tonga: Tsunami*. Situation Report #5.
[7] Government of Samoa (GoS). 2006. *Samoa's National Disaster Management Plan*.
[8] WB. 2010. *Economics of Adaptation to Climate Change: Samoa*. Washington, USA.
[9] GoS. 2013. *Strategic Programme for Climate Resilience*.
[10] Emanuel, K. 2005. Increasing destructiveness of tropical cyclones over the past 30 years. *Nature* 436: 686–688.
[11] Knutson, T. R. *et al.* 2010. Tropical cyclones and climate change. *Nature Geoscience* 3: 157–163.
[12] WB. 2006. *Not if but when: Adapting to natural hazards in the Pacific Islands region*. East Asia and Pacific Region

1.1.2 Climate variability impacts and vulnerabilities

6. While Samoa is vulnerable to a range of natural disasters – including earthquakes and tsunamis – cyclones are of particular concern. Cyclones Ofa (1990) and Val (1991) rank second and third on the list of most damaging cyclones in the South Pacific region during the last 50 years[14]. Damages caused by these two cyclones in Samoa were estimated to total between US$440 million and US$605 million[15,16]. This damage included: i) destruction of buildings and infrastructure; ii) beaching of the ferry that operates between Samoa and American Samoa; iii) disruption of communications; iv) reduction of agricultural production; and v) losses to livelihoods.

7. Cyclone Evan (2012) caused at least five deaths, temporary displacement of ~7,500 people and damage to ~2,000 houses. The cyclone also resulted in disruption of electricity distribution, communications and provision of drinking water[17]. Strong winds destroyed buildings, roads and crops. According to the Post-Disaster Needs Assessment (PDNA) undertaken by the Government of Samoa (GoS) with the assistance of the World Bank, the damage was estimated at US$204 million.

8. Climate change is expected to affect all development sectors in Samoa. Some of the expected effects of climate change include: i) damage to infrastructure; ii) reduction of water quality and availability; iii) reduced productivity of agriculture and fisheries; iv) greater food and health insecurity; and v) increased poverty. The losses caused by climate-induced natural disasters illustrate the need for a coordinated response that protects the lives and livelihoods of affected communities.

9. Samoa's vulnerability to climate change and natural disasters is the result of multiple environmental, institutional and socio-economic factors. These root causes of climate vulnerability include:
   - **Climate and topography.** Samoa is vulnerable to a number of climate-related natural disasters because of its tropical climate. Severe tropical cyclones are common during the wet season. Samoa's vulnerability to flooding during storms and intense rainfall events is exacerbated by the country's steep and mountainous topography.
   - **Poor coordination of climate change initiatives.** GoS is restricted in its capacity to plan for and coordinate climate change adaptation and disaster risk management (DRM) interventions. While Samoa receives considerable aid for climate change adaptation, there is limited coordination between the institutions responsible for managing these resources. In addition, there is little application of a programmatic approach to adaptation as climate change is not considered to be an overall development issue. Consequently, climate change finance is not used as efficiently as it could be.
   - **Limited availability of climate change information.** At present, there is no national system to monitor and evaluate the long-term effects of climate change and the success of adaptation and DRM interventions.
   - **Inadequate integrated planning.** The urban infrastructure and community settlements in Samoa are particularly vulnerable to sea-level rise and cyclones. This is largely a result of concentrated development in coastal areas without integrated planning to manage the risks posed by climate-induced natural disasters. The situation also reflect s the inability of technical

Policy Note. Washington, USA.
[13] Second National Communication. 2009.
[14] WB. 2010. *Economics of Adaptation to Climate Change: Samoa*. Washington, USA.
[15] National Adaptation Programme of Action Task Team. 2005. *National Adaptation Programme of Action: Samoa*.
[16] WB. 2010. Economics of Adaptation to Climate Change: Samoa. WB, Washington, D.C.
[17] GoS. 2013. *Post-Disaster Needs Assessment.*

institutions to provide the science behind the climate change phenomena and to do so in a user-friendly manner that could be easily understood by all

- **Reduced resilience of degraded ecosystems.** Inappropriate environmental management practices have degraded natural ecosystems in Samoa. These practices include deforestation, agricultural expansion into vulnerable areas, channelling of rivers, and coastal development. Degraded ecosystems are less able to buffer against the effects of disasters.
- **Small economy with limited diversification.** As a small island developing state, the economy of Samoa has limited diversification and is inherently small. This is partly attributable to limited foreign investment, little human capacity in specialist areas and isolation from foreign markets[18]. As a result, the economy has little resilience against the effects of climate-induced natural disasters.
- **Vulnerable infrastructure.** The National Building Code has not been revised or updated since its promulgation in 1992. As a consequence, some infrastructure in Samoa might not always be constructed according to international best practices that include climate-resilient designs. Furthermore, infrastructure to supply electricity, water and sanitation are vulnerable to climate-induced natural hazards. This is evidenced by the disruption to these services in the aftermath of Cyclone Evan. Roads, bridges and ports were also damaged by the cyclone.
- **Limited human resources.** Samoa suffers from a shortage of individuals with technical capacities in relevant fields including engineering, construction, agriculture and forestry. There is at present no formal human resource development plan to determine where the skills gaps are and to address these. This means that government institutions do not have sufficient staff with technical expertise to address climate change concerns adequately.

10. In summary, the socio-economic development of Samoa is at risk from climate-induced natural disasters such as cyclones. This situation is exacerbated by inherent vulnerabilities related to *inter alia* the country's geographical position, small population and limited technical and institutional capacity. Without an economy-wide strategy to integrate climate change adaptation into development planning, Samoa will remain vulnerable to the expected effects of climate change. This will undermine GoS' capacity to deliver social and economic benefits to vulnerable communities. For this reason, a multi-sectoral and proactive approach is needed to reduce the risks posed by climate-induced natural disasters to Samoan communities. Following a programmatic approach to climate change is in line with the sector-wide approach adopted by the GoS in 2008 to promote sectoral planning and programming.

1.2. Long-term solution and barriers to achieving the solution

1.2.1 Long-term solutions

11. The long-term solution that the proposed Least Developed Countries Fund (LDCF) project will contribute to is an economy-wide approach to integration of climate change adaptation and disaster risk management into national development planning and programming that will improve the climate resilience of communities' physical assets and livelihoods in Samoa.

12. **Preferred response 1.** *Enhanced institutional capacity for coordinating climate change adaptation.* National-level capacity for integration of climate change adaptation and DRM into development strategies across all sectors would be strengthened. This would enable governmental and other institutions to coordinate and implement climate change adaptation and DRM policies and programmes. All institutions would have a full understanding of climate change effects, the risks posed by natural disasters, appropriate response interventions and the linkages between climate change adaptation and DRM.

13. **Preferred response 2.***Improved monitoring and evaluation of adaptation and DRM interventions.* A comprehensive monitoring and evaluation (M&E) system would enable the costs and benefits of

[18] UNDP. *Country Programme Action Plan for Samoa (2008–2012)*.

interventions to be tracked and measured to inform prioritisation of climate change programming. Organisational structures and communication protocols within the government would be strengthened to support collaboration and exchange of information across different sectors. Institutions would be able to systematically capture the results from ongoing climate change adaptation and DRM interventions. Information would be collated into a centralised platform for dissemination to relevant institutions, organisations and individuals at national and local levels. Analysis of information generated by climate change adaptation and DRM initiatives would support prioritisation of budget allocations and specific interventions that increase resilience to climate-induced natural disasters.

14. **Preferred response 3.** *Improved climate resilience of infrastructure and community assets.* This response would include the climate-proofing of infrastructure – e.g. roads, bridges, ports – and community assets such as houses and community centres. This climate-proofing would entail application of the 'build back better' principle whereby post-disaster reconstruction replaces vulnerable infrastructure with more climate-resilient designs[19]. 'Build back better' would follow the most cost-effective approaches to climate-proofing reconstruction activities following the recommendations of the PDNA and the National Recovery Plan (NRP). This would include promoting the transfer of the best available adaptation technology. In addition, communities would be trained in reconstruction skills related to reducing the risks posed by climate-induced natural disasters.

15. **Preferred response 4.** *Improved climate resilience of community livelihoods.* The long-term solution would also include the diversification of Samoa's economy and communities' livelihood activities. Increased access to more resilient and diversified livelihood opportunities would build the capacity of vulnerable communities to respond to climate-induced natural disasters. This would promote community-level adaptation to climate change in the short-, medium- and long-term. The long-term solution would support alternative livelihood options for the labour force currently engaged in agriculture, while simultaneously increasing the productivity and efficiency of the sector. The approach to developing alternative livelihood options would include interventions to increase entrepreneurial skills and facilitate the development of small and medium enterprises (SME's). Furthermore, the long-term solution would build priority-specialised skills in the Samoan workforce to encourage foreign investments in the limited industrial and service sectors.

16. **Preferred response 5.** *Enhanced capacity of communities to respond to disasters.* This response would see communities mobilised to prepare and manage the risks posed by climate-induced natural disasters more effectively. Communities would be able to assess climate risks and respond in a timely manner. This would be achieved through the existence of a disaster plan for each village that clearly outlines roles, responsibilities, contingency plans and other disaster responses. In addition, communities would have access to post-disaster relief mechanisms that would enable them to recover quickly from the effects of climate-induced natural disasters.

17. **Preferred response 6.** *Sustainable management of natural resources.* The long-term solution would also include the restoration of degraded ecosystems to increase their resilience to climate change. Restored and intact ecosystems would provide a buffering service to communities, thereby reducing the risks posed by climate-induced natural disasters. Sustainable management of natural resources would include *inter alia*: i) protection of watersheds to reduce the risk of flooding; and ii) reforestation and protection of forests to reduce run-off and soil erosion.

18. The long-term solution would yield positive and measurable outcomes that would inform best practices that can be shared across the Pacific region. In addition, these best practices would be able to be replicated in other SIDS and used to increase the amount and efficiency of investments into climate change adaptation and DRM in Samoa.

[19] Gupta *et al*. 2010. *Build back better for next time*. European Union and United Nations International Strategy for Disaster Reduction – Regional Office for Asia and Pacific.

19. Achieving the long-term solution through a full suite of preferred responses may not be feasible because of economic and capacity constraints. However – by identifying barriers to implementing these responses – the proposed LDCF project will facilitate the implementation of the necessary interventions to contribute toward achieving the preferred responses in the long term.

1.2.2 Barriers to Achieving Long-term Solution

20. At present, there is limited knowledge and capacity for implementing integrated climate change adaptation and DRM interventions in Samoa. These capacity limitations hinder effective planning and successful implementation at national and local levels. Barriers underlying the capacity limitations are described below.

Persistent organisational weaknesses

21. Sectoral ministries and government institutions have limited experience in coordinating, planning and implementing multi-sectoral, integrated approaches to resolving pressing key development issues. This results in gaps within the current managerial and administrative skill sets required to oversee and supervise interventions at national and local levels. Existing approaches to address climate change and DRM remain largely *ad hoc* and fragmented. Consequently, the existing approaches do not result in on-the-ground benefits being sustained in the long-term. Fragmented approaches to climate change adaptation and DRM also result in duplication of interventions, high transaction costs and limited capacity to monitor, evaluate and respond to risks at a strategic and programmatic level.

22. Complementary skill sets and strategic advantages of institutions from different sectors are seldom capitalised upon. Poor coordination between these institutions and other stakeholders restrict opportunities for collaboration and sharing of information. For example, the Ministry of Natural Resources and Environment (MNRE) has strong technical knowledge on climate change adaptation and DRM while the Ministry of Women, Communities and Social Development (MWCSD) and Non-Governmental Organisations (NGOs) are experienced in engagement with communities. However, strategic partnerships between different ministries are seldom developed. In addition, efforts to engage with NGOs and Civil Society Organisations (CSOs) have been challenged by the existence of communication barriers between ministries, NGOs and CSOs. As such, leveraging the strengths of different stakeholders to manage climate change adaptation and disaster risks collaboratively has yet to be achieved. In the past, key ministries have focused on a projectised approach that has led to ministries being protective of resources and being slow to adopt the sector-wide approach.

Limited national-level capacity to implement, manage and enforce adaptation interventions

23. There is limited capacity within government institutions to implement and enforce existing policies, laws and regulations for climate change adaptation and DRM. For example, the application of the "build back better" principle for reconstruction of infrastructure damaged by Cyclone Evan is constrained by limited execution capacity by LTA as well as in the construction sector. There is a shortage of skills in artisanal and construction-related trades such as masonry, carpentry and electrical engineering. In addition, communities do not have access to the required financial, logistic and technical support to adopt a "build back better" approach in the post-disaster reconstruction of buildings and infrastructure. As a consequence, reconstruction of damaged infrastructure and buildings – as well as new construction projects – does not take place according to the latest information on climate-resilient building designs.

Inadequate monitoring and evaluation

24. Effective planning and management of climate change adaptation and DRM initiatives are hindered by information gaps in existing assessments of climate and disaster risks. For example, there are limited baseline data on historical effects of climate change. Accurate and consistent baseline data are required to support planning and development of policies to respond effectively to climate and natural disaster risks. Moreover, there are currently no comprehensive and

spatially explicit assessments of Samoa's expected vulnerability to climate-induced natural disasters under changing climate scenarios. Furthermore, there is a need to identify and collate all relevant information and ongoing activities that are contributing to resilience building so that this can be used to inform ongoing development planning following Samoa's sector-wide approach.

Short-term and top-down approach to implementation

25. There is limited engagement with communities to inform planning and implementation of climate change adaptation and DRM initiatives. This is the case for both government programmes as well as donor-funded projects. While ministries cooperate to deliver community programmes, design of adaptation projects is frequently determined by time and funding constraints as well as the need for project deliverables that meet the requirements of funding agencies. This affects community engagement and capacity building which requires long-term support. Consequently, there is limited building of sustainable partnerships and institutions – as well as ineffective engagement with communities – to foster lasting behaviour change for climate change adaptation.

26. The prevalence of top-down processes in government-led climate change projects is a barrier to the establishment of collaborative partnerships. This hinders development of local capacity to adapt and respond to climate change and climate-induced natural disasters. This problem is exacerbated by the misconception that the local stakeholders have insufficient technical knowledge to be effective participants. Projects are consequently implemented using a top-down approach with a result that local stakeholders resist projects that have not garnered community support during all phases of project development and implementation. While there is a need to build communities' knowledge base on climate change adaptation, there is likewise a need to develop skills in facilitation and participatory engagement within government institutions to foster local participation. This will allow development programming to build on the strengths of community participation in order to support sustainable and climate-resilient development processes.

Limited community-level capacity for climate change adaptation

27. As described previously, top-down approaches lead to poor engagement of communities in adaptation initiatives. The capacity of communities to adapt to climate change is further constrained by various institutional and societal factors. Firstly, community-level knowledge concerning climate change adaptation and DRM is limited. While national-level information is repeatedly disseminated to communities, the same individuals are usually targeted by these initiatives. Important information on climate change adaptation and DRM remains in the hands of a few community members. Consequently, the benefits of capacity building are limited to those individuals who are targeted.

28. Coupled to the above, there is a need for improved availability of easily-understood information related to climate change adaptation and DRM. It is difficult for abstract concepts such as "resilience" and "adaptation" to be translated into Samoan. There is consequently a need for translation of abstract concepts and technical knowledge on climate change into more user-friendly information. This will build the capacity of communities to adapt autonomously to climate change. It will also enhance collaboration between donors, implementers and communities to support effective cross-sectoral adaptation.

29. Furthermore, there has been limited uptake of diversified livelihood options in Samoan communities. This is in part owing to limited resources for investing in alternative livelihoods. For example, selling of handicrafts provides an alternative to agriculture that is likely to provide a sustainable income. However, there are start-up costs such as purchasing of equipment and raw materials. Without access to financing, communities are unable to adopt climate-resilient practices that require upfront investment. This is exacerbated by limited management skills and financial literacy that threaten long-term sustainability and viability of entrepreneurial initiatives. Consequently, awareness and training on livelihood diversification does not result in concrete changes in practices.

Little private sector involvement

30. Most climate change adaptation and DRM initiatives are implemented through GoS. To date, there has been little involvement of the private sector in climate change adaptation and DRM. The private sector suffered a large proportion of the total losses caused by Cyclone Evan with Tourism, Manufacturing and Commerce comprising ~20% of the total damage and loss[20]. While the private sector is vulnerable to the effects of climate change, there are few mechanisms in place for guiding investment into enhancing the climate resilience of this sector. In particular, there are few opportunities to address the needs of entrepreneurs who are at risk from climate-induced natural disasters.

2. Strategy

2.1. Country ownership: country eligibility and country drivenness

31. In line with the LDCF eligibility criteria[21], Samoa has ratified the United Nation Framework Convention on Climate Change (UNFCCC). At the time of Council approval of the LDCF grant (in 2013), Samoa was classified as a Least Developed Country. Samoa has submitted its First and Second National Communications to inform the country's policy, legal and institutional frameworks for adaptation to climate change. Under the UNFCCC, Samoa has committed to: i) adopting and implementing policies and interventions for climate change adaptation; and ii) managing existing risks through improved preparedness for and response to climate-induced natural disasters. The project proposed here will contribute towards achieving these goals and consequently meets LDCF requirements.

32. The proposed LDCF project has been developed in a country-driven approach in full alignment with Samoa's National Adaptation Programme of Action (NAPA). Specifically, the project responds to NAPA priorities 1, 5 and 7 as described below and in alignment other development partner programmes.

- **Securing Community Water Resources.** The project will support the integration of climate change adaptation into water management strategies and sectoral plans. In addition, the project will revise watershed management plans that will protect water resources and safeguard critical infrastructure.
- **Agriculture & Food Security Sustainability.** The project will support the diversification of agricultural production with a focus on strengthening agricultural value chains. This will contribute to more climate-resilient livelihoods.
- **Implement Coastal Infrastructure Management Plans for Highly Vulnerable Districts.** The project will implement post-cyclone reconstruction according to "build back better" standards. Furthermore, the project will update and implement management plans that will protect critical infrastructure against the expected effects of climate-induced natural disasters.

33. The proposed LDCF project is also aligned with United Nations Development Assistance Framework (UNDAF) for the Pacific Region 2013-2017. Specifically, it contributes towards achieving **UNDAF Outcome 1.1: Improved resilience of PICTs, with particular focus on communities, through integrated implementation of sustainable environmental management, climate change adaptation/mitigation and disaster risk management**.

34. Samoa has generally made good progress towards achieving its MDG targets. However, there remain some goals that have yet to be attained. The proposed LDCF project will contribute towards three of these, as detailed below.

[20] GoS. 2013. *Post-disaster Needs Assessment.*
[21] Updated Operational Guidelines for the Least Developed Countries Fund. GEF/LDCF.SCCF.13/04. Available at: http://www.thegef.org/gef/sites/thegef.org/files/documents/Updated%20Operational%20Guidelines%20LDCF%20Oct.16.pdf.

- **Target 1.A Halve, between 1990 and 2015, the proportion of people whose income is below the basic needs poverty line**. Samoans still experience significant hardship and income inequality[22]. The project will contribute towards this MDG by promoting climate-resilient livelihood options. The project will also strengthen value chains for agricultural produce and handicrafts that will improve sustainability of income streams.
- **Target 1.B Achieve full and productive employment and decent work for all, including women and young people.** There are presently few options for employment in Samoa. The project will contribute towards this MDG by providing employment opportunities for reconstruction of critical infrastructure. There will be a particular focus on providing opportunities for women and young people to be involved in reconstruction activities. In addition, the project will support micro-enterprises with a particular focus on improving access to self-employment opportunities for women and youth.
- **Target 7.C Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation.** The project will contribute towards this MDG by constructing community assets following the "build back better" approach. Specific assets to be constructed include *inter alia* water provision and sanitation infrastructure. The project will also promote sustainability of water resources through the implementation of integrated watershed management plans in alignment with other projects funded by development partners.

35. The proposed LDCF project is aligned with the current Strategy for the Development of Samoa (SDS, 2012–2016). The SDS outlines national development policies and identifies priority development areas towards achieving Samoa's socio-economic well-being and meeting the MDG targets. The project is aligned with several SDS priority areas.
    - **Priority Area 1: Economic Sector**. The project will promote climate-resilient livelihood options and strengthen value chains for agricultural produce and handicrafts. This is aligned with Key Outcome 3 ("Re-invigorate agriculture") and Key Outcome 5 ("Enabling environment for business development").
    - **Priority Area 2: Social Sector.** The project will implement community-based disaster risk management plans and build community-level capacity for climate change adaptation and DRM. This is aligned with Key Outcome 8.2 ("Community Development").
    - **Priority Area 3: Infrastructure Sector**. The project will reconstruct critical infrastructure damaged by Cyclone Evan. This is aligned with Key Outcome 9 ("Sustainable Access to Safe Drinking Water and Basic Sanitation") and Key Outcome 10 ("Efficient, Safe and Sustainable Transport System and Networks").
    - **Priority Area 4: The Environment**. The project will support climate change adaptation and DRM across all development sectors. This is aligned with Key Outcome 14 ("Climate and Disaster Resilience").

36. The proposed LDCF project is aligned with the recommendations of the GoS' Climate Public Expenditure and Institutional Review (CPEIR), conducted with the support of UNDP. The CPEIR details national priorities related to inclusion of climate change adaptation and DRM into planning processes and budget allocations. In addition, the project design was informed by the Post-Disaster Needs Assessment and the National Recovery Plan. These documents detail national priorities for recovery from the damages and losses incurred by Cyclone Evan. The project will implement priority activities from these plans with a focus on enhancing the climate resilience of all interventions. The proposed LDCF project is also aligned with the Community Disaster and Climate Risk Management methodology developed by GoS. This methodology has been integrated into Samoa's National Disaster Risk Management Plan.

2.2. Project rationale and policy conformity

[22] Pacific Islands Forum Secretariat. 2012. *Pacific Regional MDGs Tracking Report.*

37. The **project objective** is to establish an efficient mechanism for the integration of adaptation and disaster risk management into national development planning and programming and enhancing the resilience of communities' physical assets and livelihoods across Samoa, to climate change. LDCF funds will be used to support MNRE and the Ministry of Finance (MoF) to realise the preferred situation by: i) strategically integrating climate change adaptation and DRM into national policy frameworks and development planning through an economy-wide approach; ii) enhancing resilience of communities as first responders of climate change-induced hazards; and iii) developing and implementing a monitoring and evaluation system as well as a knowledge management strategy.

38. The primary **goal of the project** is to increase the economy-wide resilience of Samoa to climate-related hazards and disasters. This goal is aligned with a number of important policies and strategies that govern Samoa's national development and its approach to climate change adaptation and DRM.

Consistency with LDCF objectives and priorities

39. The proposed LDCF project is consistent with LDCF objectives CCA-1 "Reduce vulnerability to the adverse impacts of climate change", CCA-2 "Increase adaptive capacity to respond to the impacts of climate change" and CCA-3 "Promote transfer and adoption of adaptation technologies". Specific contributions to these objectives are described below.
    - Outcome 1.1 will support mainstreaming of climate change adaptation into policies, strategies and budgeting processes. This is aligned with LDCF Objective CCA-1, Outcome 1.1: "Mainstreamed adaptation in broader development frameworks".
    - Outcome 2.1 will support reconstruction of infrastructure according to "build back better" standards. This is aligned with LDCF Objective CCA-1, Outcome 1.2: "Reduced vulnerability in development sectors".
    - Outcome 2.1 will support the diversifying of livelihood strategies to build the climate resilience of community livelihoods. This is aligned with LDCF Objective CCA-1, Outcome 1.3: "Diversified and strengthened livelihoods and sources of income".
    - Outcome 2.2 will support the development and implementation of Village Disaster Risk Management Plans for 100 communities. This is aligned with LDCF Objective CCA-2, Outcome 2.2: "Strengthened adaptive capacity to reduce risks to climate-induced economic losses".
    - Outcome 2.1 will support the uptake of household-level technology for enhancing access to more secure livelihoods. This is aligned with LDCF Objective CCA-3, Outcome 3.1: "Successful demonstration, deployment, and transfer of relevant adaptation technology in targeted areas".

40. Through the implementation of priority interventions identified in the NAPA, the project is consistent with the ninth Conference of Parties (COP-9) and also satisfies criteria outlined in UNFCCC Decision 7/CP.7 and GEF/C.28/18.

41. Samoa is participating in the Pilot Program for Climate Resilience (PPCR). PPCR activities undertaken to date included preparation of the Climate Resilience Investment Programme (CRIP, 2011). The CRIP outlines a broad-based strategy for achieving climate resilience at the national level in the medium- to long-term, building on Samoa's SDS and NAPA as well as other policy and planning instruments. The main challenges identified by the CRIP include floods, storm events (with associated strong winds and high seas), coral bleaching and drought. The proposed LDCF project is aligned with the CRIP's priority areas of intervention including *inter alia* transport infrastructure, agriculture, flood protection, civic engagement and participation.

42. The project meets the following LDCF requirements in terms of implementation and design:
    - **Sustainability.** The project will integrate climate change adaptation into national policy frameworks and sectoral development planning. This will include specific budgetary allocations by government for climate change adaptation as part of recurrent expenditure. In

addition, the project will strengthen coordination of climate change adaptation and DRM between key ministries. The results of the LDCF financed interventions will also strengthen Samoa's institutional and technical capacities which in turn will enable the Government to secure additional climate finance from a variety of sources. These interventions will strengthen the capacity of national institutions and communities to sustain climate change adaptation related interventions in the medium- to long-term.

- **Replicability.** The project will implement a knowledge management strategy. This will allow activities, results and lessons learned to be systematically documented. This documentation will contribute to a robust planning framework that will inform design and implementation of future interventions for climate change adaptation and DRM, both within Samoa as well as across the broader Pacific region.
- **Monitoring and Evaluation.** The project design includes a monitoring and evaluation (M&E) framework. This framework will strengthen institutional coordination and provide a mechanism for reporting on the effectiveness of the interventions. It will be used to measure the indicators of progress towards the project objective. In addition, it will facilitate the documentation and dissemination of lessons learned during project implementation. The M&E frameworks includes evidence-based tracking of the interventions focused on promoting diversified livelihoods under Outcome 2.1 (see Section 5 and Annex 15). This will follow an experimental design approach that will compare the Difference-in-Differences between project beneficiaries and a control group to measure the direct impacts of the project on the target population.
- **Stakeholder involvement.** The project design has been informed by extensive stakeholder consultation. Relevant stakeholders include representatives of various ministries as well as private sector organisations, NGOs and community-based organisations (see Annexes 3, 4, 5, 6 and 10 for details on the consultations held). The stakeholders' involvement in the project is clearly defined and these stakeholders will be actively engaged during project implementation.
- **Multi-disciplinary approach.** The project will integrate climate change adaptation into sectoral planning in an economy-wide approach. By the end of the project, all fourteen sector plans will include explicit reference to climate change with budget allocations for supporting sector-specific climate change adaptation and DRM. This will facilitate a harmonised approach to climate change adaptation across all sectors and by stakeholders.
- **Complementary approach.** The project will build on various ongoing initiatives and programmes in Samoa. These initiatives include ongoing revisions of policy and plans, disaster and emergency preparedness activities at the national and local levels, post-disaster reconstruction activities, ongoing climate change adaptation projects and initiatives by donor agencies and development partners. The project will strengthen coordination of climate change activities that will facilitate collaborative partnerships between all stakeholders involved in climate change adaptation and DRM.

43. The proposed LDCF project has been prepared in line with guidance provided by GEF and the LDCF Trust Fund. The project follows guidance from the 'Strategy on Adaptation to Climate Change for the Least Developed Countries Fund and Special Climate Change Fund" and the guidance paper "Accessing resources under the Least Developed Countries Fund". The project design is also aligned with the expected interventions articulated in the LDCF programming paper and decision 5/CP.9. As the effects of climate change fall disproportionately upon the poor, the links between climate change adaptation and poverty reduction are explicitly addressed within the project design[23].

2.3. Design principles and strategic considerations

44. GoS continues to coordinate national policy-making and planning for development across all sectors. MoF has overall responsibility for coordinating this integrated approach. A central principle to this involves inclusion of climate change adaptation and DRM, GoS is changing towards an economy-wide response to climate change in line with its overall move to a sector

[23] In accordance with GEF/C.28/18, 1(b), 29.

wide approach to development planning. For example, the recommendations encapsulated in the CPEIR Readiness Plan provide a framework for a green development path for Samoa.

45. At the national level, the proposed LDCF project will enable strategic integration of climate change adaptation and DRM in national policy frameworks and sectoral development across all sectors. The direct consequence of this approach will be: i) enhanced capacity to integrate climate change adaptation and DRM into development planning; ii) stronger institutional coordination of climate change adaptation and DRM initiatives; and iii) dedicated allocation of funding for recurrent expenditure on climate change adaptation and DRM in government budgeting processes. By following an economy-wide approach to adaptation, the GoS will be better able to address national priorities for sustainable development in a climate-resilient manner. This will benefit the people of Samoa in the short-, medium- and long-term as they will be less impacted by the effects of climate change owing to climate-resilient service planning and service provision in critical sectors such as water, sanitation, agriculture and health.

46. The proposed LDCF project will implement prioritised "build back better" activities outlined in the National Recovery Plan (NRP). Critical infrastructure damaged by Cyclone Evan will be rebuilt following climate-resilient approaches. In addition, community and economic assets will benefit from improved watershed management including the construction of flood protection infrastructure. Consequently, these assets will be less vulnerable to climate-induced natural disasters. The NRP is contributing US$62 million towards the proposed LDCF project as parallel investment co-financing.

47. The project has been designed to build on the recommendations of the Post-Disaster Needs Assessment (PDNA) regarding land-use management. At present, the population of Apia is growing as a result of urban migration. As such, it is imperative that the vulnerability of people and infrastructure in Apia to climate-induced natural disasters is reduced. For example, development along the Vaisigano River is vulnerable to flooding as a result of extreme precipitation events and coastal inundation. DRM in such areas will require integrated development planning and land-use zoning that takes climate risks into account. Activities under the proposed LDCF project include integrated watershed management planning, construction of protective infrastructure and climate-proofing of vulnerable community assets following the "build back better" approach. The USAID-funded project ADAPT Asia-Pacific[24] provided technical assistance to the preparatory phase of this project by supporting the inclusion of a climate-resilient infrastructure specialist in the project design team. The results of multiple consultations with Government officials and other stakeholders by this infrastructure specialist led directly to the design of Outputs 2.1.1 and 2.1.2 under Outcome 2.1. In addition, the specialist produced two reports (Annexes 6 and 8).

48. This flood protection and watershed management will provide benefits to at least 12,000 people living within the Greater Apia area. Direct benefits from these interventions include: i) reduced risk of damage to public and private infrastructure/assets; ii) reduced possibility of loss of life; and iii) enhanced land value in flood-prone areas. Indirect benefits include: i) reduced losses in income/sales; ii) reduced costs of clean-ups, maintenance and repairs; iii) reduced costs of relief and response efforts; and iv) reduced possibility of health hazards. In addition to these 12,000 direct beneficiaries, the general population of Samoa will benefit from the safeguarding of critical

[24] The USAID Climate Change Adaptation Project Preparation Facility for Asia and the Pacific (USAID Adapt Asia-Pacific) is a project of the USAID Regional Development Mission for Asia that works with nations in the Asia-Pacific region to improve their access to the existing pool of financing for climate change adaptation interventions. The project is designed to share information and best practices about climate fund requirements and to support governments to both build the capacity necessary and actually access the adaptation funds that are presently available, both internationally and from other sources such as domestic budgets and the private sector. To complement the project's knowledge management, training and project preparation efforts, USAID Adapt Asia-Pacific also organizes an annual forum, providing a space for countries in the region to network and engage in dialogue on issues related to accessing climate change adaptation financing. USAID Adapt Asia-Pacific promotes regional networking as well as gender and other social equity issues. (For more information, visit: www.adaptasiapacific.org).

economic assets in Apia. For example, protection of the Apia Harbour as well as critical road and bridge infrastructure in the Apia area will benefit livelihoods across both Upolu and Savai'i as there will be more reliable access to markets for agricultural and trade goods. Furthermore, protection of the Alaoa Dam will improve the reliability of the water and electricity supply, particularly during emergency periods when these are in high demand.

49. The proposed LDCF project will build on the recommendations of the PDNA to support livelihoods, particularly those related to agriculture. The project will promote diversified livelihoods related to agricultural and manufacturing value chains to develop resilient micro-businesses. Diversified livelihoods will improve household-level income, which will in turn promote savings and can be expected to catalyse larger investments into activities that result in improved ability to respond to and recover from climate-induced natural disasters. This will enhance the capacity of households and individuals to respond to climate-induced natural disasters and strengthen their ability to cope with and adapt to the expected effects of climate change in the short-, medium- and long-term.

50. A total of 300 beneficiaries will receive support for agricultural livelihoods and a further 300 beneficiaries will receive support for handicraft livelihoods. This support will result in households being capacitated to add value to their products and thus receive a greater share of the profits on those products. Participants in project activities are expected to have higher levels of income that will allow them to increase savings and/or further invest in productive assets. This will strengthen their capacity to recover autonomously from eventual climate shocks as well as invest in health care, education, nutrition and other social outcomes.

51. The project has been designed with a strong focus on gender considerations[25].The results of multiple consultations with Government officials, NGOs, CSOs and other stakeholders informed the design of Outputs 2.1.3 under Outcome 2.1 as well as Output 2.2.1 under Outcome 2.2 (see Annex 5). In fact, ADAPT Asia-Pacific also provided technical assistance to the preparatory phase of this project by supporting the inclusion of a gender specialist in the project design team. Consultations were carried out specifically to ensure that these outputs put women, youth and other vulnerable groups, at the front of the decision-making process and implementation. In addition, ensured overall alignment of project activities with the specific needs of women and other vulnerable groups. For example, reconstruction of houses and other infrastructure can provide opportunities for women to be involved in skills development and gainful employment. The implementation of village-based DRM plans will cater specifically for the needs of women in disaster preparedness and response. Diversification of livelihoods will focus on gender-sensitive agriculture and handicraft opportunities. Finally, the knowledge management and M&E framework will identify successes and gaps in providing benefits for women.

52. The interventions planned under the proposed LDCF project are also aligned with the National Adaptation Plan (NAP) process established under the United Nations Convention on Climate Change (UNFCCC) as a way to facilitate medium- to long-term adaptation planning in developing countries. The project will contribute towards enabling a national mechanism under which GoS can develop its NAP process. This is especially important in the context of Samoa, as the GoS has recognized the need to advance efforts to better absorb current and future climate finance for its many pressing priorities. Table 1 provides an outline of the contributions that the project will make towards various steps of Least Developed Countries Expert Group guidelines to inform the development of the NAP process.

Table 1. Relationship between proposed LDCF project activities and the steps of the NAP process, including indicative NAP outputs[26].

[25] The USAID-funded project ADAPT Asia-Pacific provided additional technical assistance by making available the services of a gender and social issues specialist in the UNDP-led project design team.
[26] Based on: LDC Expert Group. 2012. *The National Adaptation Plan Process: A brief overview.*

Step	Indicative NAP output	Related LDCF project activity
Stocktaking: Identifying available information on climate change impacts, vulnerability and adaptation and assessing gaps and needs of the enabling environment for the NAP process.	Report on adaptation activities. Synthesis report on climate information.	Conduct updated stocktaking of all current and planned climate change adaptation projects, plans, reports and assessments.
	Geospatial database in support of the NAP process. Knowledge-base of observed climate impacts, vulnerabilities and potential interventions.	Establish a national climate and disaster risk database that is centralised and accessible to all Ministries.
Integrating climate change adaptation into national and subnational development and sectoral planning	Sectoral and subnational plans or strategies	Integrate medium and long-term climate change risks and opportunities into sector plans. Develop concrete recommendations to align the next Strategy for the Development of Samoa (2017-2021) with the draft National Climate Change Adaptation Strategy and recommendations for sector plans.
Promoting coordination and synergy at the regional level and with other multilateral environmental agreements	Matrix of potential synergies	Develop and pilot plan for systematised uploading and monitoring of data and information generated in Samoa on international platforms.

53. Finally, this LDCF project is aligned with the larger, regional programme, currently under implementation by UNDP, UNEP, and FAO titled "Pacific Islands Ridge-to-Reef National Priorities – Integrated Water, Land, Forest and Coastal Management to Preserve Ecosystem Services, Store Carbon, Improve Climate Resilience and Sustain Livelihoods". The LDCF-financed initiative is fully aligned with the overall "Ridge-to-Reef" strategy to strengthen physical assets of communities through adaptation measures that follow a comprehensive upstream-to-downstream approach. Downstream activities will be conducted in full coordination with upstream assessments and activities, so as to proceed in a holistic and proactive action to reduce vulnerabilities in the future and avoid an "ad-hoc" response to the effects of climate change in Samoa. Further, it is expected that lessons, case studies, and best practices will be shared between the regional programme and GoS during the projects' lifetime, which will promote regional cooperation and knowledge sharing to support replication and sustainability of the project's interventions.

Complementarity with the Pilot Programme for Climate Resilience and the Adaptation Fund project

54. The LDCF-financed project has been designed to align and complement with the World Bank/Asia Development Bank-supported Pilot Programme for Climate Resilience (PPCR) and the Adaptation Fund-supported project titled "Enhancing resilience of coastal communities of Samoa to climate change" (hereafter referred to as the AF project). These projects will review Coastal Infrastructure Management (CIM) Plans in a total of 41 districts[27]. The updated plans will be known as Community Integrated Management, or"CIM-2" Plans and will incorporate the multitude of existing plans – e.g. Village Sustainable Development Plans, Village Disaster Risk Management Plans and Watershed Management Plans – into comprehensive local-level planning frameworks for each district. Based on the CIM-2 Plans, both the PPCR and the AF project will implement prioritised interventions that are informed by communities' development needs as described below.

55. The PPCR will demonstrate investments into climate-resilient infrastructure. The West Coast Road linking Apia to Faleolo International Road will be rehabilitated to reduce its vulnerability to

[27]The AF project and the PPCR will review CIM Plans in 25 districts and 16 districts respectively.

flooding and coastal inundation. The PPCR will support technical assistance for design and construction of the road infrastructure. Building on this, the PPCR will also prepare a vulnerability assessment and improvement programme detailing climate-resilient options for Samoa's entire road network.

56. In addition, the PPCR will implement prioritised interventions from the CIM-2 Plans in 16 districts. Current CIM plans include risk management options that mainly comprise the construction of seawalls and other "hard" infrastructure interventions that focus on protection of community assets. The revised CIM-2 Plans will include measures for enhancing the climate resilience of ecosystems to secure the provision of ecosystem goods and services such as erosion control and storm protection. These activities will build on practices such as rehabilitation of mangroves and coastal marshes, which have proven effective for reducing climate risks in Samoa. These "soft" interventions will be designed to complement the investments in "hard" infrastructure in an approach that has proven to be more cost-effective and sustainable than implementing either of these approaches in isolation[28].

57. The AF project follows a similar approach to the PPCR, but operates in different districts. CIM Plans will be reviewed and updated in 25 districts to develop CIM-2 Plans. On the basis of these revisions, the AF project will implement prioritised investments into climate resilience in these 25 districts. This will follow the same approach as the PPCR to ensure complementarity. In addition, the AF project will implement the following measures for building climate resilience:
- climate-proofing of coastal roads in at least 10 districts;
- shoreline protection in at least 10 districts;
- enhanced water supply in least 5 districts; and
- flood protection in at least 5 districts.

58. The LDCF project will complement the above-mentioned projects by adopting a "Ridge-to-Reef" approach in designing and implementing a coordinated response for the protection of communities' physical assets under Outcome 2.1 (as described in Section 2.4 of this document). This approach refers to the integrated planning of downstream and upstream adaptation interventions on land and water management and coastal and inland biodiversity and ecosystems, ensuring full consideration of the impacts that such interventions may have on the social, economic and ecological systems that comprise a ridge-to-reef geographic coverage, as a whole. At the policy level, the GoS intends to address the barrier of a fragmented policy and programmatic approach, by putting in place an enabling framework that will guide interventions on climate change adaptation and DRM and make this a priority of 'economic and social concern'. This will be coordinated to ensure no overlap between the three projects, while at the same time maximising the efficient use of project resources.

59. To reduce the risks of climate-induced hazards posed to the communities living in Apia, the LDCF project will develop an integrated watershed management plan (WMP) for the Greater Apia area. The WMP will follow the "Ridge-to-Reef" principle with an integrated approach to building climate resilience and protecting community livelihoods/assets. The LDCF project will build on the LIDAR mapping to be undertaken as part of the PPCR as well as a hydrological mapping exercise that is currently being undertaken for the Vaisigano River.

60. On the basis of the integrated WMP, the LDCF project will develop flood protection infrastructure for the Vaisigano River. This aspect of the project will build on the work conducted by the PPCR within three districts in the Greater Apia area by implementing recommendations from the PPCR's CIM-2 Plans within the integrated WMP framework. The PPCR will not support design and

[28]Rao N.S., Carruthers T.J.B., Anderson P., Sivo L., Saxby T., Durbin, T., Jungblut V., Hills T., Chape S. 2013. An economic analysis of ecosystem-based adaptation and engineering options for climate change adaptation in Lami Town, Republic of the Fiji Islands. A technical report by the Secretariat of the Pacific Regional Environment Programme. Apia, Samoa.

implementation of large-scale flood protection infrastructure because the scope of these CIM-2 Plans is not sufficient to include the development of a comprehensive and integrated WMP nor for the implementation of interventions on the scale required to reduce the vulnerability of these communities within these districts. The LDCF project will therefore use the recommendations from the CIM-2 Plans to identify priorities for implementation.

Comparative Advantage of UNDP

61. UNDP's comparative advantage for the proposed LDCF project includes considerable support to GoS on climate change adaptation and DRM in coastal areas. UNDP has initiated several flagship development programmes, including the: i) Private Sector Support Facility; ii) MDG Acceleration Project; iii) Community-Centred Sustainable Development Programme; iv) Tsunami Early Recovery Project; and v) the Tourism Tsunami Rebuilding Programme. These initiatives all supported disaster-preparedness and -response activities in the tourism sector.

62. UNDP assisted GoS with the formulation of its NAPA. UNDP also supported the implementation of projects to address NAPA priorities in a cohesive and programmatic framework. This includes UNDP-supported adaptation projects underway in the agriculture, health, coastal management and forestry sectors. The proposed LDCF project will build on UNDP's experience in implementing these adaptation projects using a cross-sectoral approach. This will enhance cost-effectiveness and enable cross-sharing of lessons learned between projects.

63. UNDP has supported GoS to access large amounts of development funding, including more than US$20 million in recent years. Projects related to climate change include:
- Integrating Climate Change Risks into the Agriculture and Health Sectors in Samoa (LDCF);
- Integration of Climate Change Risk and Resilience into Forestry Management (LDCF);
- Pacific Adaptation to Climate Change (LDCF);
- Pacific Islands Greenhouse Gas Abatement through Renewable Energy Project;
- Enhancing resilience of coastal communities of Samoa to climate change (Adaptation Fund);
- Strengthening Multi-Sectoral Management of Critical Landscapes (GEF); and
- Enhancing the Resilience of Tourism Reliant Communities to Climate Change Risks (LDCF).

64. These resources have been used to enhance Samoa's climate resilience in the ways listed below.
- Mainstreaming climate change into sectoral planning for tourism, agriculture, health, forestry and coastal protection.
- Strengthening climate information services such as a network for climate monitoring and provision of tailored information on climate change to the various sectors.
- Enhancing technical capacities on climate risk and hazard mapping, early warning systems, remote sensing, cost-benefit analyses for selection of adaptation options and the use of climate information to inform adaptation strategies.
- Strengthening finance and budgeting capacities through the CPEIR, which assisted the various sectors to analyse public expenditure on climate change, design markers for climate change adaptation and identify budget gaps and opportunities for planning.
- Supporting communities in the implementation of adaptation interventions through demonstrations of agriculture, watershed management, coastal protection and health.

65. UNDP's Multi-country Office in Samoa has a number of staff experienced in the fields of climate change adaptation, DRM (including disaster prevention and recovery) and natural resource management. Technical aspects of project implementation are supported by a dedicated technical advisor based in Bangkok and a global senior technical advisor. The global network of the region-based advisors enables sharing and dissemination of knowledge beyond the country and region. Furthermore, the operational staff of UNDP Samoa has long-standing working relations with both MNRE and MoF. In addition, UNDP has project operational support mechanisms that are provided to line ministries such as the Ministry of Agriculture and Fisheries (MAF) and Ministry of Health. This will enable effective implementation of project processes that will include an established system for quarterly work planning and review of project performance. UNDP's use of

the National Implementation Modality has built capacity for project management and reporting in GoS. This will prove beneficial for supporting ongoing partnerships between UNDP and GoS for project implementation. UNDP's emphasis application of the Human Rights Based Approach and its emphasis on gender equality in development programming will ground the implementation of the proposed LDCF project on these important development principles.

66. The UNDP Multi-Country Office's comparative advantage in the implementation of this economy-wide project for climate change adaptation also lies in its experience with effective facilitation of partnerships with fellow UN Agencies and regional organisations. In particular, UNDP has experience in collaborative partnerships with agencies that are party to the Council of Regional Organisations of the Pacific, such as SPREP, SPC/SOPAC, SPTO and several NGOs.

67. UNDP's comparative advantage for GEF focal areas lies in its global network of country offices – such as the UNDP Multi-Country Office in Samoa – and its experience in supporting integrated policy development, human resources development and institutional strengthening as well as promotion of NGO and community participation. This experience means that UNDP is well-placed to assist GoS Samoa in designing and implementing this project in a manner that is consistent with the LDCF mandate as well as national development planning. UNDP's added value is also evident as described below.

- ***Accountability***: a track record of quality management of development finance as well as M&E and reporting on project implementation.
- ***Technical Expertise***: a large number of experienced and qualified staff with expertise in a number of relevant fields (e.g. climate change adaptation, development planning) in country offices and regional headquarters, as well as a world-wide knowledge network of specialists.
- ***Regional and global cooperation***: experience with developing synergies and cooperation at the regional and global levels, including through initiatives for North-South and South-South collaboration.
- ***Coordination with other UN agencies***: a mandate to support coordination and collaboration between other UN agencies as leader of the United Nations Development Group.

68. In summary, UNDP has a proven ability to: i) formulate project proposals; ii) collaborate with development partners and donors; iii) mobilise resources for development implementation; iv) monitor, evaluate and report on results; v) support and further develop national/local capacities for implementation; and vi) contribute to ongoing learning and improvement of processes. UNDP's track record of effective coordination of development planning and implementation – both with GoS and other development partners – makes the organisation ideally placed to support the implementation of this project.

2.4. Project Objective, Outcomes and Outputs/activities

69. The **project objective** is to establish an economy-wide approach to climate change adaptation and DRM in Samoa. This approach will support the integration and management of climate change adaptation and DRM within national development planning and programming frameworks, enhancing the resilience of Samoan communities to the expected effects of climate change such as climate-induced natural disasters.

70. The proposed LDCF project intends to address the currently fragmented policy approach to climate change adaptation by creating an enabling framework to guide interventions on climate change and DRM. This will make adaptation to climate change a priority within socio-economic development in all sectors. The project will build on existing initiatives to ensure that current limitations in implementation of interventions for climate change adaptation are addressed. Furthermore, the interventions in this project will focus on implementing Priorities 1, 5 and 7 of Samoa's NAPA, namely: i) securing community water resources; ii) agriculture and food security sustainability; and iii) coastal Infrastructure for highly vulnerable districts. To achieve this, the project will build the capacity of GoS as well as communities across Samoa to enable them to more effectively prepare for and manage climate risks.

71. The project objective will be achieved through a strategic combination of technical assistance and investments in on-the-ground interventions through pilot demonstrations of adaptation options. The project will deliver five integrated and complementary outcomes, namely: i) Outcome 1.1 – Policy Strategies/Institutional Strengthening; i) Outcome 1.2 – Public finance management at the national and village level; iii) Outcome 2.1 – Protection of communities' physical assets and livelihoods; iv) Outcome 2.2 – Climate change adaptation/DRM plans and implementation; and v) Outcome 3.1 – Knowledge about climate change adaptation and DRM at the regional and global level.

COMPONENT 1. STRATEGIC INTEGRATION OF CLIMATE CHANGE ADAPTATION AND DISASTER RISK MANAGEMENT IN NATIONAL POLICY FRAMEWORKS AND DEVELOPMENT PLANNING THROUGH AN ECONOMY-WIDE APPROACH

OUTCOME 1.1. Policy Strategies/Institutional Strengthening: Climate change adaptation and DRM mainstreamed in relevant policies, sectoral strategies, sub-national strategies[29] and budgeting processes through enhanced coordination of government institutions.

Co-financing amounts for Outcome 1.1: US$ US$15,765,849
LDCF project grant requested: US$788,638

Without LDCF Intervention (baseline)

72. At present, national capacity for management of the risks posed by climate-induced natural disasters is limited, as recently evidenced by the damage and losses caused by Cyclone Evan. This limited capacity is a result of restricted resources and a poor skill base for DRM as described by the National Progress Report on the Implementation of the Hyogo Framework for Action (2011–2013). Agencies and institutions with designated responsibility for DRM are not able to implement and enforce risk reduction regulations. In addition, there is a disparity between the modalities for implementation of activities for climate change adaptation at the national level as opposed to at the community level. Existing plans and activities that are relevant to climate change adaptation and DRM include *inter alia*: i) community disaster recovery plans; ii) watershed management plans; iii) coastal infrastructure management plans; iv) NAPA projects; v) climate change adaptation strategies for the tourism, health and agriculture sectors; and vi) village development plans. This proliferation of plans – coupled with poor coordination of activities between these plans – results in overlap and duplication of activities. This is being addressed by the establishment of a joint management committee for the AF and PPCR projects. However, more efforts are needed to ensure efficient coordination of climate change activities across all sectors.

73. The SDS 2012–2016 explicitly outlines the need for mainstreaming climate change into national planning processes such as the Sector Plans for each of the fifteen national sectors. MoF – through its Economic Policy and Planning Division (MoF-EPPD) – is mandated to coordinate policy and planning within all sectors that contribute to the objectives of the SDS. This is in line with GoS' goal of adopting an integrated approach to development planning. The state of integration of climate change adaptation into the fifteen sectors is described below.
    - The **Economic Sector** in Samoa comprises: i) agriculture; ii) tourism; iii) trade, commerce and manufacturing; and iv) finance. The Agriculture Sector Plan (2010-2015), Tourism Development Plan (2009-2013) and Trade, Commerce and Manufacturing Sector Plan (2012-2016) all include climate change adaptation and DRM considerations within their planning frameworks. However, the Finance Sector Plan (2012-2017) does not presently include specific reference to climate change adaptation or DRM.
    - The **Social Sector** in Samoa comprises: i) health; ii) communities; iii) public administration; iv)law and justice; and v) education. The Health Sector Plan (2008-2018), Community Sector

[29] Sub-national strategies include district/village strategies and a strategy for Apia

Plan (2010-2015) and Education Sector Plan (2013-2018) currently all make explicit reference to climate change adaptation and DRM for ongoing sectoral planning. By contrast, there is currently no inclusion of climate change adaptation and DRM within the Public Administration Sector Plan (2013-2017) – which is in final draft phase – or the Law and Justice Sector Plan (2012-2016).

- The **Infrastructure Sector** in Samoa comprises: i) water and sanitation; ii) transport; iii) telecommunications; iv) energy; and v) construction. The Water and Sanitation Plan (2012-2016), Transport Sector Plan (2013-2018) – currently in final draft phase – Telecommunications Sector Plan (draft phase) and Energy Sector Plan (2012-2016) all include considerations for climate change adaptation and DRM. The Construction Sector Plan has yet to be formulated.
- The **Environmental Sector** in Samoa is considered a cross-cutting sector. The National Environment Sector Plan (2013-2016) does include climate change adaptation and DRM in its planning framework.

74. MoF conducts bimonthly meetings with the coordination units of each sector. These meetings support and facilitate: i) harmonised accounting and reporting procedures; ii) improved collaboration among ministries and other agencies on advancing development; and iii) better management of national data and information. In addition, MoF meets regularly with representatives from donor agencies to coordinate aid funding with government planning processes. MoF's mandate for sector coordination provides an opportunity for facilitating the development of mechanisms for cross-sectoral coordination of climate change adaptation and DRM.

75. At present, all external development financing is administered through MoF. Donor assistance currently comprises ~20% of annual GDP[30]. This includes external financing for climate change adaptation, which is to be administered through the Climate Resilience Investment Coordination Unit (MoF-CRICU). However – despite its strong mandate for coordination of all sectors – MoF needs specialists in thematic areas of expertise related to the specific sectors. This is particularly the case for climate change adaptation and DRM. As a consequence, planning remains largely decentralised between the line ministries and there is poor coordination of activities designed to build climate resilience. These limitations prevent CRICU from effectively coordinating national planning for climate change adaptation efforts. Enhanced collaboration between CRICU and the National Planning Division of MoF is necessary to improve planning for adaptation across all sectors.

76. MNRE is mandated with policy-making, planning and implementation related to climate change adaptation in Samoa. As such, this ministry is responsible for producing policy documents to guide climate change programming, such as the National Policy on Climate Change and the NAPA. In addition to this, MNRE is also the designated secretariat for the National Climate Change Country Team (NCCCT). The NCCCT was envisaged provide overall coordination of the national response to climate change. However, the NCCCT's activities have not been sustained and it is currently inactive. While MNRE's GEF Unit has served as an important focal point for climate change financing, the ministry does not have sufficient capacity to implement initiatives for climate change adaptation in an economy-wide, cross-sectoral manner. At present, MNRE's capacity limitations restrict both the scope and the scale of its ability to support climate change adaptation.

77. MNRE's mandate also extends to policy-making and planning for management of the natural environment. This mandate includes the implementation of interventions focused on management of: i) water resources – through the Water Resources Division; ii) disaster risks – through the Disaster Management Office; iii) forests and terrestrial ecosystems – through the Forestry Division; and iv) urban planning – through the Planning and Urban Management Agency.

[30] See World Bank Data, World Development Indicators: http://data.worldbank.org.

Although the environment is considered a cross-cutting sector, several factors constrain MNRE from collaborating effectively with other ministries. MNRE staff has little access to information and knowledge produced outside of their specific divisions. Obtaining data from other ministries takes time and requires approval of such a request from MoF. Consequently, MNRE is not able to coordinate initiatives for climate change adaptation effectively, despite its mandate for DRM.

78. The creation of the sector coordination units has established a forum for enhanced sectoral planning and decision-making. However, the sector coordination units have yet to explicitly integrate climate change adaptation and DRM within ongoing planning and prioritising across sectors. Furthermore, budget performance frameworks liked to sectoral planning do not include climate change adaptation as a key performance indicator. As a result, there is still insufficient inclusion of climate change considerations within sectoral planning frameworks.

79. In summary, planning and implementing initiatives for climate change adaptation and DRM remains fragmented. National and sectoral development strategies and plans are not informed by up-to-date scientific knowledge on climate change as there is necessary information is rarely available. Sectoral and other lower-level plans do not link with an overarching plan/strategy for addressing climate change. Project management for climate change-related initiatives remains problematic. This results in duplication of staffing, reporting and implementation with consequent inefficiencies.

With LDCF Intervention (adaptation alternative)

80. At the national level, the GoS will use LDCF resources to integrate climate change adaptation and DRM into an overall national policy for adaptation as well as within sectoral development planning. As a result, all sectoral plans will have sector-specific objectives for climate change adaptation. This will create a stronger institutional framework for climate change adaptation along with the integration of climate change considerations into budget allocations. Ongoing planning and budgeting will consequently be conducted in a more climate-resilient manner with enhanced monitoring and evaluation of climate-related initiatives (linked to Component 3).

81. The Public Financial Management Reform Plan (PFMRP) will provide US$12,300,000 as parallel support co-financing to the LDCF project through its ongoing support to the sector coordination units within GoS. This is part of a performance-linked budget support programme that is supported by the Governments of New Zealand, Australia and the European Union as well as the World Bank and Asian Development Bank. The PFMRP has a focus on building the institutional, organisational and administrative capacity of line ministries and government agencies in Samoa and improving public finance management systems for better accountability. In addition, the PFMRP has strengthened capacity for preparation of budget performance frameworks linked to sectoral planning. The proposed LDCF project will build on these activities by supporting the inclusion of climate change adaptation within the budget performance frameworks. This will be guided by the improved integration of climate change risks and opportunities into sectoral planning as well as national development strategies.

82. The proposed LDCF project will support strengthening of national mechanisms for coordination of plans and projects for climate change adaptation. Strengthened coordination between the various divisions of MNRE, MoF and other government agencies will enhance overall operational efficiency. This will enable better sequencing and prioritising of activities to limiting duplication and overlap. Public expenditure and activities implemented by *inter alia* donor agencies and NGOs will be streamlined within a coherent national framework. Clear responsibilities for climate change will be allocated to government institutions to improve coordination of climate policy and programming as well as budgetary and fiscal mainstreaming of climate change activities. Reports detailing public expenditure on climate change will inform strategic decision-making on climate change adaptation and DRM.

83. The improvements in efficiency and coordination will result in increased benefits derived from the available resources. Gaps in planning and/or implementation of activities for climate change

adaptation will be identified and addressed effectively. Specific mandates will be developed for monitoring, evaluating and reporting on the implementation of interventions for climate change adaptation and DRM in alignment with the Monitoring and Evaluation Framework for the SDS. This will strengthen national capacity for delivering climate-resilient benefits in an integrated manner.

Output 1.1.1. Climate change adaptation mainstreamed into development and sectoral plans.

84. A proposed National Climate Change Adaptation Strategy (NCCAS) will be developed[31]by MNRE in alignment with the recommendations outlined in the ongoing Samoa Climate Change Policy Review and Way Forward (being completed in 2014) and in consultation with all relevant stakeholders including the MoF. A comprehensive literature review and stakeholder consultations were conducted to assess the current state of climate change policy in Samoa, including progress on implementation of priorities outlined in the NAPA and the National Policy for Combating Climate Change. MNRE will build on these recommendations for strengthening the institutional and policy framework for climate governance in order to mainstream climate change into sectoral planning and national development policy. The NCCAS will form the foundation of the National Adaptation Plan process in Samoa by outlining mechanisms for integrating climate change adaptation into national and sub-national development planning. In addition, the NCCAS will formulate a long-term national adaptation implementation strategy. Development of the NCCAS will take into account the NAP Guidelines produced by the UNFCCC. Relevant lessons learned and best practices from LDCs –as reflected in web-based knowledge products of the NAP Global Support Programme[32] – will be used to guide and inform the finalisation of the NCCAS.

85. In addition, MNRE and MoF will coordinate the integration of climate change adaptation and DRM into the next Strategy for the Development of Samoa (2017-2021)[33] as well as sectoral planning for all 15 sectors[34]. Explicit consideration of climate change in on-going planning and budgeting will support climate-resilience of all aspects of Samoa's planning and budgeting for recurrent expenditure.

86. Activities will include:

1.1.1.1 Identify entry points for integration of climate change into all sector plans. This will include a sector-by-sector review of medium- and long-term climate change risks and opportunities, based on up-to-date information on climate change projections and expected impacts for Samoa.

1.1.1.2 Revise all sector plans to take medium- and long-term climate change risks and opportunities into account. The revisions will include explicit budgets and M&E indicators to guide implementation of sectoral priorities for climate change adaptation. This will occur as part of GoS's schedule for sector revisions whereby all sector plans will be updated between 2014–2018.

1.1.1.3 Develop MNRE and MoF's human resource capacity to continuously revise sector plans based on up-to-date information on expected impacts of climate change (see Annex 4). This will occur based on the capacity assessments conducted under Output 1.1.2. and will include appointment of a Climate Change Policy Advisor to provide guidance and input into sectoral plans.

1.1.1.4 Finalise review of the NPCC (2007) and produce a proposed National Climate Change Adaptation Strategy to mobilise the integration of adaptation in medium- and long-term planning and budgeting processes in Samoa. This will build on the "Samoa Climate Change Policy Review & the Way Forward" report that has identified key gaps and opportunities in the current policy framework.

[31] In accordance with Recommendations R2 and R8 of the CPEIR.
[32] Currently being jointly implemented by UNDP and UNEP.
[33] In accordance with Recommendations R1 and R8 of the CPEIR.
[34] In accordance with Recommendations R3 and R8 of the CPEIR.

1.1.1.5 Develop concrete recommendations to align the next Strategy for the Development of Samoa (2017-2021) with the draft National Climate Change Adaptation Strategy and recommendations for sector plans.

Output 1.1.2. Institutional and operational frameworks for coordination of climate change adaptation strengthened.

87. The respective roles and responsibilities of MNRE and MoF with regard to coordination of policy-making, planning and implementation of climate change activities will be defined using a sector-wide approach. This will support the mainstreaming of climate change adaptation into sectoral and development planning (as outlined under Output 1.1.1).

88. A Climate Change Unit (CCU) will be established within MNRE. Guidelines for the CCU – as outlined in a concept note submitted to the Public Service Commission for endorsement in May 2014 – will include: i) mandating MNRE for overall coordination of climate change adaptation and DRM initiatives; and ii) outlining how it will coordinate with CRICU and other government agencies[35]. This will enable better sequencing and prioritising of activities through a more programmatic approach to reducing duplication and overlap of efforts. The resulting improvements in efficiency and coordination will increase the benefits provided to local communities.

89. The CCU will initiate a stock-taking exercise to update the inventory of all current and planned climate change adaptation projects in Samoa. Based on this stock-taking, capacity for the coordination of climate change activities will be strengthened. This will serve to prevent duplication of initiatives and identify gaps in planning and implementation on a sector basis. As new adaptation initiatives are planned and implemented, the CCU will coordinate continuous revisions of the inventory of climate change adaptation projects to ensure that climate change adaptation follows a programmatic and cross-sectoral approach.

90. Specific guidelines for CRICU's functions will be prepared to guide mainstreaming of climate change adaptation into budgetary and accounting frameworks. This will enable more streamlined and efficient management of climate finance that will support sequencing and prioritising of climate change activities and reflect most effective pathways by which integration of climate change has taken place at sector and national levels.

91. Activities will include:

1.1.2.1 Conduct capacity assessments of MNRE and MoF to identify capacity gaps related to coordination of climate change activities nation-wide including those implemented by government ministries/institutions as well as development partners and NGOs (see Annex 4).

1.1.2.2 Create a Climate Change Unit within MNRE to improve decision-making and project management of national climate change activities (see Annex 4). This unit will provide a central point for supporting management and implementation of climate change adaptation activities across all sectors as well as those carried out by development partners and NGOs.

1.1.2.3 Define roles for MoF and MNRE to ensure coordinated climate policy-making, planning, and implementation in collaboration with relevant sectors. This will include specific roles for nation-wide policy-making, planning, budgeting and monitoring of adaptation activities according to national and sectoral priorities developed under Output 1.1.1.

1.1.2.4 Conduct periodic and ongoing stocktaking of all current and planned climate change adaptation projects, plans, reports and assessments. This will be carried out at regular intervals by the MNRE Climate Change Unit to include all new adaptation activities as

[35] Recommendations R8, R9, R11 and R12 of the CPEIR.

new initiatives by government ministries/institutions, development partners and NGOs are planned and initiated.

1.1.2.5 Develop specific guidelines for CRICU functions including accounting, budgetary and fiscal mainstreaming of climate change initiatives. This will allow for centralised monitoring of the progress towards national and sectoral objectives related to climate change adaptation.

OUTCOME 1.2. Public finance management at the national and village level: Capacity to access, manage, implement and monitor use of climate change funds is enhanced at the national and village level.

Co-financing amounts for Outcome 1.2: US$1,999,124
LDCF project grant requested: US$100,000

Without LDCF Intervention (baseline)

92. Various sources of funding – in particular the Civil Society Support Programme (CSSP) – are available for community-based organisations (CBOs) and individuals to implement local-level development projects. CBOs and communities also receive training to enhance their ability to successfully apply to these sources of funding. The training is primarily provided through the Samoa Umbrella for Non-Governmental Organisations (SUNGO) and covers: i) project identification and prioritisation; ii) proposal writing and application; iii) project management and procurement; and iv) financial management and M&E. The activities that are undertaken mainly comprise construction of household and community assets. As such, the types of projects funded through these programmes focus on conventional socio-economic benefits. At present, there is no particular emphasis on using such funding for building climate resilience, for example by prioritising projects that will retrofit community assets following the "build back better" approach. As a result, the sustainability of benefits delivered to communities by such projects are likely to be threatened by climate change.

93. As the lead government financial agency, MoF is mandated to coordinate the budgeting and financing across all sectors. At present, MoF receives support for building capacity to improve public finance management through the PFMRP. Specific areas for building capacity include planning and budgeting as well as accounting, monitoring and reporting. Under the PFMRP, MoF has carried out a Public Expenditure Review (PER) detailing analysis of expenditure for the period 2006–2012.These PERs support a strengthened analytical basis for the GoS' management of public expenditure to improve linkages between policy and planning with budgeting and expenditure. In this way, line ministries will have enhanced capacity for improved decision-making and prioritisation across all sectors. However, the PERs are yet to detail expenditure on climate change adaptation and DRM explicitly. As a result, line ministries are presently unable to identify climate expenditure within the various sectors. The application of these skills to climate-related expenditure presents a broader cross-sector challenge that requires additional expertise.

94. To address this challenge, the CPEIR was initiated as a collaborative effort between MoF, UNDP and other development agencies that provided MoF with some background in public finance management for climate change. During this process, assistance was provided to analyse public expenditure on climate change, design markers for climate change adaptation and identify budget gaps and opportunities for planning within the relevant sectors. However, MoF does not currently have the in-house expertise required to perform such an analysis of climate expenditure on a regular basis. This constrains MoF's capacity to prioritise and manage climate financing.

With LDCF Intervention (adaptation alternative)

95. Building capacity for managing climate finance at all levels will enable improved programming for adaptation. This is dependent on accessibility of information on initiatives for climate change adaptation including knowledge of funding opportunities, how to access them, methodologies for prioritisation of interventions and modalities for implementation.

96. With LDCF resources, MoF will build the capacities of communities to access funding for climate-resilient development. This will build on the current suite of training offered by SUNGO and other CBOs that is supported by the PPCR. Community members will be trained on using the funding made available through initiatives such as the CSSP for local-level activities that focus on climate change adaptation. The training will focus on identifying and prioritising interventions that build climate resilience. Such interventions could include retrofitting houses following the "build back better" principle, constructing disaster shelters, installing community-level early warning systems and enhancing climate-resilient agricultural production. Communities will also be trained on management of community-level projects for climate change adaptation. This capacity development will enhance the ability of communities to leverage available funding for improving local-level resilience to climate change.

97. In addition, MoF will use LDCF resources to adapt the CPEIR methodology to provide guidelines for ongoing analysis of climate-related expenditure. This will be aligned with MoF's experience related to the PERs under the PFMRP. The PFMRP will provideUS$3,000,000 as parallel support co-financing to the LDCF project through its ongoing capacity development of MoF to conduct regular PERs. These PERs support the GoS' capacity to analyse and manage public expenditure, improving linkages between policy and planning with budgeting and expenditure. MoF will be supported to develop a methodology for conducting regular analysis of public expenditure on climate change as part of the PER process. The adapted methodology will guide the compilation of a report that details *inter alia*: i) new developments in climate-related policies across all sectors; ii) recent trends in climate expenditure, building on the CPEIR; iii) new developments in international cooperation on climate change; and iv) opportunities for climate funding. The climate expenditure report will be prepared through a collaboration between MNRE – responsible for policy-related aspects – and MoF – responsible for finance-related aspects. By building capacity to analyse climate expenditure – especially with regard to monitoring and evaluation – across all sectors, MoF will be better able to deliver climate finance on an economy-wide scale using a programmatic approach.

Output 1.2.1. MoF and MNRE climate change units – as well as NGOs and village governance structures – have enhanced capacity to manage climate finance.

98. Communities will be trained on managing climate change adaptation projects. A number of NGOs have demonstrated success in building the capacity of communities to access funds made available by development partners and through other initiatives. Training conducted under this project will build on these initiatives by supporting communities to plan and implement community-based adaptation projects. This training will include guidelines for identification of adaptation priorities, project design, funding proposals and financial management of projects. Communities will be better able to access funding to implement community-based adaptation activities that is available through programmes such as the CSSP and the GEF Small Grants Programme.

99. MoF-CRICU and MNRE-CCU presently have nascent capacity to monitor and report on expenditure for climate change adaptation. To further develop this capacity, the methodology of the CPEIR will be refined to produce guidelines for preparation of a biennial report on climate expenditure[36]. Based on the revised methodology, a CPEIR-style report will be piloted to finalise the guidelines and toolkits. These guidelines/toolkits will then be used to produce two further reports on public expenditure for climate change. These reports will support improved M&E of climate expenditure to enhance the mainstreaming of climate change in sectoral planning and budgeting under Outcome 1.1. MoF-CRICU and MNRE-CCU will consequently have strengthened capacity for prioritising public expenditure on climate change in a programmatic manner.

100. Activities will include:

[36] Recommendations R3, R8, R10, R12 and R17 of the CPEIR.

1.2.1.1 Develop guidelines for communities on management of climate change adaptation/DRM projects. These guidelines will outline approaches to prioritisation, design, proposal writing and financial management of community-based projects for climate change adaptation and DRM.

1.2.1.2 Train communities on managing projects for climate change adaptation and DRM following the guidelines developed through Activity 1.2.1.1. The training will equip communities to identify climate risks, prioritise adaptation actions, design adaptation interventions, develop costed project proposals, apply for funding and implement the projects. In particular, communities will be trained to manage project finances and on-the-ground activities.

1.2.1.3 Develop guidelines/toolkits – based on the CPEIR methodology – for a biennial analysis of government climate expenditure. This approach will be aligned with MoF's procedures for conducting Public Expenditure Reviews, with a focus on identifying and quantifying climate-specific expenditure.

1.2.1.4 Produce three biennial, CPEIR-style reports on climate change expenditure as a means for harmonising government agencies' monitoring of climate change adaptation. These analyses will occur in conjunction with MoF's Public Expenditure Reviews, following the methodologies developed in the guidelines/toolkits.

COMPONENT 2. ENHANCE RESILIENCE OF COMMUNITIES AS FIRST RESPONDERS OF CLIMATE CHANGE-INDUCED HAZARDS

OUTCOME 2.1. Protection of communities' physical assets and livelihoods: Increased resilience, and decreased exposure and susceptibility of communities to climate change and natural disasters by protection of household and community assets and promoting resilient livelihoods.

Co-financing amounts for Outcome 2.1: US$58,139,920
LDCF project grant requested: US$9,997,492

Without LDCF Intervention (baseline)

101. Climate change is expected to have severe effects on urban settlements in Samoa. Urbanisation is resulting in greater exposure of infrastructure to climate risks. Settlements are concentrated in coastal areas with approximately 70% of the population living within one kilometre of the coast. As a result, critical infrastructure – such as hospitals, schools, places of employment, power plants and airports – is also primarily located in the coastal zone. This infrastructure is at risk to flooding caused by extreme rainfall events and coastal inundation during storms. For example, the PDNA estimated the total cost of damage caused to physical assets by Cyclone Evan at ~US$103 million.

102. In particular, critical economic as well as household infrastructure is becoming increasingly affected by climate-induced disaster events. Transport infrastructure is vulnerable to climate change as evidenced by the damage caused to roads and bridges by Cyclone Evan. Roads in Samoa are exposed to a range of climate risks, including: i) sea level rise; ii) storm surges and wave action during cyclones; iii) flooding and landslips during extreme rainfall events; and iv) accelerated deterioration of road surfaces owing to extreme weather and rising water tables. Tourism developments are also at risk as these are generally located on the coast and are consequently exposed to climate-induced natural disasters. At present, GoS considers maintenance of the ~2,340 kilometres of road and 52 bridges to be a priority for promoting connectivity and access of communities to *inter alia* government services and agricultural markets. However, the increase in frequency and severity of cyclones expected to result from climate change will threaten the sustainability of maintenance and construction of infrastructure in the long-term.

103. The National Recovery Plan (NRP) will contribute US$59 million as parallel investment co-financing to the LDCF project. This investment will largely be used to rebuild economic and community assets damaged/destroyed by Cyclone Evan. For example, the damage to the Leone

Bridge in Apia has disrupted a major east–west transport corridor and destruction of road infrastructure has affected other commercial links. Consequently, the NRP identified repair and reconstruction of bridges and roads as a priority for revitalising the economy and restoring access to markets and important services (e.g. health care). However, the current schedule for reconstruction does not include long-term consideration of the increased risk of natural disasters expected under a changing climate scenario. As a result, the infrastructure that is to be constructed under the NRP is likely to remain vulnerable to extreme weather events.

104. In addition to the damage caused to economic infrastructure, the flooding caused by Cyclone Evan damaged 2,088 houses located across the country, mostly in urban settlements on Upolu Island. GoS has identified the need to ensure a "build back better" approach when housing is being rebuilt. However, there is at present limited capacity for ensuring that climate-resilient designs are followed during reconstruction of housing. This is exacerbated by the fact that some houses are being rebuilt within hazard zones such as areas prone to flash floods during storm surges. Small catchment areas and steep slopes – coupled with poor drainage – result in rapidly rising water levels during rain events. The flooding also resulted in extensive destruction of household goods and the temporary displacement of ~7,500 people. These problems are exacerbated by human activities such as deforestation in upper watershed areas that reduce infiltration and increase run-off. The area around Apia is particularly modified, with urban development in the coastal plain and peri-urban development and commercial agriculture in the watersheds.

105. The Greater Apia area comprises three districts, *viz.* Faleata West, Faleata East and Vaimauga West. Five rivers – the Vaisigano, Gasegase, Fuluasou, Loimata o Apaula and Fagalii Rivers – flow through these districts. GoS' main approach to water resource management in these and other river systems is through the implementation of Watershed Management Plans (WMPs). However, the development and enforcement of WMPs have been delayed by limited capacity for design and implementation. WMPs have been developed for the Vaisigano, Gasegase, Fuluasou and Loimata o Apaula Rivers. However, these WMPs do not include comprehensive hydrological models that include projections of the impacts of climate change on the watersheds[37]. There is at present no WMP for the Fagalii River. Without effective design and implementation of WMPs for these five watersheds, urban planning and infrastructure construction in the Greater Apia area will remain vulnerable to the expected effects of climate change. Communities and infrastructure within these watersheds will consequently remain exposed to flood risks during extreme rainfall events.

106. The PPCR is developing CIM-2 Plans for the three districts within the Greater Apia area. However, the scope of these plans are not sufficient to include the comprehensive development of an integrated WMP on the scale required to inform the design and implementation of the interventions that would be necessary to reduce the vulnerability of these communities within these districts. The degree of urbanisation of these districts (approximately 20% of the national population resides here) necessitates technical inputs such as characterisation of geo-physical and socio-economic features, comprehensive vulnerability assessments and detailed engineering design of interventions that are beyond the scope of the PPCR. Furthermore, the PPCR will be unable to implement the large-scale flood protection infrastructure that would be required to protect communities and their assets within the Greater Apia area.

107. While much of the impact of climate change is felt by individual households, households have little financial capital for implementing household-level interventions for climate change adaptation. The limited disposable income of most Samoan households means that tendencies for short-term gain take precedence over investment into longer-term measures for climate resilience. Households are not able to save for contingencies, nor are they able to proactively implement interventions that will reduce their vulnerability to the effects of climate change.

[37] A hydrological study will be conducted on the Vaisigano River during the first half of 2014.

108. Approximately 68% of the population of Samoa is classified as "Agriculturally Active"[38]. However, the sector only contributes ~10% of the country's GDP. This is because most agricultural production is subsistence or semi-commercial in nature. There are limited opportunities for commercialisation of agricultural products as the value chains are not presently sustainable. This is largely owing to limits in terms of the quality and sustainability of the supply of agricultural products that lead to preference for expensive imports.

109. The Trade Sector Support Programme (TSSP) is a partnership between MoF, Women in Business Development (WIBDI) and the Scientific Research Organisation of Samoa (SROS) that is supporting the expansion of agricultural value chains for coconut and cocoa. Despite the initiatives planned under the TSSP, a number of potential value chains still remain underexploited in Samoa. Commercial crops such as bananas, papaya and taro as well as traditional crops such as *nonu* and *laupele* could potentially be economically viable in local or regional markets. In addition, there is potential for beneficiation of these products such as producing dried fruit or pulp for fruit juice. At present, however, there are limited opportunities for exploiting the market potential. This is a result of *inter alia*: i) weak value chains; ii) poor quality of agricultural production; and iii) limited supply of agricultural products. There are similar opportunities for the production of handicrafts such as wood carvings and textiles. However, these products suffer from similar limitations to the agricultural products described above.

With LDCF Intervention (adaptation alternative)

110. The proposed LDCF project will guide the planning for reconstruction of infrastructure damaged during Cyclone Evan. This will serve to climate-proof the ongoing reconstruction of infrastructure under the NRP. In order to reduce the risks by flooding to the communities living in Apia, the project will develop an integrated watershed management plan that will address up- and down-stream causes and effects of climate vulnerability within all five watersheds in the Greater Apia area. LTA will complete vulnerability and adaptation assessments for the Vaisigano, Gasegase, Fuluasou, Loimata o Apaula and Fagalii Rivers. On the basis of these assessments, an integrated WMP for the Greater Apia area will be developed. This integrated WMP will include the following elements:
    - Geophysical features such as climate, geology, hydrology and vegetation.
    - Socio-economic features such as population and land-use.
    - Water resource characterisation such as water use, water quality and pollution.
    - Flood risk assessments such as flood scenarios and identification of risk zones.

111. The integrated WMP will thus outline climate risks posed to the communities living in Faleata West, Faleata East and Vaimauga West. It will follow the "Ridge-to-Reef" principle following an integrated approach to building climate resilience and supporting community livelihoods through the inclusion of aspects such as water, land and coastal management within an overarching framework. The work done under this LDCF project will build on the work conducted by the PPCR within the three districts that constitute the Greater Apia area by integrating recommendations from the CIM-2 Plans within is the integrated WMP framework. For example, the integrated WMP will identify particular hazard zones that can be expected to be prone to repeated flooding during extreme weather events. In addition, it will detail upstream mitigation measures that can be taken to reduce the risk of such disaster incidents. For example, improved management of watersheds with a focus on rehabilitation of deforested areas will improve infiltration of water during precipitation events and consequently reduce flooding. The hydrological models will also be able to inform the implementation of additional water management measures such as check dams and percolation ponds. These will all result in a reduced occurrence of climate-induced disasters.

112. The integrated WMP will also be used to guide the implementation of downstream measures for disaster mitigation. This will build on the LIDAR mapping to be undertaken as part of the PPCR as

[38] Samoa Bureau of Statistics. 2009. *Agriculture Census Analytical Report 2009.*

well as a hydrological mapping exercise that is currently being undertaken for the Vaisigano River. Mapping of hazard zones will be used to inform urban planning to prevent development within these areas. On the basis of the integrated WMP, the project will develop flood protection infrastructure for the Vaisigano River. Flooding in this river was particularly evident during Cyclone Evan, necessitating evacuation of local communities and resulting in considerable damage to assets and infrastructure. The construction of climate-resilient riverbank protection will safeguard communities and physical infrastructure from flooding associated with extreme weather events. Tourism infrastructure, community households, local businesses and other livelihood assets will be protected from damages and loss resulting from river flooding.

113. MNRE, with LDCF resources will support comprehensive planning and design of flood protection infrastructure. Based on the integrated WMP, appropriate options for structural (e.g. river banks, rock walls, river channelling) and non-structural (early warning systems, flood awareness) measures will be developed. These will be prioritised based on cost-benefit analyses as well as comprehensive environmental and social impact assessments. Community consultations as well as expert advice will be used to guide the selection of measures that are most socially and economically appropriate for implementation.

114. In addition to up- and down-stream mitigation measures, LTA and PUMA will be supported to increase resilience and decrease exposure and susceptibility of communities to climate change and natural disasters by climate-proofing household and community assets. The protection and reinforcement of these assets will reduce the damage caused by natural disasters. The project will provide the means for the design and reconstruction of community assets following the "build back better" principle. Communities with at-risk housing and other assets will benefit from technologies and technical assistance pertaining to climate-resilient housing, water supply and sanitation. Furthermore, community members will be engaged in the construction of these community assets as well as the flood protection infrastructure described above[39]. These community members will also receive training on climate-resilient construction techniques. As a result, these community members will have enhanced employability after the project implementation is completed owing to their expanded skillsets. Furthermore, they will have improved understanding of climate-resilient housing that can be expected to inform future choices concerning design and construction of household assets.

115. The proposed LDCF project will also promote the adoption of diversified livelihood options to enhance climate resilience at the household level. The development of micro-businesses opportunities related to food production and manufacture will be supported to enhance linkages between supply and market, as well as increasing beneficiation of existing production. The TSSP is an Enhanced Integrated Framework-supported initiative funded by the European Investment Fund and will provide co-financing of US$2,000,000). The LDCF project interventions will build on this initiative by supporting the identification and development of sustainable and commercially viable value chains for agricultural products as well as handicrafts. This will be done through improving linkages between suppliers and markets, with a focus on developing the quality and quantity of production to the level required to satisfy demand in local and/or regional markets.

116. Technical assistance will be provided to analyse agricultural and handicrafts products with the potential for enhanced commercial viability. This will include analysis of the potential for beneficiation of agricultural crops such as producing dried fruit or pulp for fruit juice as well as identification of value chains for textiles and other handicrafts. Community members will receive training on the techniques required to improve sustainability of supply and quality of production for the identified value chains. Household members involved in training on agricultural products will receive planting materials and household processing facilities such as drying machines. Household members involved in training on handicraft production will receive equipment such as sewing machines. This will increase income-generating opportunities for community members,

[39] For example, through the "cash-for-work" modality.

improving the levels of disposable income and enhancing their capacity to save. Enhanced savings will enable communities to build up a financial buffer to help them cope with and adapt to climate change in the short-, medium- and long-term. For example, households will be able to invest in climate-resilient buildings. Improved savings will also lead to households being able to recover independently after disaster events rather than having to rely on aid from GoS or other aid agencies.

117. These livelihoods interventions will be complementary to the Asian Development Bank-supported agribusiness initiative. The ADB project will support an export processing and packaging facility for agricultural products. LDCF project beneficiaries who receive processing facilities will therefore be able to deliver the agricultural products to the packaging facility, thereby linking the value chain to export markets.

Output 2.1.1. Integrated Watershed Management Plan for Greater Apia following "Ridge-to-Reef" approach.

118. An integrated WMP for the Greater Apia area will be developed[40] to identify the root causes of climate vulnerability and outline strategies for reducing the risks posed by climate-induced disasters[41]. Technical staff in MNRE and the Land Transport Authority (LTA) will be supported to design this integrated WMP[42]. The integrated WMP will detail both "hard" (i.e. structural) and "soft" (i.e. non-structural) options to build climate resilience. Based on the integrated WMP, the project will support LTA to design of flood protection infrastructure to protect economic and community assets. Flood protection measures are likely to include: i) check dams and retention ponds to control flow rates; ii) diversion channels to reroute water flows away from vulnerable communities during flood events; and iii) riverbank stabilisation to prevent flood waters from damaging economic infrastructure and community assets.

119. The design of flood protection measures will include cost-benefit analyses as well as comprehensive environmental and social impact assessments to ensure that construction of these measures will take place in an environmentally and socially responsible manner that is also cost effective and sustainable in the long-term. The structural and non-structural interventions will be designed to provide optimal protection of economic infrastructure as well as community assets from risks posed by climate-induced disasters. These interventions will follow international best practices and standards for cost-effectiveness. In addition, the interventions will be designed to address the specific long-term vulnerabilities to climate risks identified in current climate change projections while at the same time consisting of "no-regrets" measures that will address current vulnerabilities. Details of the steps, Terms of Reference for the technical team, and a list of physical and socio-economic data requirements involved in the design of the Integrated WMP for Greater Apia are to be found in Annexes 6, 8 and 9.

120. Activities will include:

2.1.1.1 Conduct complete assessments of the Vaisigano, Gasegase, Fuluasou, Loimata o Apaula and Fagalii Rivers to identify the root causes of climate risks in the Greater Apia urban area. These assessments will include collection of: i) physical data such as geology and soil mapping, vegetation mapping, climate change projections and hydrology; and ii) socio-economic data such as population census and land use/land tenure (see Annex 8).

2.1.1.2 Conduct a comprehensive vulnerability and risk assessments to identify risks posed to economic infrastructure and community assets within the Greater Apia urban area. This assessment will include analysis of the location and vulnerability of human populations and critical infrastructure as well as climate/flood risk assessments to identify threats posed to these populations and infrastructure (see Annex 8).

[40] Recommendation under "Disaster Risk Management" section of NRP.
[41] Recommendation under "Environment" section of NRP.
[42] Recommendation under "Disaster Risk Management" section of NRP.

2.1.1.3 Conduct community consultations to field-truth the vulnerability and risk assessments. These consultations will assist to identify locations of vulnerable populations, community assets and economic infrastructure. In addition, these consultations will serve to prioritise structural and non-structural interventions to reduce vulnerability to climate-induced risks.

2.1.1.4 Develop an integrated watershed management plan detailing threats and management responses for the catchments in the Greater Apia area. This plan will be based on the assessments outline above, focussing on the prioritised structural and non-structural interventions to reduce vulnerability to threats identified by the climate/flood risk assessments (see Annexes 6 and 8).

2.1.1.5 Design structural flood protection measures such as check dams, retention ponds, diversion channels and riverbank stabilisation to reduce the flood risk posed to communities in the Vaisigano River catchment. This design will include feasibility studies, climate-resilient design, cost-benefit analyses, EIAs, SIAs, etc. (see Annexes 6 and 8).

Output 2.1.2. Hard and soft measures for protection of community assets.

121. This output will serve as a demonstration of integrated management of climate risks following a "Ridge-to-Reef" approach. Based on the integrated WMPs and climate-resilient infrastructure designs produced under Output 2.1.1, flood protection measures will be built by LTA to protect community assets and livelihoods as well as critical infrastructure in the Greater Apia area from climate risks. The flood protection measures are likely to include check dams, retention ponds, diversion channels and riverbank stabilisation. These flood protection measures will reduce the frequency and impact of climate-induced hazards occurring within the Greater Apia area. Details of the proposed climate-proofed infrastructure interventions that can stem from the integrated WMP are listed under the "Samoa Infrastructure Vulnerability Assessment" (Annex 6).

122. In addition, ecosystem-based approaches to watershed management and other non-structural interventions will be implemented by MNRE-Water Resources Division and MNRE-Forestry Division in the upper catchment areas to reduce the frequency and severity of climate-induced hazards. These measures will include reforestation of degraded catchments promotion of land-use activities that will reduce the rate of run-off during flood events and consequently reduce the impact of climate-induced disasters.

123. Furthermore, community assets (e.g. houses, sanitation, drinking water sources, disaster shelters, evacuation routes) in high risk areas that were damaged during Cyclone Evan will be rebuilt by LTA according to the "build back better" principle[43]. PUMA will be supported to use best-practice regulations and building codes to inform planning and implementation of reconstruction that is climate-smart. As a result, communities are expected to experience a reduced threat to lives as well as fewer economic losses induced by climate-induced disasters.

124. The structural and non-structural interventions implemented here will be located where they can provide optimal protection of economic infrastructure as well as community assets from risks posed by climate-induced disasters. In particular, up-stream interventions will reduce the likelihood and intensity of potential disaster events while down-stream interventions will reduce the exposure of infrastructure and assets to such risks. Implementation will be guided by *inter alia* the Post-Disaster Needs Assessment in such a way as to address high risk areas susceptible to flooding as experienced during Cyclone Evan. This will ensure that the losses to be expected to result from such climate-induced disasters are considerably reduced. Details of the types of structural mitigation measures and indicative costs are described in Annex 6.

125. Activities will include:

2.1.2.1 Build structural flood protection measures designed under Output 2.1.1 – such as check dams, retention ponds, diversion channels and riverbank stabilisation – in the Vaisigano

[43] Recommendation under "Transport" section of NRP.

River catchment. These will be constructed based on the feasibility studies, cost-benefit analyses and EIAs undertaken for the integrated WMP.

2.1.2.2 Implement ecosystem-based approaches to watershed management. These will focus on management of upper catchment areas to reduce the risks posed by floods and other climate-induced disasters.

2.1.2.3 Reconstruct community assets such as climate-proof houses, drinking water supply systems, disaster shelters, evacuation routes and sanitation systems. This will be based on international best practices for climate-resilient development following "build-back-better" approaches.

Output 2.1.3. Sustainable micro-enterprises for youth and women on agro-businesses with a sustainable and resilient value chain approach to promote diversified livelihoods.

126. Building on the TSSP initiative implemented by MoF and WIBDI, MNRE and MWCSD will support communities to diversify livelihoods by increasing income-generating opportunities for community members with particular consideration for vulnerable groups such as women and youth[44]. Promotion of diversified livelihoods will enhance climate resilience at the household level by increasing household income and savings. Households will have enhanced capacity to cope with and adapt to climate change as they will have the financial resources to invest in measures for climate-resilience. Households will also have more resources for recovery after disaster events.

127. This approach to strengthen the climate resilience of livelihoods of women and vulnerable population groups in Samoa will focus on the development of business incubators through the creation of sustainable and resilient value chains for agricultural and handicraft products. The attached "Socio-Cultural Gender Report" (Annex 5), highlights some gaps in the context of gender empowerment in climate change adaptation interventions in Samoa, including the need to: i) review the impact of livelihoods projects on women's empowerment; ii) further train and build capacity among women on climate change adaptation; and iii) work with existing organisations to build on and expand specific interventions that contribute directly to enhancing the resilience of women to respond to climate-induced hazards.

128. Communities and women and youth groups who will participate in these interventions will be identified and selected, through household surveys which will be carried out in 100 villages across Samoa to support interventions of this output and Output 2.2.1 of the project. The surveys will provide detailed socio-economic and demographic data (including disaggregated data for age and sex) to identify the most vulnerable groups within these communities.

129. Access to robust household baseline information will serve to identify not only the most vulnerable populations to climate risks across Samoa (for adequate planning of DRM efforts, as described under Output 2.2.1), but also contribute to more targeted interventions in building community resilience of these vulnerable groups. For example, the identification of single mothers living in a community can contribute to involving them in income-generating activities and as such, build their capacity and ensure they are more resilient and not severely disadvantaged during a disaster. This approach also contributes to the cost-effectiveness of interventions planned in both outputs.

130. MNRE – in collaboration MWCSD – will hire specialists to carry out assessments of the current business-as-usual value chains for crops and handicrafts to identify gaps and opportunities to build the sustainability of these value chains. The assessments may include the potential for new agricultural and handicraft products[45] and identification of stronger linkages between supply and demand, leading to increased opportunities for communities to produce and sell agricultural and handicraft products. Further, the specialists will be tasked with identifying climate change risks

[44] Recommendation under "Disaster Risk Management" section of NRP.
[45] Recommendation under "Agriculture, Livestock and Fisheries" section of NRP.

and opportunities of the value-chains in question and identify measures to mitigate such impacts (designing an “adaptive value chain”), as well as additional potential market options for these products.

131. Finally, through this output, MWCSD in partnership with local NGOs will provide training to selected community members (mainly women and youth) on the techniques required to improve production of agricultural and handicraft products for the identified value chains. Approximately 300 community members will be trained for each identified value chain (i.e. 300 for agriculture and 300 for handicrafts) through 10 training sessions for each value chain. Community members involved in the training programmes will receive planting materials and household processing facilities such as fruit driers (for agricultural production) and equipment such as sewing machines (for handicraft production).This initiative will equip women and youth with the skills and inputs required to sustain small business enterprises. These will be sustainable as beneficiaries will have: i) appropriate technical know-how for production; ii) start-up resources such as seeds and equipment; and iii) links to sustainable markets.

132. This intervention will improve household welfare in order to build resilience to climate-induced disasters. Introducing the specific technological equipment – coupled with targeted technical training – will allow women to improve the sustainability and profitability of their livelihoods. Use of the supplied technology and improved production skills will lead to improved enterprise outcomes, allowing women to invest in household welfare and further improvements to their businesses. Such investments are likely to lead to direct as well as indirect improvements in climate resilience. Possible outcomes of increased income-earning opportunities include: i) re-investment into livelihood assets and production; ii) improved health and welfare, especially of children; iii) investments into education; iv) enhanced savings, especially for post-disaster recovery; v) investment in climate resilience of household or community assets (e.g. climate-proofed housing, evacuation centres); vi) improved nutrition; vii) clean water; and viii) sanitation. Such investments decrease climate vulnerability by reducing the impact of disasters on community/household assets (through climate-proofing), reducing the likelihood of disease after disaster events (improved health, sanitation and drinking water) and enhancing post-disaster recovery (through savings).

133. MWCSD will lead the execution of this output, as it currently oversees Government commitments to Samoa’s vulnerable and marginalized groups, and is the *de facto* entry point to the communities. During PPG phase, NGOs and national research organizations were consulted and potential partnerships were identified for this output; these can be further explored during project implementation (particularly with WIBDI and SROS) in order to benefit from existing engaging and training methodologies at the community level. The Government Women Representatives are the liaison officers between GoS and the village and therefore, these representatives will also have a significant role in the execution of this output.

134. Activities will include:

2.1.3.1 Assess value chains for crops such as *misiluki,* papaya, *nonu, laupele* and taro. These assessments will analyse operational and productions costs, potential for development of new products and gaps/barriers to sustainability of both supply and demand.

2.1.3.2 Assess value chains for handicrafts such as wood carvings and *siapo.* These assessments will analyse operational and productions costs, potential for development of new products and gaps/barriers to sustainability of both supply and demand.

2.1.3.3 Based on the assessment in Activity 2.1.3.1, provide training to 300 women and youth on the technical skills required to supply viable value chains with agricultural products.

2.1.3.4 Based on the assessment in Activity 2.1.3.2, provide training to 300 women and youth on the technical skills required to supply viable value chains with handicraft products.

2.1.3.5 Provide planting materials, equipment and household processing facilities for women and youth to supply viable value chains with agricultural and handicraft products.

2.1.3.6 Design and implementation of a quasi-experimental design approach (Difference-in-Differences) to test the impact of the value chain interventions in household welfare.

135. In order to understand the impact that diversification of community livelihoods will have on building the climate-resilience of women and youth, an innovative aspect of this project is that LDCF resources have been allocated to pilot a quasi-experimental design strategy to accurately measure benefits provided through this output. During PPG consultations, GoS and practitioners have recognized that, in most projects, evidence of success still remains in the confines of anecdotal evidence, making it difficult to attribute changes in indicators to project interventions and in quantifying project effects. Therefore, an experimental design pilot has been designed to assist the project team to gain additional insights into developmental and adaptive impact of the livelihood interventions that will be carried out in this output. Details of how this strategy will be implemented are explained in Annex 15 "Experimental Design".

OUTCOME 2.2. <u>CCA/DRM plans and implementation:</u> Increased adaptive capacity of communities for implementation of effective risk management and protection of household and community assets.

Co-financing amounts for Outcome 2.2: US$2,812,463
LDCF project grant requested: US$500,000

<u>Without LDCF Intervention (baseline)</u>

136. The national Disaster Management Programme has developed some Village Disaster Risk Management Plans (VDRMPs) for disaster risk reduction and response. Implementation of these plans has been facilitated by MNRE's Disaster Management Office in collaboration with *inter alia* the Samoan Red Cross. VDRMPs include household surveys to identify specific vulnerabilities to disasters. These surveys are then used to inform plans for disaster preparation and response, such as planning of evacuation routes. However, these plans have only been developed for ~40 of the more than 300 villages in the country. Consequently, a large number of communities have yet to develop and implement local-level plans for coordinating disaster preparedness and response. These communities remain extremely vulnerable to the increased incidence of climate-induced natural disasters expected under future climate scenarios.

137. After the occurrence of natural disasters, communities have limited capacity to recover. Their capacity is constrained by loss of assets and livelihoods. Post-disaster needs include *inter alia*: i) food, water and medical supplies; ii) building materials for reconstruction of houses; iii) financial support to cover loss of income; and iv) seeds and planting materials to compensate for destruction of crops. At present, disaster support is not provided in a timely and effective manner. In addition, community members do not have access to the knowledge and information necessary to respond to disasters appropriately. For example, communities may not know how to react during different climate-induced disaster scenarios and may not be aware of how to go about obtaining assistance from MNRE-DMO and other relief services. As a consequence, communities are not able to respond to and recover quickly from climate-induced disasters.

138. The NRP has outlined the need for prioritisation of enhanced DRM, particularly with regard to the risks posed by flooding during cyclones. However, the NRP is unable to provide support to communities for the development and implementation of VDRMPs. The CIM-2 Plans developed by the PPCR and AF project are focused on district-level planning. This is unlikely to include adequate design for village-level DRM measures. There is therefore limited availability of resources for moving from planning to implementation of VDRMPs. Consequently, communities remain poorly equipped to prepare for, respond to and recover from climate-induced disaster events.

<u>With LDCF Intervention (adaptation alternative)</u>

139. The capacity of communities to cope with climate-induced natural disasters will be strengthened. MNRE's Disaster Management Office (DMO) – in collaboration with MWCSD – will develop and implement VDRMPs in 100 villages to support communities to act as "first responders" to climate-

induced disasters. These disaster management plans will integrate climate adaptation information and thus will help communities prepare for, respond to, and recover from climate-induced disasters. This will have a direct effect on the ability of communities reduce climate risks and minimise future losses.

140. Communities will directly benefit from increased community coordination and ownership of CCA and DRM initiatives. By building community-level capacity, communities will be able to adopt a more proactive approach to climate change adaptation. This will reduce the burden on GoS to coordinate localised planning and implementation of adaptation interventions. Consequently, delays in disaster response will be reduced and communities will be able to react in a timely manner. This will have a direct effect on the capacity of communities to cope with climate-induced natural disasters.

141. The NRP will provide co-financing of US$2,812,463 through its ongoing work on strengthening of DRM governance through revisions of the Disaster and Emergency Management Act (2007) as well as enhancing the national climate risk forecasting and warning systems. However, this work occurs at a national level and the NRP does not currently support communities with regards to adaptation planning. The LDCF project will build on this work by supporting community-based adaptation activities through improved planning and implementation of local-level DRM. This will address the limited availability of resources for moving from planning to implementation of VDRMPs.

142. DMO will coordinate closely with the work on village-level disaster planning undertaken by the PPCR and the AF project. The CIM-2 Plans will provide a framework within which the LDCF project will conduct household-level surveys to identify climate vulnerabilities. These surveys will inform the design and implementation of VDRMPs, including the provision of the necessary training to ensure that community members are aware of their roles in the event that a climate-induced disaster occurs.

Output 2.2.1. Building on the work of DMO, village plans designed and implemented to develop the capacities of 100 communities to prepare, respond, recover and manage CC risks.

143. At present, less than 15% of villages in Samoa have VDRMPs. DMO and MWCSD coordinate the development and implementation of VDRMPs in an additional 100 communities to increase national coverage of these plans to ~50% of all villages. In order to guide this process, household surveys will be conducted to identify vulnerabilities of local communities to climate risks, disaggregated by age and gender. These household surveys will be complemented by broader-level community consultations that will be conducted to identify localised disaster risks and outline potential response strategies such as evacuation plans, access to drinking water and health care services. On the basis of the survey and consultations, VDRMPs will be developed and implemented to support these 100 communities to act as “first responders” to disasters. Community members will be trained on implementation of the VDRMPs such as the individual roles and actions to be taken during disaster events. This will enable communities to prepare for, respond to, recover from and manage climate risks.

144. Activities will include:

2.2.1.1 Conduct household surveys to map vulnerability to climate risks. This will follow the methodology successfully used by DMO in the VDRMPs developed to date and is likely to comprise an ongoing partnership with Samoa Red Cross.

2.2.1.2 Analyse data from household surveys to identify most vulnerable groups and communities to establish gender- and age-disaggregated vulnerabilities.

2.2.1.3 Hold community consultations to identify localised climate risks as well as appropriate responses during and after disaster events.

2.2.1.4 Develop and implement Village Disaster Risk Management Plans that outline roles and actions for responding to climate-induced disasters. This will be coordinated by DMO to

ensure that there is no overlap between the communities targeted under the LDCF project and those targeted by other initiatives (e.g. Samoa Red Cross, PPCR, AF).

2.2.1.5 Provide training on the implementation of Village Disaster Risk Management Plans. This will include informing community members of evacuation routes and disaster responses, provision of first aid training, drills for disaster events and post-disaster recovery activities.

145. The household surveys conducted under this output will also be used as the baseline survey for the quasi-experimental design strategy to be conducted under Output 2.1.3. Collection and analysis of household-level data will be used to identify households to be targeted to benefit from livelihood diversification activities, as well as to identify households to serve as a control group. Details of how this strategy will be implemented are explained in Annex 15 "Experimental Design".

COMPONENT 3. MONITORING AND EVALUATION AND KNOWLEDGE MANAGEMENT

OUTCOME 3.1. Knowledge about CCA and DRM is captured and shared at the regional and global level.

Co-financing amounts for Outcome 2.2: US$6,996,933
LDCF project grant requested: US$350,000

Without LDCF Intervention (baseline)

146. Samoa has recently undertaken a series of assessments on the efficiency and effectiveness of national initiatives for climate change adaptation[46]. These assessments have generated recommendations to strengthen and coordinate climate change adaptation at the national level. A common recommendation within the assessments includes the importance of a strong M&E framework. Existing M&E systems are not able to track the success of adaptation interventions. Principles of results-based management – such use of baseline indicators, tracking success of outputs and documentation of tangible results – are new to public sector work in Samoa. Consequently, there are few government ministries that have mainstreamed such principles into operational practice. As a result, capacity for monitoring, analysing, evaluating and reporting on the effectiveness of adaptation interventions remains weak.

147. Such capacity limitations are particularly evident within the Ministry for Women, Communities and Social Development (MWCSD). Large amounts of community-level data passes through MWCSD but little of this is captured and analysed systematically. As a result, communities do not have access to lessons learned from interventions implemented by GoS or other development actors. The coordination unit for the Community Development Sector has begun with tracking of village progress against villages' sustainable development plans. However, this tracking does not follow M&E techniques such as measuring progress against baseline data. In addition, the coordination unit is constrained by limited human resources that affect its ability to collect and analyse data. As a result, there is minimal management of knowledge occurring in a coordinated and systematic manner.

148. Reporting between different agencies – e.g. government institutions, development partners, NGOs – is done according to each agency's protocols. The various agencies have separate reporting systems to track project progress. At present, these reporting systems are labour intensive. In addition, current M&E systems track progress achieved in activities through monitoring of project expenditure. There is consequently minimal analysis of information on project results to determine whether the projects are achieving their respective outputs and outcomes. Without detailed knowledge on how projects deliver benefits to communities, ongoing

[46] These assessments include the: i) CPEIR; ii) National Strategy for a Climate-Resilient Samoa; iii) Climate Resilience in Samoa; iv) Capacity Assessment and Enhancement Consultancy; v) Situation Analysis; and vi) Policy, Institutional and Legal Framework for a Climate-Resilient Samoa.

planning and decision-making cannot be based on lessons learned and rely instead on anecdotal evidence.

149. Where information on progress and success of interventions is available, it remains scattered between line ministries, donor agencies and NGOs. While MoF is mandated to coordinate initiatives implemented by line ministries and using donor aid, it experiences difficulties with gathering and managing information from the various sectors. Some projects have contributed towards knowledge management and the establishment of databases for information on climate change. For example, the UNDP-GEF project "Integrating Climate Change Risks in the Agriculture and Health Sectors in Samoa" strengthened the management of climate databases. However, such knowledge management initiatives are not coordinated or centralised. As a consequence, information on climate change adaptation and DRM remains fragmented.

150. The PDNA revealed that there is presently minimal knowledge on the roles that communities can play in contributing towards climate change adaptation and DRM. Rather, there is a misconception that communities should rely on GoS, donor agencies and NGOs to secure their safety. As a result, there are insufficient autonomous initiatives by communities to proactively engage in climate change adaptation. Without awareness raising on the potential and opportunities for communities and individuals to implement DRM initiatives independently, they will remain vulnerable to the expected effects of climate change.

151. The PFMRP is strengthening the overall framework for monitoring and reporting with GoS. This includes linking performance indicators within each sector to development planning and sectoral budgets. Support is being provided for a monitoring framework to enhance linkages between and within line ministries for monitoring performance horizontally as well as vertically. However, the PFMRP Annual Progress Report for 2013 identified gaps in the availability, accuracy and timeliness of data which is reducing the effectiveness of M&E. In addition, there are currently no M&E frameworks that clearly identify progress towards targets and performance indicators for climate change adaptation and DRM. As a result, line ministries are unable to monitor, evaluate and report on progress towards targets for reducing climate vulnerability within the various sectors. Without a systematic M&E framework that details performance on climate change adaptation and DRM, sectoral planning is likely to suffer from implementation gaps as a result of inadequate prioritisation of sectoral needs. The PFMRP will provideUS$10,700,000 as parallel support co-financing to the LDCF project.

With LDCF Intervention (adaptation alternative)

152. The proposed LDCF project will develop a knowledge management strategy to improve access to data and information on climate change for government institutions, particularly MNRE, MWCSD and MoF. These ministries will consequently be better able to plan and budget for climate change adaptation in sectoral budgets and plans. A comprehensive M&E framework will be created to support the coordination of knowledge and information on climate change adaptation. The development of a systematic M&E framework will enable:

- less labour-intensive monitoring;
- greater comparability of results between ministries and initiatives;
- improved tracking of progress at a national level;
- tracking changes in vulnerability to climate change to determine effectiveness of interventions;
- measuring progress on specific interventions to determine the efficiency of implementation;
- cost-benefit analysis of adaptation;
- identification of implementation gaps and additional needs; and
- sustainable and coordinated implementation of adaptation strategies.

153. The M&E framework will form the basis for harmonised reporting on climate change adaptation between government institutions. This would enable: i) less labour intensive monitoring; ii) greater comparability of results; and iii) improved tracking of progress at a national level. Data collected through the framework will be used to prepare the climate expenditure report (see Component 1),

enabling annual monitoring and reporting on efficiency and efficacy of climate expenditure. Monitoring will focus on tracking of concrete and tangible benefits provided by adaptation interventions, rather than progress towards activities and annual expenditure. This will provide lessons learned that will be able to inform future development planning and budgeting for climate change adaptation and DRM.

154. In order to pilot the implementation of the M&E framework, the framework will be used to monitor the progress of the proposed LDCF project. This will follow an experimental design approach to tracking of project results. Benefits accruing from project interventions implemented through Component 2 will be compared with business-as-usual activities elsewhere in the country. In this way, tangible and concrete results will be generated to inform planning and decision-making for climate change adaptation and DRM. These lessons learned will be fed into national and international platforms for knowledge sharing. Project benefits to be tracked include:

- climate-resilience of infrastructure (e.g. reduced maintenance costs);
- protection provided by infrastructure (e.g. reduced losses incurred); and
- improved income from climate-resilient livelihoods.

155. The M&E framework will also feed into a centralised database on climate change adaptation and DRM. This database will build on the databases developed through NAPA projects and other initiatives, providing a central clearing house for information on climate change adaptation. The database will also provide a foundation for improved knowledge sharing. This knowledge sharing will enable government institutions to learn from past activities – both nationally and internationally – on delivery of interventions for climate change adaptation to communities. The knowledge-sharing strategy will feed into the existing GEF regional "Ridge to Reef" project, also implemented by UNDP. The strategy will also be used to guide national awareness raising and inform line ministries on climate change adaptation.

156. The proposed LDCF project will also raise awareness among communities on climate change adaptation and DRM. This will build and community-level capacity to respond to climate change and extreme weather events. Communities will be informed on how to enhance the climate resilience of community assets and livelihoods, based on results and lessons learned from the interventions under Component 2. In particular, the results from the quasi-experimental design pilot to analyse benefits from the livelihood diversification interventions under Output 2.1.3 will be used to inform the knowledge management and awareness raising strategies. Lessons learned from this analysis of project benefits will be carefully documented at various stages during project implementation (see Annex 15). This will provide the basis for detailed analysis and description of the impacts of livelihood diversification on community resilience with specific reference to benefits provided to women and youth. These will be shared nationally – through awareness campaigns – as well as internationally – through the Ridge-to-Reef and other regional initiatives – to contribute to knowledge on best practices for building climate resilience.

Output 3.1.1. Knowledge management strategy developed, including national awareness campaigns and information sharing through existing international platforms and new multimedia platforms

157. Based on the databases developed through the NAPA projects – and in coordination with the work of the Rio+ project – a national climate and disaster risk database will be established by MNRE in collaboration with MoF. This database will be linked to the national M&E framework (see Output 3.1.2) and will provide information on *inter alia*: i) climate change scenarios; ii) expected effects of climate change; iii) international best practices on climate change adaptation and DRM; and iv) lessons learned from national adaptation activities. This will improve the access of government institutions, donor agencies and NGOs to knowledge on climate change risks. Line ministries will consequently be better able to plan and budget for climate change adaptation (supporting work under Component 1 of this project). In addition, awareness campaigns on climate change adaptation and DRM will target village leaders and the general public. "User-

friendly" media – especially video – will translate scientific findings into useful guidance for the general public.

158. The LDCF project will also link with the awareness campaigns to be conducted under the PPCR. MNRE will undertake campaigns to increase public awareness concerning climate change, vulnerability and adaptation. Awareness campaigns will disseminate this information during village meetings, church gatherings and through various media such as radio and television.

159. Data, information and lessons learned will be collated and synthesised for sharing on the national database as well as via regional and international platforms. This will promote regional exchange of best practices on building climate resilience across the Pacific Region. Particularly, lessons learned and best practices of this LDCF project will be shared and linked up with the "Ridge-to-Reef" programme (currently under implementation by UNDP, UNEP, and FAO). It is expected that the results from the quasi-experimental design pilot will generate credible and transparent evidence, which will be analysed and integrated into this and other regional knowledge platforms to increase catalytic leverage of GoS investments (in the context of LDCF adaptation interventions), supporting in this way the sustainability and replication of the livelihoods interventions of the project.

160. Activities will include:

3.1.1.1 Develop protocols for storage and sharing of information/data between government institutions.

3.1.1.2 Establish a national climate and disaster risk database that is centralised and accessible to all Ministries.

3.1.1.3 Develop and pilot plan for systematised uploading and monitoring of data and information generated by adaptation projects in Samoa (particularly taking into account results from the quasi-experimental design) onto regional and international platforms such as the Ridge-to-Reef programme.

3.1.1.4 Conduct awareness campaigns on water resources, land management, village development, climate change adaptation and DRM.

Output 3.1.2. M&E system established to strengthen institutional coordination and enhance the effectiveness of the interventions on adaptation with an economy wide approach.

161. A standardised M&E framework will be established by MNRE in collaboration with MoF to support harmonisation of reporting systems between government institutions as well as the private sector, NGOs, CSOs and villages. The national M&E framework will feed into the national climate database (Output 3.1.1) as well as the biennial climate expenditure report (Output 1.2.1). This would enable: i) less labour intensive monitoring; ii) greater comparability of results; and iii) improved tracking of progress at a national level. Consequently, the mainstreaming of climate change adaptation into sectoral and development planning will be based on up-to-date information on national adaptation activities.

162. Activities will include:

3.1.2.1 Review current M&E systems to identify best practices and opportunities for standardisation of reporting modalities.

3.1.2.2 Establish a national M&E framework with guidelines for collecting, analysing and reporting of data on water resources, land management, village development, climate change adaptation and DRM.

3.1.2.3 Develop a standardised reporting modality to enable harmonised monitoring, evaluating and reporting of expenditure and progress of interventions for climate change adaptation.

2.5. Key indicators, risks and assumptions

2.5.1 Indicators

163. Indicators for the proposed LDCF project were developed in line with UNDP's Strategic Plan and UNDP's "Monitoring and Evaluation Framework for Climate Change Adaptation". In addition, project indicators were aligned with the LDCF Adaptation Monitoring and Assessment Tool (AMAT). The Project Results Framework in Section 3 details indicators, baselines, targets and sources of verification at the Objective and Outcome level. These indicators will be used to track progress in achieving project Outcomes. Baseline values for these indicators will be collected within the first six months of project implementation.

164. At the level of the **Project Objective**, the indicators are as follows:
- Increased capacity within GoS for coordination of cross-sectoral actions for climate change adaptation, including planning, budgeting, implementing and monitoring and evaluating.
- Integration of climate change adaptation and DRM into the Strategy for the Development of Samoa 2017–2021.

165. The Outcome-level indicators are described below.

Outcome 1.1: Policies Strategies/Institutional Strengthening.
- Sector plans that include specific budgets for adaptation actions [adapted from AMAT 1.1.1].
- Formulation and endorsement of National Climate Change Adaptation Strategy.

Outcome 1.2: Public finance management at the national and village level.
- Increase in number of community-managed projects for adaptation to climate risks.
- Improved monitoring of government expenditure on climate change adaptation.

Outcome 2.1: Protection of communities' physical assets and livelihoods.
- Number of people benefitting from improved flood management through implementation of hard and soft measures for protection of community assets. [AMAT 1.2.15].
- Number of people with increased income – compared to the control group – as a result of diversified livelihood practices and more secure access to livelihood assets, disaggregated by age and gender.
- Number of people adopting household-level processing facilities transferred to targeted groups – disaggregated by age and gender [adapted from AMAT 3.1.1].

Outcome 2.2: CCA/DRM plans and implementation.
- Number of villages covered by Village Disaster Risk Management plans to reduce risks of and respond to climate variability [adapted from AMAT 2.2.1].

Outcome 3.1: Knowledge about CCA and DRM is captured and shared at the regional and global level.
- Increased capacity of government staff to access information on climate and disaster risks as well as M&E on climate change adaptation.

2.5.2 Risks and assumptions

166. Risks and assumptions are outlined in the table below. For the full risk log, see Annex 14.

Description	Type	Impact & Probability	Countermeasures / Management Response	Assumptions
Poor coordination with AF and PPCR projects reduces opportunities for collaboration and alignment with interventions under	Operational & Strategic	P = 2 I = 2	Develop strong coordination arrangements between LDCF project and AF/PPCR projects. Use common members of Project Board (PB) and Technical Advisory Team (TAT) to coordinate workplans	Constant coordination between projects ensures continuous progress that is complementary and aligned.

LDCF project.			and procurement processes. Ensure regular communications of updates between project boards.	
Delays in progress of baseline projects prevent implementation of interventions under LDCF.	Operational & Strategic	P = 2 I = 2	Ensure regular communication of targets and workplans between LDCF and baseline projects. When delays seem imminent, PB members to advocate for accelerating processes or design alternative strategies to deliver on outputs.	Constant coordination with baseline projects ensures that LDCF project can build on on-going initiatives.
High staff turnover affects project implementation.	Operational	P = 3 I = 4	Explore a partnership between the University of the South Pacific, the Secretariat of the Pacific Community and GoS, whereby national students or new graduates can be fast-tracked into working in the project in the case of staff turnover. These students could join the project as interns or on a time-bound entry-level contract. This will not only directly contribute to the project implementation capacity, but also help build a pool of young professionals who can contribute towards future initiatives in the environment space.	Low rates of staff turnover and proper handover procedures ensure continuity. Mechanisms for recruiting new staff quickly will minimise delays.
Community participation decreases as benefits of adaptation measures and project interventions are not immediately evident.	Organisational	P = 3 I = 4	Maintain constant communication with communities concerning project progress, targets and expected benefits. Implement tangible and visible activities to address community priorities early during project implementation. Manage community expectations to ensure that they are aligned with project scope. Disseminate project findings and lessons learned through appropriate media to maintain project profile and positive community perception.	Constant communication and management of expectations ensures continuous community involvement throughout planning and implementation.
Competing mandates and poor coordination between government agencies/line ministries disrupt project activities.	Political	P = 2 I = 3	Continuously inform policy- and decision-makers of project aims and potential synergies with other projects as well as on-going government initiatives. Demonstrate links between on-the-ground implementation and policies/strategies, with particular reference to contributions to relevant mandates of line ministries. Engage with relevant Sector Coordination Units to ensure alignment of project with sectoral priorities.	Proper coordination between government agencies enhances and sustains project progress that is aligned with sectoral adaptation priorities. MNRE Climate Change Unit and MoF-CRICU will ensure a programmatic approach and coordination of adaptation work.
Disaster events/ hazards destroy or	Environmenta	P = 2	Maintain contact with Met Office to ensure adequate lead time when	Adequate monitoring of potential risks ensures that

delay project interventions.	l	I = 4	disaster is imminent. Schedule project activities during low storm risk periods to reduce likelihood of extreme climate events. Monitoring potential extreme events and ensure coordination of preparation and responses with the national DRM framework.	impacts of these risks are mitigated.
Land disputes amongst community members hamper implementation of adaptation interventions.	Organizationa l	P = 1 I = 4	Ensure adequate consultation with targeted communities throughout planning, design and implementation of project interventions. Maintain strict adherence to approved national practices concerning community involvement. Ensure that project activities are aligned with community priorities in a culturally and social responsible manner.	Socially sensitive approaches to project activities that are in line with approved national practices will prevent land disputes from arising.
Limited human resources in government ministries and agencies delay project activities.	Operational	P = 1 I = 3	Adequately resource the PMU including the securing of positions to be recruited for key technical support. Ensure alignment with PPCR/AF technical assistance. Monitor project processes to identify limitations timeously and allow for alternatives to be implemented.	Human resources in government ministries and agencies will be sufficient to ensure successful implementation of project activities.
Project interventions are not implemented in a gender- and culturally-sensitive manner.	Operational	P = 2 I = 4	Ensure that project team is sensitised to gender and cultural sensitivities. Involve women committees and traditional authority structures in planning and implementation of project activities.	Involvement of women committees and traditional authority structures will ensure gender and cultural sensitivity of project interventions.
Insufficient political and financial support from line ministries and other government departments/ agencies.	Political	P =2 I = 2	Consistently reinforce the importance of adherence to agreed-upon roles and responsibilities for project progress. Update governmental decision-makers of project progress in order to garner high-level support and political will.	Adequate political and financial support contributes to successful implementation of project interventions.
Communities and governmental stakeholders don't distinguish resilience to climate change from baseline weaknesses.	Operational	P = 1 I = 2	Maintain proactive outreach communications strategy for duration of programme, including tailored awareness raising activities linked with the assessment, consultation and planning of adaptation interventions.	Awareness-raising of communities allows them to perceive adaptation benefits of project interventions.
Unanticipated social and/or environmental impacts are caused by project activities.	Strategic	P = 1 I = 4	No interventions will be implemented unless they have adequate measures for mitigating social and environmental impacts. Constant monitoring of design/planning to ensure adequate mitigation measures are included.	Proper design and planning of project interventions will mitigate social and environmental impacts.

2.6. Cost-effectiveness

167. The proposed LDCF project has been designed with an inherently cost-effective approach. The project objective is to enhance integration of climate change adaptation and DRM into development sectoral planning as well as enhancing the resilience of communities to climate change. The project will implement measures that have been shown to be cost-effective in reducing vulnerability to climate change. These measures include: i) building capacity for integration of climate risks into planning across all sectors; ii) strengthening the climate resilience of community assets and livelihoods; iii) investing in disaster prevention and preparedness; and iv) enhancing knowledge management and awareness of climate change risks and adaptation. Alternative approaches to reducing climate vulnerability were considered during the design of the proposed LDCF project. An evaluation of their cost-effectiveness vis-à-vis that of the interventions proposed in Section 2.4 is described below.

Cost-effectiveness of policy-level interventions

Alternative: Continued focus on vulnerabilities of individual sectors to climate risks

168. This approach – as characterised by the implementation of various NAPA projects in Samoa – is aimed at reducing climate risks in the short term. The various government agencies would implement interventions based on their respective mandates[47]. However, the expected effects of climate change in Samoa are likely to result in cross-sectoral impacts that would require a more integrated approach to prevention and management. For example, flooding as a result of tropical cyclones will have wide-spread implications for agriculture, infrastructure, health, water resource management, energy and transport. Facilitation of an economy-wide approach to reducing climate vulnerability will promote more sustainable and efficient management of climate risks. This would also build on the strengths of MoF's role in coordinating policy and planning across all sectors through implementation of the SDS 2012–2016. For these reasons, the actions proposed under Outcome 1.1 – relating to strengthening of national policies and institutions – and Outcome 3.1 – relating to knowledge management and M&E – have been designed to promote cross-sectoral planning for climate change adaptation. In addition, the actions proposed under Outcome 2.1 will coordinate the building of climate resilience across a number of sectors including water, housing, sanitation, agriculture and manufacturing. This economy-wide approach will allow GoS to address national priorities for climate change adaptation across all sectors in the short-, medium- and long-term.

Cost-effectiveness of proposed flood protection measures

Alternative: Implementation of exclusively hard adaptation measures for flood risk management

169. This approach would only implement "hard" infrastructure – such as dykes, levees and sea walls – to reduce the risks of floods resulting from tropical cyclones. Under this option, such infrastructure measures would be built in Apia where flood damages during the recent Cyclone Evan were greatest. However, this approach was rejected for various reasons. Firstly, hard adaptation measures are considerably more expensive and riskier than softer measures such as ecosystem management- based measures. During the development of this project proposal, a potential alternative plan for implementation of exclusively hard infrastructure in Apia only, was budgeted at US$ 12 million by LTA (*not counting* feasibility studies, nor EIAs). This plan would have accounted implementation only in the lower watershed (mainly roads, bridges, and rockwalls) and would consequently reach fewer beneficiaries. After several consultations, it was recommended (and

[47] E.g. DMO for village disaster plans, LTA and PUMA for flood protection infrastructure, WRD for water resource management and MAF for agriculture.

agreed by GoS) that thorough feasibility studies are performed first, stemmed from the recommendations of an Integrated Watershed Management Plan. The IWMP would use a ridge-to-reef approach so as to reduce transfer of risk up- or down-stream. This approach would not only take into account upstream and downstream measures, but also soft, ecosystem-based adaptation measures. Budget was significantly reduced while still accounting for feasibility studies and further cost-benefit analysis of the options presented in the IWRM. The IWRM is intended to propose a mix of hard and soft adaptation measures that would be thoroughly assessed and costed as part of its design. Second, hard measures often have a focus on preventing damage from disaster events rather than reducing the risk of disaster events occurring. Such adaptation measures will reduce both the risk of disaster events occurring as well as the impact of such events if they do occur. The proposed design will see upstream implementation of hard and soft measures such as reforestation and construction of check dams of degraded catchments to reduce the risk of floods to at least 12,000 beneficiaries. Along with this, the project will support implementation of downstream interventions such as diversion channels and riverbank stabilisation to protect economic infrastructure and community assets. This blended approach using both hard and soft adaptation measures is expected to prove less costly and provide protection to more beneficiaries than the exclusive implementation of hard infrastructure

Alternative: Nation-wide implementation of measures for flood risk management

170. This approach would see hard and/or soft measures for adaptation through flood risk management being implemented across various districts and in various catchments across Samoa. Such a design would see greater geographic coverage of the proposed interventions. However, this approach was precluded in preference to design and implementation of adaptation measures for flood risk management only in the Greater Apia area. This is because the population of the Greater Apia area constitutes ~20% of the population of the entire country[48]. In addition, loss-and-damages caused by Cyclone Evan in the Greater Apia area were 10 times greater than those occurring in all but four of the districts in Samoa[49]. Finally, most of Samoa's economically important infrastructure occurs within the Greater Apia area. Examples of this infrastructure and the effects of flooding are described below.
    - *Apia Harbour*. The harbour was temporarily closed as a result of debris such as tress and logs as well as sedimentation washed into the harbour during Cyclone Evan. The harbour is a critical link between the islands of Upolu and Savai'i and is one of the best-performing ports in the Pacific region.
    - *Alaoa Dam*. This dam provided both drinking water and hydro-electric power prior to Cyclone Evan. However, the capacity of the dam to provide these services was compromised by logs and trees blocking the dam as well as the destruction of the water supply pipes. This had severe impacts on the quality of life of Samoans immediately after Cyclone Evan.

    The high proportion of Samoa's population living in the Greater Apia area and the concentration of critical economic infrastructure in Apia make it more cost-effective to focus on implementation of flood protection measures here rather than spreading such measures across a number of districts.

Cost-effectiveness on proposed livelihood diversification measures

Alternative: Crop insurance against climate risks

Crop insurance was identified as a potential solution to compensate farmers against losses incurred owing to climate-induced natural disasters. However, such insurance mechanisms are reliant on inter alia: i) comprehensive climate monitoring systems that are explicitly linked to crop yields; ii) the ability of farmers to pay insurance premiums; and iii) the willingness and ability of government to subsidise insurance premiums. The implementation of such an insurance scheme

[48] Samoa Bureau of Statistics. 2011. *Population and Housing Census.*
[49] GoS. 2013. PDNA. *Post-disaster Needs Assessment: Cyclone Evan 2012.*

was deemed unfeasible for Samoa. Firstly, there is insufficient capacity for climate monitoring and linking this directly to crop yields to inform if/when insurance pay-outs should occur. Secondly, the majority of farmers in Samoa are subsistence farmers with very low levels of income. As such, they would be unable to service insurance premiums and would consequently be unable to participate in insurance schemes. Finally, the GoS is not able to subsidise insurance premiums to the extent required to implement such a scheme. This is compounded by the relative immaturity of the Samoan insurance industry that would make it difficult to obtain the requisite re-insurance to render such a scheme viable. Based on this analysis, it was decided to instead focus the alternative livelihoods component on the development of business incubators through the creation of sustainable and resilient value chains for agricultural and handicraft products. This would allow farmers to increase savings and/or further invest in productive assets, thereby strengthening their capacity to recover autonomously from eventual climate shocks. As there is no financial barrier to participation – i.e. no insurance premiums – this approach is expected to reach more beneficiaries. A total of 300 beneficiaries will receive support for agricultural livelihoods and a further 300 beneficiaries will receive support for handicraft livelihoods.

171. Further general considerations for the cost-effectiveness of some of the proposed LDCF project's interventions are described below.

Cost-effectiveness of protection of infrastructure[50]

172. Strengthening of disaster preparedness measures have proven to be more cost-effective when compared to disaster response and reconstruction activities[51,52]. For example, the inclusion of disaster-resilient features in the design of new construction projects is estimated to increase construction costs by 1%. In comparison, the cost of repair and reconstruction of damage caused by climate-induced natural disasters is estimated to be 35-40% of total construction costs[53]. A case study of the damage caused by Hurricane David (1979) showed that losses totalling ~4.2% of construction cost could have been avoided by investing an additional 1.9% of original construction costs in climate-resilient measures[54].

173. The LDCF project will implement measures for integrated watershed management to reduce risks posed by flooding in the Greater Apia area. According to the PDNA (2012), the total cost of damage and losses from Cyclone Evan was estimated at US$203 million which equates to more than a quarter of the country's GDP. This included damage to physical assets totalling ~US$ 103 million as well as production costs and losses of an additional ~US$ 100 million. Without implementation of appropriate counter-measures for such climate risks, economic assets are threatened by damage critical infrastructure while resources are likely to be diverted away from development spending – such as health and education – towards disaster response and reconstruction efforts. This project will reduce such risks by protecting critical economic and community assets from climate-induced disasters. This will include upstream, "soft" interventions to address the root causes of vulnerability. There is growing evidence of the cost-effectiveness of such investments[55]. An economic analysis of adaptation measures compared the costs and benefits of "soft" interventions, "hard" interventions and a combination of both approaches. The analyses demonstrated that "soft" interventions are twice as cost-effective as "hard" interventions

[50] For more information on the costs and benefits involved, see Annex 6.
[51] Kellett, J. &Peters, K. 2013. *Dare to prepare: Taking risk seriously*. Overseas Development Institute.
[52] Shyam, K.C. 2012. *Cost Benefit Studies on Disaster Risk Reduction in Developing Countries*. EAP DRM Knowledge Notes. Working Paper Series No. 27.
[53] Pereira, J. 1995. *Costs and Benefits of Disaster Mitigation in the Construction Industry*. Caribbean Disaster Mitigation Project. Available at http://www.preventionweb.net/files/1177_CDMPCostsandBenefits.pdf. Accessed on 12 Dec 2013.
[54] Vermeiren, J., S. Stichter, and A. Wason. 2004. *Costs and Benefits of Hazard Mitigation for Building and Infrastructure Development: A Case Study in Small Island Developing States*.
[55] Jones, H.P., D. G. Hole & E. S. Zavaleta. 2012. Harnessing nature to help people adapt to climate change. *Nature Climate Change* 2: 504-509.

(benefit-to-cost ratios of US$10.50 versus US$4.80), while strategies that combined these approaches were likely to reduce losses resulting from disaster by 25% with a benefit-to-cost ratio of US$4.30–8.00[56].

174. Investments into project interventions will contribute to safeguarding long-term socio-economic development. In particular, critical economic as well as household infrastructure will be protected from climate-induced disaster events. Improved management of watersheds in the Greater Apia area will reduce the vulnerability of major transport corridors – such as the east–west corridor over the Leone Bridge – and other commercial links to climate risks. This will enhance the resilience of economic activity by maintaining connectivity and access to markets. In addition, it will enhance the safety and welfare of communities as they will have improved access to government services such as health care and support for post-disaster recovery. As detailed in the Samoa Infrastructure Vulnerability Assessment Report (Annex 6), the design of flood-protection measures derived from the recommendations in the IWMP will have to include an appropriate cost-benefit analysis before any construction activity is conducted.

Cost-effectiveness of strengthening value chains

175. Supporting growth in the agricultural sector has been shown to be more than twice as effective in poverty alleviation when compared to growth in other sectors[57]. Investments in agriculture are more cost-effective for increasing household-level income than comparable investments in roads and other infrastructure[58]. Supporting value chains – agricultural and otherwise – will improve efficiency and strengthen linkages between producers, processors and buyers. This more efficient organisation of value chains will allow greater benefits to accrue to primary producers, while at the same time improving reliability and quality of supply to buyers and consumers. Analysis of value chains will link suppliers to markets and strengthen the ability of the suppliers to produce commodities according to exact product specifications. Raising the productivity and income of value chain actors will allow producers to develop high-return production systems and use their livelihood assets more optimally. Consequently, small-scale producers will have greater capacities for increasing the amount of produce they can supply at the requisite levels of quality. Where quality of products is of particular concern, improved access to processing technology provides a cost-effective means for compensating[59] as processors are able to supply final products rather than raw materials. For these reasons, strengthening of value chains is considered to be one of the most effective approaches for addressing poverty[60].

176. A “rapid economic diagnosis” of the agriculture sector in Samoa was conducted, as part of the project preparatory phase (see Annex 10), to better inform the approach selected to introduce alternative livelihoods. The diagnosis revealed the need and opportunity for strengthening value chains supported by new technologies to promote income generation from agricultural products. It was stated that in the absence of incentives to produce surplus for the market, prevailing circumstances have induced households to gear production towards meeting the subsistence needs of the family unit, in particular if there is cash available from remittances. The prevailing low level of technology compounded by the limited availability of credit may have consolidated both the atomization of market participation and the fragmentation of land use. The overall result has been the amplification of agricultural holdings into operations geared towards home consumption

[56] Rao N.S. *et al*. 2013. *An economic analysis of ecosystem-based adaptation and engineering options for climate change adaptation in Lami Town, Republic of the Fiji Islands*. SPREP Technical Report. Apia, Samoa.
[57] Ligon, E. & Sadoulet, E. 2007. *Estimating the Effects of Aggregate Agricultural Growth on the Distribution of Expenditures*. Background Paper for the World Development Report.
[58] Oehmke, J.F. 2012. *Impacts of USAID-supported Agricultural Programs on Household Income Growth and Cost-Effectiveness for Poverty Reduction*. USAID Policy Brief.
[59] World Bank. 2008. *Growth and poverty reduction in agriculture’s three worlds.* World Development Report 2008: Agriculture for Development.
[60] Devaney, P.L. 2011. *Global Agricultural Value Chains: Sustainable Growth as a Means for Sustainable Development*. Community Development Investment Review, Federal Reserve Bank of San Francisco.

alone. Hence, GoS has recognized the need to address the gap in promoting income-generating activities for households based on diversification of agricultural products.

2.7. Sustainability

177. Adaptation interventions promoted by the project will be mainstreamed into main policy instruments and legislative platforms to enable project results to be sustained beyond the lifetime of the project. Sustainability has been built into the project approach by emphasising institutional and individual capacity development.

178. The focus on improved planning and decision-making on climate change (Outcome 1.1) as well as strengthened PFM management for adaptation (Outcome 1.2) will strengthen GoS' capacity to plan for and implement measures for climate change adaptation in the medium- to long-term. These outcomes thus inherently contribute to sustainability of project activities by mainstreaming climate change adaptation – including practical measures implemented in this project – into national policies, strategies and plans on an ongoing basis.

179. The project's sustainability will be secured through the strengthened institutional structures and public-private partnerships that will be supported through the policy and related capacity-building processes. This cross-sectoral approach includes: i) climate resilient development planning; ii) protection of community assets and livelihoods; and iii) enhanced capacities for climate change adaptation at the national and local level. For example, livelihood enhancement at the household level and implementation of VDRMPs can be replicated in communities outside of those within which the project will be active. The South-South transfer of knowledge proposed under Outcome 3.1 will serve as vehicle to replicate project experience beyond Samoa, while also strengthening national M&E to inform local replication of project experience within the country.

180. The proposed adaptation interventions aim at safeguarding the main livelihoods and physical and environmental assets of communities, and associated value chains from climate-induced risks and hazards. Climate change adaptation in communities can only be tackled through integrated approaches, because it is based on location-specific assets and activities using natural and cultural resources. Therefore, the implementation of these activities will be closely linked to each other, as they will take place in highly vulnerable and exposed areas. To address climate change and environmental concerns in an integrated way, linkages will be explored during the project development phase with other relevant initiatives.

181. Through supporting livelihoods and income-generating opportunities, communities will have access to more financial capital. Supported by strong capacity-building and specific training, these activities will help create a sustainable and virtuous cycle whereby households with greater income re-invest these funds into their livelihoods e.g. through purchase of new productive assets. This virtuous cycle is likely to be sustainable in the long-term, as continual re-investment into livelihoods will lead to further improved income that can again be invested or used for other socio-economic outcomes such as health care, education and improved nutrition.

182. Project resources will be used to systematically capture, analyse and disseminate experience and best practices, from early stages of community engagement and policy-related work.

183. The best practices and lessons learned from this project – which will be uncovered by tracking and measuring the positive effects of the project – will be communicated to the Ridge to Reef regional programme. Consequently, the investments in this project will not only be replicated in other SIDS in the region, but will also catalyse further investments that will help scale up this nationwide approach. In particular, the results from the quasi-experimental design pilot to analyse benefits from the livelihood diversification interventions (see Output 2.1.3) will be used to develop best practice guidelines. Lessons learned from will provide the basis for detailed documentation of the impacts of livelihood diversification on community resilience with specific reference to benefits

provided to women and youth. These will be shared nationally – through awareness campaigns – as well as internationally – through the Ridge-to-Reef and other regional initiatives – to contribute to current knowledge on building climate resilience.

2.8. Replicability

184. The proposed LDCF project is undertaking several different approaches to promoting climate resilience within Samoa. There is therefore considerable potential for replication throughout the country.

185. The close involvement of government institutions and departments in the project's development and implementation promises potential for future incorporation of its approaches into on-going planning and strategies. Additionally, it is expected that the strengthening of capacities among main government stakeholders will enable continued mainstreaming of climate considerations into sectoral planning and decision-making.

186. Furthermore, the extensive training and capacity building of local communities and technical staff regarding adaptation interventions – such as climate-resilient infrastructure and diversified livelihood options – will aligned future activities that are climate-resilient as demonstrated by this project's adaptation interventions. In so doing, project interventions are more likely to be replicated and/or upscaled.

187. After development of an integrated WMP for all watersheds in the Greater Apia area, hard and soft flood protection measures will be implemented within the Vaisigano watershed. Lessons learned from the implementation of these measures will allow for replication of these approaches in the other watersheds in the Greater Apia area, as well as watersheds across the rest of the country. The interventions in this project can therefore serve as a model for future national adaptation projects. In addition, the interventions described here offer potential for replication in other SIDS that suffer from the same climate change impacts, *viz.* increased risk of floods associated with more severe storm events. The project will share lessons learned through the Ridge-to-Reef programme, which will create opportunities for replication across the Pacific region.

188. There is also potential for replication of the livelihood diversification interventions both national and internationally. These interventions may be quite easily replicated in other villages within Samoa with relatively small investment, especially since such interventions will be implemented through experienced national NGOs. Such replication would be able to build on and leverage from ongoing initiatives supported by GoS and WIBDI to enhance the livelihoods of agriculturally active households as well as those involved in handicraft production. There is similarly potential for replication in other SIDS in the region through the sharing of lessons learned through the Ridge-to-Reef network.

2.9. Stakeholder involvement plan

189. Stakeholders at both national and local levels will be engaged during implementation of the proposed LDCF project. During the validation mission, the plan for stakeholder engagement during project implementation was discussed and agreed upon during bilateral consultations and one-on-one meetings with relevant stakeholders as well as during the validation workshop, as presented in Table 4.

Table 2. Relevant partners and stakeholders identified for engagement by project outcome/output.

Outcome	Output	Stakeholder	Key Responsibilities
Outcome 1.1. ***Policy Strategies/Institutional Strengthening***	**Output 1.1.1.** Climate change adaptation mainstreamed into development plans and	MNRE MoF Sector	Integrate climate change into sector plans and budgets. Develop National Climate Change Adaptation

	sectoral strategies	coordination units Other line ministries	Strategy. Align Strategy for the Development of Samoa (2017-2021) with the National Climate Change Adaptation.
	Output 1.1.2. Institutional and operational frameworks for coordination of climate change adaptation strengthened	MNRE MoF	Coordinate climate policy-making, planning, and implementation. Stocktake current and planned climate change adaptation projects, plans, reports and assessments. Establish Climate Change Unit. Develop guidelines for CRICU functions.
Outcome 1.2. ***Public finance management at the national and village level***	**Output 1.2.1.** MOF and MNRE climate change units – as well as the private sector, NGOs and village governance structures – have enhanced capacity to manage climate finance	MoF MNRE CSOs/NGOs (e.g. SUNGO)	Develop guidelines for community management of climate change projects. Train communities on managing finances for climate change. Develop guidelines/toolkits methodology for biennial analysis of climate expenditure. Produce three reports on climate change expenditure.
Outcome 2.1.*Protection of communities' physical assets and livelihoods*	**Output 2.1.1.** Integrated Watershed Management Plan for Greater Apia following "Ridge-to-Reef" approach.	MNRE MWCSD LTA Other ministries	Develop an integrated management plan for the Greater Apia area. Design flood protection measures to build resilience of communities.
	Output 2.1.2. Hard and soft measures for protection of community assets	MNRE MWCSD LTA	Build flood protection infrastructure along Vaisigano River. Implement ecosystem-based approaches to watershed management. Reconstruct community assets following "build-back-better" approaches.
	Output 2.1.3. Sustainable micro-enterprises for youth and women on agro-businesses with a sustainable and resilient value chain approach to promote diversified livelihoods.	Private sector CSOs/NGOs (e.g. WIBDI, SROS)	Assess agricultural and handicraft value chains. Train women and youth on technical skills for agricultural and handicraft value chains. Provide planting materials and household processing facilities.
Outcome 2.2. ***CCA/DRM plans and implementation***	**Output 2.2.1.** Building on the work of DMO, village plans designed and implemented to develop the capacities of 100 communities to prepare, respond, recover and manage CC risks	MNRE MWCSD CSOs/NGOs (e.g. Red Cross)	Conduct household surveys and analyse data to map vulnerability to climate risks. Develop and implement Village Disaster Risk Management Plans.
Outcome 3.1. ***Knowledge about CCA and DRM is captured***	**Output 3.1.1.** Knowledge management strategy developed, including national	MNRE MWCSD	Develop protocols for storage and sharing of information/data. Establish national climate and disaster risk

and shared at the regional and global level.	awareness campaigns and information sharing through existing international platforms and new multimedia platforms (feeding into R2R programme)		database. Pilot plan systematised uploading and monitoring of data and information. Conduct awareness campaigns on water resources, land management, village development, climate change adaptation and DRM.
	Output 3.1.2. M&E system established to strengthen institutional coordination and enhance the effectiveness of the interventions on adaptation with an economy wide approach	MNRE MoF	Establish national M&E framework for water resources, land management, village development, climate change adaptation and DRM. Develop a standardised reporting modality to enable harmonised monitoring, evaluating and reporting on climate change adaptation.

2.10 Explain compliance with UNDP Safeguards Policies

190. The UNDP environmental and social safeguard requirements have been followed in the development of the proposed LDCF project. As outlined below, the project is expected to have predominantly positive environmental and social impacts. Where the potential for negative effects exists, adequate provision has been made to plan for appropriate mitigation actions.

191. The LDCF project does include activities that support upstream planning processes. However, the envisaged revisions that will be proposed to national policies and strategies are unlikely to have negative environmental or social impacts. On the contrary, the project will have positive environmental and social impacts by influencing policies and strategies for climate-resilient development planning.

192. The protection of communities' assets and livelihoods – proposed under Outcome 2.1 – will involve the construction of infrastructure to reduce the risk posed by climate-induced disasters. The proposed infrastructure has the potential to affect natural resources negatively. For example, construction of flood protection infrastructure may lead to changes in hydrology and river functioning. As a consequence, the LDCF project will develop detailed plans for watershed management and flood protection measures under Output 2.1.1 prior to construction. This comprehensive planning will include vulnerability and adaptation assessments, gap analysis, feasibility plans, cost-benefit analyses, environmental impact assessments and social impact assessments that will guide the design of infrastructure that will mitigate any potential negative effects. The planning will include extensive consultations with local communities to ensure that interventions maximise social and environmental benefits as well as minimise social and environmental costs. On the basis of these plans, all potential negative impacts will be adequately mitigated during implementation.

193. Construction of flood protection infrastructure could result in increased settlement in areas where the infrastructure has reduced hazard risk. The potential environmental and social effects associated with this will be assessed during the development of the integrated watershed management plan and the design of the flood protection infrastructure. Appropriate mitigation responses for any negative impacts will be clearly elaborated by the implementing partner in consultation with UNDP during the design and implementation of proposed interventions.

194. The integrated watershed management plans developed under Output 2.1.1 will guide the implementation of ecosystem-based approaches to watershed management that will further reduce the risks posed by climate-induced disasters. These measures will *inter alia* stabilise soil, improve water infiltration and restore natural vegetation. This will have a positive effect on the

natural resources and hydrological functioning. The watershed management plans will be based on international best practices and are consequently expected to have positive effects on natural resources and local communities. In addition, the proposed interventions will not increase pollution or greenhouse gas (GHG) emissions. Instead, interventions are likely to increase aboveground biomass – because of the restoration of watershed slopes – and will consequently reduce GHG emissions.

195. Reconstruction of community assets following the "build-back-better" principle will also be informed by the integrated watershed management plan. This plan will be based on community consultations that will identify at-risk communities and physical assets. Reconstruction of community assets will take place outside of hazard zones so that communities can relocate away from areas that will be impacted by climate risks. Local communities will be fully involved in decision-making and implementation of interventions for reconstruction of community assets. This will include stakeholder meetings and other forms of community consultations. A strategy to solve land disputes that may arise among village members will be implemented following the standard practices of the Government of Samoa, which has experience in dealing with such concerns

196. The LDCF project focuses on gender equality and the use of a community-based approach. Consequently, project interventions are community-centred and gender-sensitive to promote social equity and equality. Consultation with community groups – including women and youth – will ensure that interventions take place in a culturally-appropriate manner. Benefits for local communities include *inter alia*: i) reduced vulnerability of communities to natural disasters; ii) positive effects on health; and iii) improved livelihoods. Consequently, the project is expected to have positive socio-economic effects.

197. Communities may not initially perceive benefits of the application of climate sensitive adaptation measures and planning processes. Consequently, indigenous groups will receive training and sensitisation on the inclusion of climate resilience and DRM in village development processes. This will build communities' capacity to identify and prioritise measures for climate change adaptation for implementation through support provided by this project as well as other on-going initiatives in Samoa.

198. The support of micro-businesses has been designed to safely integrate women into decision-making, implementation and monitoring phases of the project. This entails development of diversified livelihoods that will cater specifically to the needs of women through its complementarity with the work undertaken by the Women in Business Development initiative

199. The design and implementation of VDRMPs will be based on extensive engagement with local communities. Household surveys will be conducted to identify vulnerabilities and design counter-measures to enhance resilience. Community members will also be trained on the implementation of these plans. In this way, the interventions will be sensitive to the socio-cultural context of each community. The implementation of Village Disaster Management Plans will focus on the specific needs of women and other vulnerable groups (e.g. the elderly, people with disabilities).

200. In summary, the proposed LDCF project is expected to have largely positive effects on the environment and local communities. Where the potential for negative effects are anticipated, adequate mitigation measures will be included through the development of comprehensive plans based on environmental and social impact assessments.

3. Project Results Framework

This project will contribute to achieving the following Country Programme Outcome as defined in CPAP or CPD: ***Outcome 3.1.1:****National capacities and institutional mechanisms strengthened for effective disaster response; plans in place capturing community and CSO participation*

Country Programme Outcome Indicators: *Strengthening Gender Responsive Disaster Risk Reduction and Mitigation Programmes in Communities and Amongst Civil Societies.*

Primary applicable Key Environment and Sustainable Development Key Result Area: *3. Promote climate change adaptation.*

LDCF Strategic Objective and Program: **LDCF Climate Change Adaptation**
CCA-1*: Reducing Vulnerability: Reduce vulnerability to the adverse impacts of climate change, including variability, at local, national, regional and global level.*
CCA-2*: Increasing Adaptive Capacity: Increase adaptive capacity to respond to the impacts of climate change, including variability, at local, national, regional and global level.*
CCA-3*: Adaptation Technology Transfer: Promote transfer and adoption of adaptation technology.*

LDCF Expected Outcomes:
Outcome 1.1: *Mainstreamed adaptation in broader development frameworks at country level and in targeted vulnerable areas.*
Outcome 1.2*: Reduced vulnerability in development sectors.*
Outcome 2.2*: Strengthened adaptive capacity to reduce risks to climate-induced economic losses.*
Outcome 3.1*: Successful demonstration, deployment, and transfer of relevant adaptation technology in targeted areas.*

LDCF Outcome Indicators (AMAT):
Indicator 1.1.1: *Adaptation actions implemented in national/sub-regional development frameworks.*
Indicator 1.2.15: *% of targeted population benefitting from improved flood management through implementation of hard and soft measures for protection of community assets.*
Indicator 2.2.1*: No. and type of targeted institutions with increased adaptive capacity to reduce risks of and response to climate variability.*
Indicator 3.1.1*: % of targeted groups adopting adaptation technologies by technology type (% disaggregated by gender).*

	Indicator	Baseline	Targets End of Project	Source of verification	Risks and Assumptions
Project Objective[61]: Establishment of an economy-wide approach to climate change adaptation in Samoa, aimed for efficient integration and management of adaptation and DRM into national development planning and programming and enhancing the resilience of communities' physical assets and livelihoods across Samoa, to climate change and natural disasters.	1. Increased capacity within GoS for coordination of cross-sectoral actions for climate change adaptation, including planning, budgeting, implementing and monitoring and evaluating. 2. Integration of climate change adaptation and DRM into the Strategy for the Development of Samoa 2017–2021.	1. Capacity for national coordination of climate change adaptation and DRM is presently limited (Level 3: Partially developed capacity). 2. Integration of climate change adaptation and DRM in the Strategy for the Development of Samoa 2012–2016 is limited.	1. By the end of the project, GoS will have sufficient capacity for effective coordination of cross-sectoral actions for climate change adaptation (Level 5: Fully developed capacity). 2. The Strategy for the Development of Samoa 2017–2021 will include key performance indicators for climate change adaptation for outcomes relating to agriculture, community development, water and sanitation, transport and climate and disaster resilience.	1. Capacity scorecard assessment of officials within the MoF-CRICU and MNRE-Climate Change Unit at MTR and FTE. 2. Endorsed Strategy for the Development of Samoa 2017–2021 that includes climate change adaptation/DRM.	Risk: Competing mandates and poor coordination between government agencies/line ministries disrupt project activities. Assumption: Proper coordination between government agencies enhances and sustains project progress that is aligned with sectoral adaptation priorities. MNRE Climate Change Unit and MoF-CRICU will ensure a programmatic approach and coordination of adaptation work. Risk: Limited human resources in government ministries and agencies delay project activities. Assumption: Human resources in government ministries and agencies will be sufficient to ensure successful implementation of project activities.

[61] Objective (Atlas output) monitored quarterly ERBMand annually in APR/PIR

					Risk: High staff turnover affects project implementation. Assumption: Low rates of staff turnover and proper handover procedures ensure continuity. Mechanisms for recruiting new staff quickly will minimise delays. Risk: Insufficient political and financial support from line ministries and other government departments/agencies. Assumption: Strong political will and financial support will contribute to successful implementation of project interventions.
Outcome 1.1[62] (equivalent to activity in ATLAS): Policy Strategies/ Institutional Strengthening: Climate change adaptation and DRM mainstreamed in relevant policies, sectoral strategies, sub-national strategies[63] and budgeting processes through enhanced coordination of government institutions.	1.1.1. Sector plans that include specific budgets for adaptation actions [adapted from AMAT 1.1.1] 1.1.2. Formulation and endorsement of National Climate Change Adaptation Strategy.	1.1.1. At present, 4 sector plans do not include climate change adaptation. 1.1.2. There is presently no National Climate Change Adaptation Strategy.	1.1.1. All 15 sector plans are formulated to include climate change adaptation and are approved by the end of the project. 1.1.2. A National Climate Change Adaptation Strategy is formulated and endorsed by the end of the project.	1.1.1. Updated and approved sector plans. 1.1.2. Formulated and endorsed National Climate Change Adaptation Strategy.	Risk: Competing mandates and poor coordination between government agencies/line ministries disrupt project activities. Assumption: Proper coordination between government agencies enhances and sustains project progress that is aligned with sectoral adaptation priorities. MNRE Climate Change Unit and MoF-CRICU will ensure a programmatic approach and coordination of adaptation work. Risk: Limited human resources in government ministries and agencies delay project activities. Assumption: Human resources in government ministries and agencies will be sufficient to ensure successful implementation of project activities. Risk: Insufficient political and financial support from line ministries and other government departments/agencies. Assumption: Strong political will and financial support will contribute to successful implementation of project interventions.
Outcome 1.2 (equivalent to activity	1.2.1. Increase in number of	1.2.1. Few community-managed	1.2.1. At least 20 community-managed projects for adaptation to	1.2.1. Review of successful	Risk: Community participation decreases as benefits of adaptation measures and

[62] All outcomes monitored annually in the APR/PIR.It is highly recommended not to have more than 4 outcomes.
[63] Sub-national strategies include district/village strategies and a strategy for Apia

in ATLAS): Public finance management at the national and village level: Capacity to access, manage, implement and monitor use of climate change funds is enhanced at the national and village level.	community-managed projects for adaptation to climate risks. 1.2.2. Improved monitoring of government expenditure on climate change adaptation.	projects for adaptation to climate risks. 1.2.2. No monitoring of public expenditure on climate change adaptation.	climate risks. 1.2.2. MoF-CRICU and MNRE-CCU have improved capacity to monitor expenditure on climate change adaptation.	implementation of community-managed projects funded by CSSP and other initiatives. 1.2.2. Review of CPEIR-style reports of public expenditure on climate change adaptation. Capacity assessments of MoF-CRICU and MNRE-CCU on monitoring of expenditure on climate change adaptation.	project interventions are not immediately evident. Assumption: Constant communication and management of expectations ensures continuous community involvement throughout planning and implementation. Risk: Communities and governmental stakeholders don't distinguish resilience to climate change from baseline weaknesses. Assumption: Awareness-raising of communities allows them to perceive adaptation benefits of project interventions.
Outcome 2.1 (equivalent to activity in ATLAS): Protection of communities' physical assets and livelihoods: Increased resilience, and decreased exposure and susceptibility of communities to climate change and natural disasters by protection of household and community assets and promoting resilient livelihoods.	2.1.1. Number of people benefitting from improved flood management through implementation of hard and soft measures for protection of community assets. [AMAT 1.2.15]. 2.1.2. Number of people with increased income – compared to the control group – as a result of diversified livelihood practices and more secure access to livelihood assets, disaggregated by age and gender 2.1.3. Number of people adopting household-level processing facilities transferred to targeted groups – disaggregated by age and gender [adapted	2.1.1. No people benefit from improved flood management from climate-resilient flood protection measures introduced in Vaisigano River catchment for protection of community assets. 2.1.2. No difference in income between targeted and control groups owing to diversified livelihoods and secure access to livelihood assets. 2.1.3. No people have adopted and utilised household-level processing facilities to support diversified livelihoods	2.1.1. At least 12,000 people benefit from improved flood management from climate-resilient flood protection measures introduced in Vaisigano River catchment for protection of community assets (6,000 male and 6,000 female). 2.1.2. At least 600 beneficiaries adopting diversified livelihoods have demonstrable increases in income compared to the control group owing to more secure access to livelihood assets (at least 400 women irrespective of age and 200 youth irrespective of gender). 2.1.3. At least 600 beneficiaries participating in project interventions adopt and utilise household-level processing facilities to support diversified livelihoods (at least 400 women irrespective of age and at	2.1.1. Review of infrastructure design to verify climate resilience. Site visits to verify implementation of climate-resilient flood protection measures. 2.1.2. Household surveys conducted at baseline (prior to implementation of interventions), MTR and TE/endline. 2.1.3. Household surveys conducted at baseline (prior to implementation of interventions), MTR and FTE/endline.	Risk: Poor coordination with AF and PPCR projects reduces opportunities for collaboration and alignment with interventions under LDCF project. Assumption: Proper coordination between government agencies enhances and sustains project progress that is aligned with sectoral adaptation priorities. Risk: Delays in progress of baseline projects prevent implementation of interventions under LDCF. Assumption: Constant coordination with baseline projects ensures that LDCF project can build on on-going initiatives. Risk: Community participation decreases as benefits of adaptation measures and project interventions are not immediately evident. Assumption: Constant communication and management of expectations ensures continuous community involvement throughout planning and implementation. Risk: Disaster events/ hazards destroy or delay project interventions. Assumption: Adequate monitoring of

	from AMAT 3.1.1]		least 200 youth irrespective of gender).		potential risks ensures that impacts of these risks are mitigated. Risk: Land disputes amongst community members hamper implementation of adaptation interventions. Assumption: Socially sensitive approaches to project activities that are in line with approved national practices will prevent land disputes from arising. Risk: Project interventions are not implemented in a gender- and culturally-sensitive manner. Assumption: Involvement of women committees and traditional authority structures will ensure gender and cultural sensitivity of project interventions. Risk: Communities and governmental stakeholders don't distinguish resilience to climate change from baseline weaknesses. Assumption: Awareness-raising of communities allows them to perceive adaptation benefits of project interventions. Risk: Implemented interventions are not climate resilient. Assumption: Proper design and planning of project interventions will ensure climate-resilience. Risk: Unanticipated social and/or environmental impacts are caused by project activities. Assumption: Proper design and planning of project interventions will mitigate social and environmental impacts.
Outcome 2.2 (equivalent to activity in ATLAS): CCA/DRM plans and implementation: Increased adaptive capacity of	2.2.1. Number of villages covered by Village Disaster Risk Management plans to reduce risks of and respond to climate variability [adapted	2.2.1. No Village Disaster Risk Management Plans implemented by the project.	2.2.1. At least 100 Village Disaster Risk Management Plans implemented by the project.	2.2.1. Consultations with community members in villages covered by Village Disaster Risk Management Plans.	Risk: Community participation decreases as benefits of adaptation measures and project interventions are not immediately evident. Assumption: Constant communication and management of expectations ensures continuous community

communities for implementation of effective risk management and protection of household and community assets.	from AMAT 2.2.1]				involvement throughout planning and implementation. Risk: Communities and governmental stakeholders don't distinguish resilience to climate change from baseline weaknesses. Assumption: Awareness-raising of communities allows them to perceive adaptation benefits of project interventions. Risk: Project interventions are not implemented in a gender- and culturally-sensitive manner. Assumption: Involvement of women committees and traditional authority structures will ensure gender and cultural sensitivity of project interventions.
Outcome 3.1 (equivalent to activity in ATLAS): Knowledge about CCA and DRM is captured and shared at the regional and global level.	3.1.1. Increased capacity of government staff to access information on climate and disaster risks as well as M&E on climate change adaptation.	3.1.1. Low capacity of government staff to access information on climate and disaster risks as well as M&E on climate change adaptation.	3.1.1. By the end of the project, key officials from MNRE-CCU and MoF-CRICU will have sufficient capacity for accessing information on climate and disaster risks as well as M&E on climate change adaptation (Level 5: Fully developed capacity).	3.1.1. Consultations with government officials on use of national climate database and M&E framework on climate change adaptation. Capacity scorecard assessment of officials within the MoF-CRICU and MNRE-Climate Change Unit	Risk: Communities and governmental stakeholders don't distinguish resilience to climate change from baseline weaknesses. Assumption: Awareness-raising of communities allows them to perceive adaptation benefits of project interventions. Risk: Insufficient political and financial support from line ministries and other government departments/agencies. Assumption: Strong political will and financial support will contribute to successful implementation of project interventions.

4. Total budget and workplan

Award ID:	00079044	Project ID(s):	00089160
Award Title:	PIMS 5264 FSP LDCF: Economy-wide integration of CC Adaptation and DRM/DRR to reduce climate vulnerability of communities in Samoa		
Business Unit:	WSM10		
Project Title:	Economy-wide integration of CC Adaptation and DRM/DRR to reduce climate vulnerability of communities in Samoa		
PIMS no.	5264		
Implementing Partner(Executing Agency)	MNRE		

LDCF Outcome/Atlas Activity	Responsible Party/ Implementing Agent	Fund ID	Donor Name	Atlas Budgetary Account Code	ATLAS Budget Description	Amount Year 1 (US$)	Amount Year 2 (US$)	Amount Year 3 (US$)	Amount Year 4 (US$)	Amount Year 5 (US$)	Amount Year 6 (US$)	Total (US$)	Budget Notes:
OUTCOME 1.1: Policy Strategies/ Institutional Strengthening	MNRE MoF	62160	LDCF	71300	Local Consultants	$73,200	$51,800	$20,000	$20,000	$20,000	0	$185,000	1.1a
				75700	Training, Workshops and Conferences	$50,000	$20,000	$10,000	0	0	0	$80,000	1.1b
				74200	Audio Visual &Print Prod Costs	0	$10,000	0	0	0	0	$10,000	1.1c
				71400	Contractual Services – Individual	$102,273	$102,273	$102,273	$102,273	$52,273	$52,273	$513,638	1.1d
					Total Outcome 1.1	$225,473	$184,073	$132,273	$122,273	$72,273	$52,273	$788,638	
OUTCOME 1.2: Public finance management at the national and village level	MNRE MoF	62160	LDCF	71300	Local Consultants	$50,000	0	0	0	0	0	$50,000	1.2a
				75700	Training, Workshops and Conferences	$11,000	$12,000	$12,000	0	0	0	$35,000	1.2b
				74200	Audio Visual &Print Prod Costs	0	$5,000	0	$5,000	0	$5,000	$15,000	1.2c
					Total Outcome 1.2	$61,000	$17,000	$12,000	$5,000	0	$5,000	$100,000	
OUTCOME 2.1: Protection of communities' physical assets and livelihoods	MNRE LTA	62160	LDCF	71200	International Consultants	$200,000					0	$200,000	2.1a
				72100	Contractual Services-Companies	$479,000	$1,029,000	$429,000	$429,000	$429,000	0	$2,795,000	2.1b
				72300	Materials & Goods		$986,600	$986,600	$986,600	$986,600	$986,600	$4,933,000	2.1c
				72200	Equipment & Furniture		$313,898	$313,898	$313,898	$313,899	$313,899	$1,569,492	2.1c
				71300	Local Consultants	$40,000					0	$40,000	2.1d
				75700	Training, Workshops and Conferences		$2,000	$2,000	$2,000	$2,000	$2,000	$10,000	2.1e
				72600	Grants		$412,750	$10,750	$10,750	$10,750	$5,000	$450,000	2.1f
					Total Outcome 2.1	$719,000	$2,744,248	$1,742,248	$1,742,248	$1,742,249	$1,307,499	$9,997,492	
OUTCOME 2.2: CCA/DRM plans and implementation	MNRE/MWCSD	62160	LDCF	71400	Contractual Services - Individual	$50,000	$150,000	0	0	0	0	$200,000	2.2a
				75700	Training, Workshops and Conferences	$75,000	$225,000	0	0	0	0	$300,000	2.2b
					Total Outcome 2.2	$125,000	$375,000	0	0	0	0	$500,000	

OUTCOME 3.1: Knowledge about CCA and DRM is captured and shared at the regional and global level	MNRE MoF	62160	LDCF	71300	Local Consultants	0	$100,000	0	0	0	0	$100,000	3.1a
				75700	Training, Workshops and Conferences	0	$30,000	0	0	0	0	$30,000	3.1b
				72800	Information Technology Equipmt	0	$160,000	0	0	0	0	$160,000	3.1c
				74200	Audio Visual &Print Prod Costs	0	$15,000	$15,000	$15,000	$15,000	0	$60,000	3.1d
					Total Outcome 3.1	0	$305,000	$15,000	$15,000	$15,000	0	$350,000	
Project management unit	MNRE	62160	LDCF	71400	Contractual Services - Individual	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$300,000	PM.1
				74100	Professional Services	$20,539	$20,539	$20,539	$20,539	$20,539	$20,539	$123,234	PM.2
				72800	Information Technology Equipmt	$12,000	0	0	0	0	0	$12,000	PM.3
				72500	Supplies	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$30,000	PM.4
				75700	Training, Workshops and Conferences	$10,000	0	$10,000	0	0	$10,000	$30,000	PM.5
				71200	International Consultants	$11,572	0	$40,000	0	0	$40,000	$91,572	PM.6
					Total Management	$109,111	$75,539	$125,539	$75,539	$75,539	$125,539	$586,806	
				PROJECT TOTAL		$1,239,584	$3,700,860	$2,027,060	$1,960,060	$1,905,061	$1,490,311	$12,322,936	

Summary of Funds:

	Amount Year 1	Amount Year 2	Amount Year 3	Amount Year 4	Amount Year 5	Amount Year 6	Total
GEF	$1,239,584	$3,700,860	$2,027,060	$1,960,060	$1,905,061	$1,490,311	$12,322,936
Co-financing	$10,282,575	$32,107,705	$16,356,435	$15,472,300	$12,302,500	$3,478,485	$90,000,000
TOTAL	$11,522,159	$35,808,565	$18,383,495	$17,432,360	$14,207,561	$4,968,796	$102,322,936

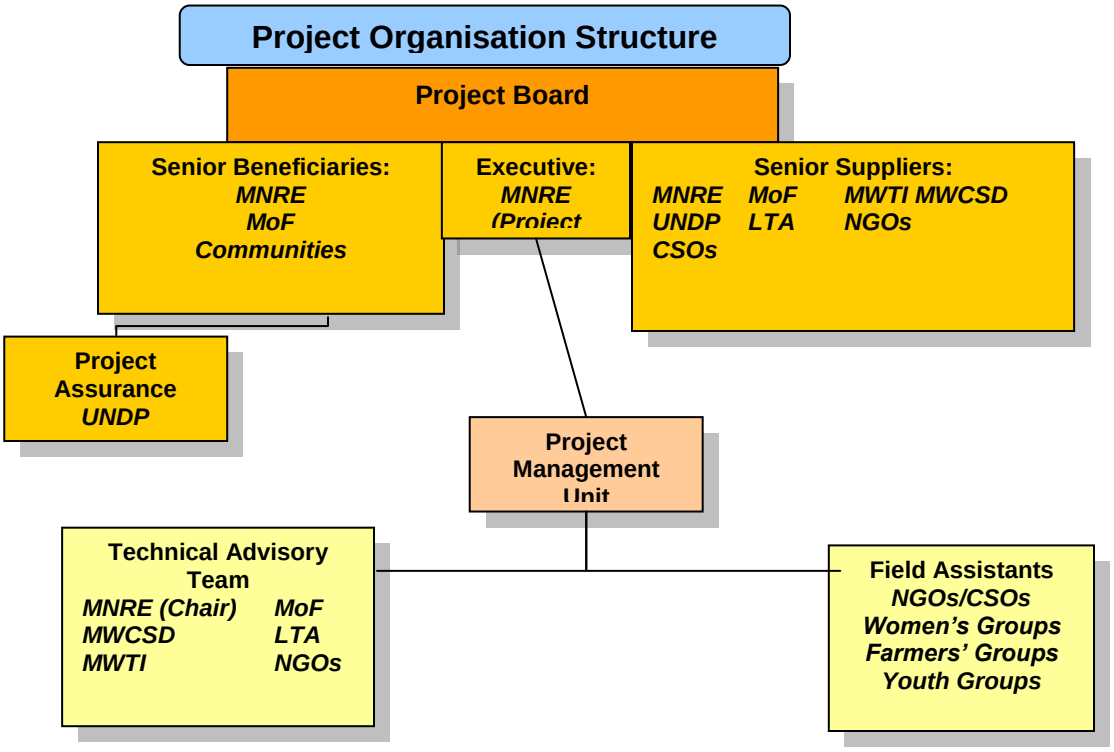
Budget Note	Description of cost item
1.1a	- Local TA to mainstream CCA/DRM into national SDS and relevant sector plans. 20 months @ $5,000 per month. - Local TA to develop National Adaptation Strategy. 10 months @ $5,300 per month. - Local TA to conduct capacity assessments of MNRE and MoF. 4 months @ $5,350 per month.
1.1b	- Workshops for National Adaptation Strategy. 6 workshops @ $5,000 per workshop. - Workshops for strengthening CCA coordination. 10 workshops @ $5,000 per workshop.
1.1c	Printing and publishing National Adaptation Strategy. 100 reports @ $100 per report.
1.1d	- Local TA to MNRE Climate Change Unit for stocktaking and coordinating current/planned CCA initiatives. 4 years @ $50,000 per year. - Principal Climate Change Policy Officer. 6 years @ $25,000 per year. - Senior Knowledge Management and Communications Officer. 6 years @ $15,909 per year. - Climate Change Unit Administration Officer. 6 years @ $11,364 per year.

1.2a	- Local TA to refine CPEIR methodology and streamline into MOF planning and budgetary processes. 8 months @ $5,000 per month. - Local TA to develop guidelines for communities on financial management of CCA/DRM projects. 2 months @ $5,000 per month.
1.2b	- Workshops for CPEIR refinement. 2 workshops @ $2,500 per workshop. - Training workshops for communities on managing finances for CC projects. 10 workshops @ $3,000 per workshop.
1.2c	Produce bi-annual CPEIR style report to analyse climate expenditure. 3 reports @ $5,000 per report.
2.1a	International TA to develop Integrated Watershed management plan for Greater Apia Area (see Annexes 6, 8 and 9). This will comprise a team of specialists with *inter alia* the following competencies: i) hydro-geology; ii) climate change adaptation; iii) drainage and flood control; iv) GIS; and v) environment/natural resources. 4 months @ $50,000 per month.
2.1b	- Services procured to undertake feasibility studies, design, cost benefit analysis, EIA, SIA (see Annexes 6, 8 and 9). This will comprise a team of specialists with *inter alia* the following competencies: i) hydro-geology; ii) drainage and flood control; iii) GIS; iv) environmental engineering; v) economics; vi) town planning; and vii) structural/design engineering. 16 months @ $50,000 per month. - Engineering services to design & supervise flood protection infrastructure. This will comprise a team of specialists with *inter alia* the following competencies: i) hydro-geology; ii) drainage and flood control; iii) GIS; iv) environmental engineering; v) economics; vi) town planning; and vii) structural/design engineering. 12 months @ $50,000 per month. (Total $1,400,000) - Implement ecosystem based approach. Based on indicative costs of: • Community consultations for 5 years @ $21,000 per year. • Community information/awareness raising activities for 5 years @ $20,000 per year. • Establishing 3 community nurseries @ $15,000 per nursery. • Maintaining 3 community nurseries for 5 years @ $5,000 per year. • Procurement of equipment for land preparation and rehabilitation @ $35,000. • Operation/maintenance of equipment for land preparation and rehabilitation for 5 years @ $5,000 per year. • Monitoring and enforcement of ecosystem-based approaches for 5 years @ $10,000 per year. • Training of staff on techniques for ecosystem-based approaches @ $10,000 • Preparation of land and implementation of ecosystem-based approaches in 5 watersheds for 5 years @ $40,000 per watershed per year. (Total $1,395,000)
2.1c	- Construction of flood protection infrastructure. Based on indicative costs as described below (for further references, see Annex 6): • 1 km of riverbank stabilisation @ $3,000 per metre. • 25,000 m^3 of retention ponds/check dams @ $37 per m^3. • 3.6 km of diversion channels @ $280 per metre. - Reconstruct community assets. Based on indicative costs of: • Reconstruction of 40 climate-resilient houses @ $35,000 per house. • Climate-proofing of sanitation services to 90 households @ $1,549.91 per household. • Development and protection of 5 drinking water sources @ $6,000 per water source.
2.1d	- Local TA to develop value chains for selected agricultural products. 4 months @ $5,000 per month. - Local TA to develop value chains for selected handicrafts. 4 months @ $5,000 per month.
2.1e	- Delivery of trainings for selected agricultural products. 10 trainings @ $500 per training. - Delivery of trainings for selected handicrafts. 10 trainings @ $500 per training.
2.1f	Provision of planting materials and household processing facilities. Indicative costs are described below. - Open-pollinated seeds: $25,000.

	- Materials for composting: $23,000. - Small farming equipment (hoes, spades, digging forks, mattocks, compost spreaders): 300 households @ $540 per household. - Household fruit driers: 300 driers @ $500 per drier. - Sewing machines: 300 machines @ $300 per machine.
2.2a	- Household-based village surveys. 100 surveys @ $1,000 per survey. - Analysis of household-based village surveys. 100 surveys @ $1,000 per survey.
2.2b	- Development and implementation of Disaster Management Plans. 100 plans @ $2,000 per plan. - Training for Disaster Management Plans. 100 villages @ $1,000 per village.
3.1a	- TA to develop protocols & pilot plan for data storage. 8 months @ $5,000 per month. - TA to establish national CCA M&E systems and develop standardised CCA reporting system. 10 months @ $6,000 per month.
3.1b	- Workshops for data storage development. 3 workshops @ $5,000 per workshop. - Workshops for M&E systems. 3 workshops @ $5,000 per workshop.
3.1c	Develop and procure equipment & software for centralised database. 8 computers with associated software @ $20,000 per computer.
3.1d	Awareness campaigns for R2R approach. 12 campaigns @ $5,000 per campaign.
PM.1	Project Manager (Project Management Unit). 6 years @ $25,000 per year. Finance and Procurement Officer (part of Project Management Unit). 6 years @ $25,000 per year.
PM.2	Annual audit. 6 audits @ $20,539 per audit.
PM.3	Office Equipment. 4 computers @ $3,000 per computer
PM.4	Office operating consumables for GEF division. 6 years @ $5,000 per year.
PM.5	- Inception Workshop. 1 workshop @ $10,000. - Midterm community consultations for M&E experimental design. $10,000. - Endline community consultations for M&E experimental design. $10,000.
PM.6	- Development of M&E experimental design. $11,572 - Mid-Term Review. 1 MTR @ $40,000. - Final Evaluation. 1 FE @ $40,000.

5. Management Arrangements

The project will be executed according to UNDP's National Implementation Modality (NIM) as per NIM guidelines agree by UNDP and the Government of Samoa.



201. **Implementing Partner (IP).** At the national level, the Ministry of Natural Resources and Environment (MNRE) will act as the Implementing Partner (Project Executive) of the project. Based on the standard NIM procedures, MNRE will be responsible for the overall project and reporting to UNDP Multi- Country Office in Samoa. MNRE will establish a Project Management Unit (PMU) in Apia with a full time Project Manager and other core project staff. The Project Executive (MNRE) will appoint the CEO of MNRE as Project Director (PD), given the strategic importance of the project. The PD will be supported by the Deputy Project Director (the ACEO of MNRE) and the National Project Manager within the PMU.

202. **Responsible Party (RP).** MNRE will designate the following responsible parties: MoF for Outcome 1.1 and 1.2; LTA, MWCSD, MWTI, and NGOs for Outcome 2.1; and DMO for Outcome 2.2.As implementing partner, MNRE has general responsibility for organizing and overseeing all phases of the project as well as for coordinating all other responsible parties involved. Additionally, a range of public and private entities will contribute to specific activities. The roles and responsibilities outlined below will be further guided by capacity assessments of the implementing partners conducted under Output 1.1.2.

203. MNRE responsibilities for the first component of the project involve improving integration of climate in ongoing national policy, strategy and institutional strengthening endeavours. These are largely shared with MoF and focus on: i) better addressing adaptation in the sector plans, the new Strategy for the Development of Samoa, and the National Adaptation Strategy; and ii) developing a more complete

inventory of all ongoing and projected adaptation work – along with mechanisms for maintaining this – and improved national coordination and planning for adaptation.

204. MoF's responsibilities for the first component involve: i) developing detailed guidelines for CRICU functions (for accounting, budgetary and fiscal mainstreaming of climate change initiatives); ii) facilitating development of guidelines for communities on financial management of projects that incorporate CCA and DRR/DRM; iii) developing guidelines/toolkits for preparation of a bi-annual CPEIR-style report on climate change expenditure; and iv) producing these bi-annual reports as a means to harmonizing government agencies' analysis of climate expenditure.

205. MNRE responsibilities for the second component of the project involve activities aimed at protection of communities' physical assets and livelihoods against climate change and disaster. These responsibilities include the development of Integrated Watershed Management Plan for the Greater Apia area as well as the design and implementation of ecosystem-based approaches to watershed management and flood mitigation. Other responsibilities are shared with LTA for developing flood protection measures (such as feasibility studies, climate resilient designs, cost-benefit analyses and Environmental Impact Assessments, for example) and building flood protection infrastructure. The last activities under this component MNRE will carry out primarily with MWCSD and these involve research on climate and disaster vulnerable populations and the development and implementation of Village Disaster Management Plans.

206. Finally, MNRE responsibilities related to the project's third component include: i) improving CC and DRM/DRR knowledge management throughout the country; and ii) establishing a CCA M&E system to better institutional coordination and intervention effectiveness. The first involves development and implementation of a national CC/DRM/DRR centralized database along with protocols for updating and maintaining this, along with general public awareness campaigns on CCA and DRM. The second, a responsibility with MoF, involves the review of current M&E systems and the design and implementation of a national M&E framework for CCA and DRM, along with the appropriate protocols for updating and maintaining this new M&E system.

207. *Audit arrangements*: Audits will be conducted in accordance with the UNDP NIM Audit policies and procedures, and based on UN Harmonized Approach to Cash Transfer (HACT) policy framework. Annual audit of the financial statements relating to the status of UNDP (including GEF) funds will be undertaken according to the established procedures set out in the Programming and Finance manuals. The Audit will be conducted by a special and certified audit firm. UNDP will be responsible for making audit arrangements for the project in communication with the Project Implementing Partner. UNDP and the project Implementing Partner will provide audit management responses and the Project Manager and Project Management Unit (PMU) will address audit recommendations.

208. **Project Board** is responsible for making management decisions for a project in particular when guidance is required by the Project Manager. The Project Board plays a critical role in project monitoring and evaluations by quality assuring these processes and products, and using evaluations for performance improvement, accountability and learning. It oversees that required resources are committed and arbitrates on any conflicts within the project or negotiates a solution to any problems with external bodies. In addition, it approves the appointment and responsibilities of the Project Manager and any delegation of its Project Assurance responsibilities. Based on the approved Annual WorkPlan, the Project Board can also consider and approve the quarterly plans (if applicable) and also approve any essential deviations from the original plans.

209. In order to ensure UNDP's ultimate accountability for the project results, Project Board decisions will be made in accordance to standards that shall ensure management for development results, best value money, fairness, integrity, transparency and effective international competition. In case consensus cannot be reached within the Board, the final decision shall rest with the UNDP Project Manager.

210. Potential members of the Project Board are reviewed and recommended for approval during the PAC meeting. Representatives of other stakeholders can be included in the Board as appropriate. The Board contains three distinct roles, including:

1) **An Executive**: individual representing the project ownership to chair the group. The Executive is MNRE: The Project Director (CEO of MNRE), assisted by the Project Manager will report to the Board on project progress. The Deputy Project Director (ACEO MNRE) will be responsible for coordinating the flow of results and knowledge from the project to the Board.
2) **Senior Suppliers**: This group represents the interests of the parties concerned which provide technical expertise to the project. The Senior Supplier's primary function within the Board is to provide guidance regarding the technical feasibility of the project: i) Make sure progress towards the outputs remains consistent from the supplier perspective; ii) promote and maintain focus on the expected project outputs from the point of vide of supplier management; iii) ensure that supplier resources required for the project are made available; iv) contribute supplier opinions on project board decisions on whether to implement recommendations on proposed changes; v) arbitrate on, and ensure resolution of, any supplier priority or resource conflicts. Suppliers should also advise on the selection of strategy, design and methods to carry out project activities; ensure that any standards defined for the project are met and used to good effect; monitor potential changes and their impact on the quality of deliverables from a supplier perspective; monitor any risks in the implementation aspects of the project. These senior suppliers are: **UNDP, MNRE, MoF, LTA, MWTI, MWCSD, NGOs/CSOs**
3) **Senior Beneficiary**: individual or group of individuals representing the interests of those who will ultimately benefit from the project. The Senior Beneficiary's primary function within the Board is to ensure the realisation of project results from the perspective of project beneficiaries. This role includes: i) ensuring the expected output and related activities of the project are well defined; ii) ensuring progress towards the outputs required by the beneficiaries remains consistent from beneficiaries; iii) promote and maintain focus on the expected project outputs; iv) prioritise and contribute beneficiaries' opinions on Project Board decisions on whether to implement recommendations on proposed changes; v) resolve priority conflicts.
   - MNRE, MoF and targeted communities' authorities
4) The **Project Assurance** role supports the Project Board Executive by carrying out objective and independent project oversight and monitoring functions. The Project Manager and Project Assurance roles should never be held by the same individual for the same project.
   - UNDP

211. **Project Manager**: The Project Manager has the authority to run the project on a day-to-day basis on behalf of the Implementing Partner within the constraints laid down by the Board. The Project Manager's prime responsibility is to ensure that the project produces the results specified in the project document, to the required standard of quality and within the specified constraints of time and cost.

212. **Finance and Procurement Officer**: The Finance and Procurement Officer has the responsibility to see to the running of the project's finance. In addition, this officer is responsible for procurement of supplies, goods and materials for the project as well as the recruitment of project staff and technical assistance according to the budget and workplan. This officer will also see to it that the annual audit is conducted.

213. The **Technical Advisory Team (TAT)** consists of technical level staff from all Ministries and NGOs, represented on the Project Board.

6. Monitoring Framework and Evaluation

214. The project will be monitored through the following M&E activities. The M&E budget is provided in the table below.

Project start

215. A Project Inception Workshop will be held within the first 2 months of project start with those with assigned roles in the project organisation structure, UNDP country office and where appropriate/feasible

regional technical policy and programme advisors as well as other stakeholders. The Inception Workshop is crucial to building ownership for the project results and to plan the first year annual work plan.

216. The Inception Workshop should address a number of key issues including:

a) Assist all partners to fully understand and take ownership of the project. Detail the roles, support services and complementary responsibilities of UNDP CO and RCU staff vis à vis the project team. Discuss the roles, functions, and responsibilities within the project's decision-making structures, including reporting and communication lines, and conflict resolution mechanisms. The Terms of Reference for project staff will be discussed again as needed.
b) Based on the project results framework and the relevant LDCF Tracking Tool if appropriate, finalise the first annual work plan. Review and agree on the indicators, targets and their means of verification, and recheck assumptions and risks.
c) Provide a detailed overview of reporting, monitoring and evaluation (M&E) requirements. The Monitoring and Evaluation work plan and budget should be agreed and scheduled.
d) Discuss financial reporting procedures and obligations, and arrangements for annual audit.
e) Plan and schedule Project Board meetings. Roles and responsibilities of all project organisation structures should be clarified and meetings planned. The first Project Board meeting should be held within the first 12 months following the inception workshop.

217. An Inception Workshop report is a key reference document and must be prepared and shared with participants to formalise various agreements and plans decided during the meeting.

Quarterly

- Progress made shall be monitored in the UNDP Enhanced Results Based Management Platform.
- Based on the initial risk analysis submitted, the risk log shall be regularly updated in ATLAS. Risks become critical when the impact and probability are high. Note that for UNDP GEF projects, all financial risks associated with financial instruments such as revolving funds, microfinance schemes, or capitalisation of ESCOs are automatically classified as critical on the basis of their innovative nature (high impact and uncertainty due to no previous experience justifies classification as critical).
- Based on the information recorded in Atlas, a Project Progress Reports (PPR) can be generated in the Executive Snapshot.
- Other ATLAS logs can be used to monitor issues, lessons learned etc...The use of these functions is a key indicator in the UNDP Executive Balanced Scorecard.

Annually

- Annual Project Review/Project Implementation Reports (APR/PIR): This key report is prepared to monitor progress made since project start and in particular for the previous reporting period (30 June to 1 July).The APR/PIR combines both UNDP and SOF (e.g. GEF) reporting requirements.

218. The APR/PIR includes, but is not limited to, reporting on the following:

- Progress made toward project objective and project outcomes - each with indicators, baseline data and end-of-project targets (cumulative)
- Project outputs delivered per project outcome (annual).
- Lesson learned/good practice.
- AWP and other expenditure reports
- Risk and adaptive management
- ATLAS QPR
- Portfolio level indicators (i.e. GEF focal area tracking tools) are used by most focal areas on an annual basis as well.

6.1 Experimental design for M&E

219. The project will use experimental design principles to assess the project impacts on targeted groups under Outcome 2.1, focusing on the micro-enterprises developed under Output 2.1.3. The experimental design will follow a randomised control trial approach (please see Annex 15 for a more detailed description). During the household surveys conducted as part of the VDRMPs, households will be identified for tracking during project implementation. Households participating in the activities for promoting crop and handicraft value chains will be compared to households that are not involved in the value chains over the course of the project lifespan to determine benefits attributable to project interventions.

220. The primary goal of the intervention is to improve household welfare in order to build resilience to climate-induced disasters. This is based on the hypothesis that the technical training and involvement in sustainable value chains will lead to improved enterprise outcomes, allowing participants to invest in household welfare. This is likely to include: i) re-investment in ongoing production; ii) improved health; iii) investment in education; iv) increased savings; and v) investment in household and/or enterprise assets.

221. The household surveys will form the baseline assessment, i.e. before any project activities take place. This survey will collect important demographic and socio-economic data including outcome variables of interest such as income, child and family health indicators, enterprise profits and asset holdings. During the Mid-Term Review of the project, these data will again be collected and evaluated to inform ongoing adaptive management of project activities. During the Final Terminal Evaluation, an endline survey will be conducted. This will allow evaluators to estimate the impact that the project interventions had on the target groups.

222. The indicators that will be measured to track project benefits for these groups are described below.
- Change in income generation for households or individuals participating in project interventions for promoting diversified livelihoods (e.g. % increase of per capita income).
- Uptake of agricultural and handicraft practices introduced by project (e.g. % of targeted population sustaining practices).
- Investment of income from diversified livelihood practices into households or community assets (e.g. total US$ investment).
- Re-investment of income from diversified livelihood practices into households or community (e.g. total US$ re-invested into micro-enterprise).
- Improved health as a result of spending on health care, sanitation, hygiene etc. (e.g. reduced illness, total US$ spent on health care, sanitation, hygiene).
- Investment into education (e.g. additional qualifications, short courses or other type of training attended).
- Increased savings (e.g. total US$ saved)

Periodic Monitoring through site visits

223. UNDP CO and the UNDP RCU will conduct visits to project sites based on the agreed schedule in the project's Inception Report/Annual Work Plan to assess first hand project progress. Other members of the Project Board may also join these visits. A Field Visit Report/BTOR will be prepared by the CO and UNDP RCU and will be circulated no less than one month after the visit to the project team and Project Board members.

Mid-term of project cycle

224. The project will undergo an independent Mid-Term Evaluation at the mid-point of project implementation (insert date).The Mid-Term Evaluation will determine progress being made toward the achievement of outcomes and will identify course correction if needed. It will focus on the effectiveness, efficiency and timeliness of project implementation; will highlight issues requiring decisions and actions; and will present initial lessons learned about project design, implementation and management. Findings of this review will be incorporated as recommendations for enhanced implementation during the final half of the project's

term. The organisation, terms of reference and timing of the mid-term evaluation will be decided after consultation between the parties to the project document. The Terms of Reference for this Mid-term evaluation will be prepared by the UNDP CO based on guidance from the Regional Coordinating Unit and UNDP-EEG. The management response and the evaluation will be uploaded to UNDP corporate systems, in particular the UNDP Evaluation Office Evaluation Resource Centre (ERC).

225. The relevant SOF (GEF) Focal Area Tracking Tools will also be completed during the mid-term evaluation cycle.

End of Project

226. An independent Final Terminal Evaluation will take place three months prior to the final Project Board meeting and will be undertaken in accordance with UNDP and SOF (e.g. GEF) guidance. The final evaluation will focus on the delivery of the project's results as initially planned (and as corrected after the mid-term evaluation, if any such correction took place).The final evaluation will look at impact and sustainability of results, including the contribution to capacity development and the achievement of global environmental benefits/goals. The Terms of Reference for this evaluation will be prepared by the UNDP CO based on guidance from the Regional Coordinating Unit and UNDP-GEF.

227. The Final Terminal Evaluation should also provide recommendations for follow-up activities and requires a management response which should be uploaded to PIMS and to the UNDP Evaluation Office Evaluation Resource Centre (ERC).

228. The relevant SOF (e.g GEF) Focal Area Tracking Tools will also be completed during the final evaluation.

229. During the last three months, the project team will prepare the Project Terminal Report. This comprehensive report will summarise the results achieved (objectives, outcomes, outputs), lessons learned, problems met and areas where results may not have been achieved. It will also lay out recommendations for any further steps that may need to be taken to ensure sustainability and replicability of the project's results.

Learning and knowledge sharing

230. Results from the project will be disseminated within and beyond the project intervention zone through existing information sharing networks and forums, particularly through the regional "Ridge-to-Reef" programme.

231. The project will identify and participate, as relevant and appropriate, in scientific, policy-based and/or any other networks, which may be of benefit to project implementation though lessons learned. The project will identify, analyse, and share lessons learned that might be beneficial in the design and implementation of similar future projects.

232. Finally, there will be a two-way flow of information between this project and other projects of a similar focus.

6.2 Communications and visibility requirements

233. Full compliance is required with UNDP's Branding Guidelines. These can be accessed at https://intranet.undp.org/country/rbap/in/intra/Programme/Communications/Shared%20Documents/UNDP%20Branding%20Guidelines%202013/Graphic%20Standards%20Guidelines%20for%20Publishing/UNDPGS_2011_final.pdf. Amongst other things, these guidelines describe when and how the UNDP logo needs to be used, as well as how the logos of donors to UNDP projects needs to be used. For the avoidance of any doubt, when logo use is required, the UNDP logo needs to be used alongside the GEF logo. The GEF logo can be accessed at: http://www.thegef.org/gef/GEF_logo.

234. Full compliance is also required with the GEF's Communication and Visibility Guidelines (the "GEF Guidelines").The GEF Guidelines can be accessed at: http://www.thegef.org/gef/sites/thegef.org/files/documents/C.40.08_Branding_the_GEF%20final_0.pdf.A mongst other things, the GEF Guidelines describe when and how the GEF logo needs to be used in project publications, vehicles, supplies and other project equipment. The GEF Guidelines also describe other GEF promotional requirements regarding press releases, press conferences, press visits, visits by Government officials, productions and other promotional items.

235. Where other agencies and project partners have provided support through co-financing, their branding policies and requirements should be similarly applied.

6.3 M& E workplan and budget

Type of M&E activity	Responsible Parties	Budget US$ Excluding project team staff time	Time frame
Inception Workshop and Report	▪ Project Manager ▪ UNDP CO, UNDP CCA	Indicative cost:10,000	Within first two months of project start up
Initial development of M&E following experimental design	▪ Project Manager ▪ UNDP CO, UNDP CCA	Indicative cost:11,572	Within first 6 months of project start up
Measurement of Means of Verification of project results.	▪ UNDP CCA RTA/Project Manager will oversee the hiring of specific studies and institutions, and delegate responsibilities to relevant team members.	To be finalised in Inception Phase and Workshop.	Start, mid and end of project (during evaluation cycle) and annually when required.
Measurement of Means of Verification for Project Progress on *output and implementation*	▪ Oversight by Project Manager ▪ Project team	To be determined as part of the Annual Work Plan's preparation.	Annually prior to ARR/PIR and to the definition of annual work plans
ARR/PIR	▪ Project manager and team ▪ UNDP CO ▪ UNDP RTA ▪ UNDP EEG	None	Annually
Periodic status/progress reports	▪ Project manager and team	None	Quarterly
Mid-term Evaluation	▪ Project manager and team ▪ UNDP CO ▪ UNDP RCU ▪ External Consultants (i.e. evaluation team)	Indicative cost:40,000	At the mid-point of project implementation.
Community consultations at mid-term for M&E experimental design	▪ Project manager and team, ▪ UNDP CO ▪ UNDP RCU ▪ External Consultants (i.e. evaluation team)	Indicative cost:10,000	At the mid-point of project implementation.
Final Evaluation	▪ Project manager and team, ▪ UNDP CO ▪ UNDP RCU ▪ External Consultants (i.e. evaluation team)	Indicative cost :40,000	At least three months before the end of project implementation
Community consultations at endline for M&E experimental design	▪ Project manager and team, ▪ UNDP CO ▪ UNDP RCU ▪ External Consultants (i.e. evaluation team)	Indicative cost:10,000	At least three months before the end of project implementation
Project Terminal Report	▪ Project manager and team ▪ UNDP CO ▪ local consultant	0	At least three months before the end of the project
Audit	▪ UNDP CO	$20,539	Yearly

Type of M&E activity	Responsible Parties	Budget US$ Excluding project team staff time	Time frame
	▪ Project manager and team		
Visits to field sites	▪ UNDP CO ▪ UNDP RCU (as appropriate) ▪ Government representatives	For GEF supported projects, paid from IA fees and operational budget	Yearly
TOTAL indicative COST Excluding project team staff time and UNDP staff and travel expenses		US$ 244,806	

7. Legal Context

236. This document together with the UNDAF Action Plan, signed by the Government and UNDP through the UNDAF Country Result Matrix, which is incorporated herein by reference, constitute together a Project Document as referred to in the Standard Basic Assistance Agreement (SBAA); as such all provisions of the UNDAF Action Plan apply to this document. All references in the SBAA to "Executing Agency" shall be deemed to refer to "Implementing Partner", as such term is defined and used in the UNDAF Action Plan and this document.

237. Consistent with the Article III of the Standard Basic Assistance Agreement, the responsibility for the safety and security of the implementing partner and its personnel and property, and of UNDP's property in the implementing partner's custody, rests with the implementing partner.

238. The implementing partner shall:
   a) put in place an appropriate security plan and maintain the security plan, taking into account the security situation in the country where the project is being carried;
   b) assume all risks and liabilities related to the implementing partner's security, and the full implementation of the security plan.

239. UNDP reserves the right to verify whether such a plan is in place, and to suggest modifications to the plan when necessary. Failure to maintain and implement an appropriate security plan as required hereunder shall be deemed a breach of this agreement.

240. The implementing partner agrees to undertake all reasonable efforts to ensure that none of the UNDP funds received pursuant to the Project Document are used to provide support to individuals or entities associated with terrorism and that the recipients of any amounts provided by UNDP hereunder do not appear on the list maintained by the Security Council Committee established pursuant to resolution 1267 (1999). The list can be accessed via http://www.un.org/sc/committees/1267/aq_sanctions_list.shtml. This provision must be included in all sub-contracts or sub-agreements entered into under this Project Document.

241. This project will be implemented by the Ministry of Natural Resources and Environment ("Implementing Partner") in accordance with its financial regulations, rules, practices and procedures only to the extent that they do not contravene the principles of the Financial Regulations and Rules of UNDP. Where the financial governance of an Implementing Partner does not provide the required guidance to ensure best value for money, fairness, integrity, transparency, and effective international competition, the financial governance of UNDP shall apply.

List of Annexes

Annex 1: Signature Page

Country: Samoa

Project Title: ***Economy-wide integration of climate change adaptation and disaster risk management to reduce climate vulnerability of communities in Samoa.***

UNDAF Outcome:

Outcome 1.1. By 2017 the most vulnerable communities across the PICTs are more resilient and select government agencies, civil society organizations and communities have enhanced capacity to apply integrated approaches to environmental management, climate change adaptation/mitigation, and disaster risk management.

UNDP Strategic Plan Outcome:

Outcome 5. Countries are able to reduce the likelihood of conflict, and lower the risk of natural disasters, including from climate change.

UNDAF Results Matrix:

Output 3.1.2. Strengthened national capacity to develop and upgrade the national environmental policy and the implementation of relevant gender and climate change policy responses.

Output 3.2.2. Strengthened capacity support for community disaster risk reduction and school-based DRM.
Output 3.2.4. Strengthened government and UN planning and coordination of humanitarian responses, including post disaster employment and livelihood options for women and men.
Output 3.2.7. Improve monitoring of climate change through centralised collection of data.

Implementing Agency: United Nations Development Programme (UNDP)

Executing Agency/Implementing Entity: Ministry of Natural Resources and Environment (MNRE)

Responsible Parties: Ministry of Finance, Ministry of Women, Communities and Social Development; Land Transport Authority

Programme Period:	72 Months
Atlas Award ID:	00079044
Project ID:	00089160
PIMS #	5264
Start date:	August 2014
End Date	July 2019
Management Arrangements	DIM
PAC Meeting Date	15 August 2014 (Tentative date)

Total resources required	102,322,936
Total allocated resources:	102,322,936
• Regular	12,322,936
• Other:	
○ GEF	12,322,936
In-kind contributions	90,000,000

Agreed by (Government):

NAME SIGNATURE Date/Month/Year

Agreed by (Executing Entity/Implementing Partner):

NAME SIGNATURE Date/Month/Year

Agreed by (UNDP):

NAME SIGNATURE Date/Month/year

Economy-wide integration of CC Adaptation and DRM/DRR to reduce climate vulnerability of communities in Samoa

INCEPTION REPORT

Dirk Snyman, Bapon Fakhruddin, Ana Laqeretabua, Nadia Meredith-Hunt, Eduardo Quiroga and Nanette Svenson

November 2013

1 Introduction

The Inception Mission for the GEF-UNDP project titled “Economy-Wide Integration of CC Adaptation and DRM/DRR to Reduce Climate Vulnerability of Communities in Samoa” was undertaken from 30 September - 11 October 2013. This mission formed part of the Project Preparation Grant (PPG) phase to support the UNDP Samoa Country Office with the design of a climate change adaptation and disaster risk management information to be financed by the LDCF. An Inception Workshop was held on 04 October 2013. In addition, bilateral consultations involving key stakeholders were held during the course of the Inception Mission. The primary tasks of the Inception Workshop and stakeholder consultations were to: i) ensure that all relevant stakeholders were aware of the nature of the proposed LDCF project; ii) map the current institutional landscape for climate change adaptation and disaster risk management in Samoa; and iii) solicit information on the status quo to guide the project design.

A follow up mission is planned for November 2013 during which the logframe, baseline analysis and budget will be finalised. This will lead to the development of a zero draft of the UNDP project document in December 2013

2 Participants in Inception Mission

The PPG design team consists of the following members:

- Dirk Snyman – Project Development Specialist;
- Bapon Fakhruddin – Infrastructure Specialist;
- Ana Laqeretabua – Social, Cultural and Gender Specialist;
- Nadia Meredith-Hunt – Climate Change Adaptation Specialist;
- Eduardo Quiroga – Environmental Economist; and
- Nanette Svenson – Capacity Assessment Specialist.

In addition, the following UNDP personnel participated in the Inception Mission:

- Claudia Ortiz – Regional Technical Specialist (Bangkok Office); and
- Marta Moneo – Climate Change Specialist (UNDP Country Office, Samoa).

3 Initial activities, workshop and consultations

Individual stakeholder consultations took place with representatives from the following institutions: i) government ministries/departments; ii) various NGOs; iii) donor agencies; and iv) private sector. The purpose of these meetings was to: i) inform the relevant institutions of the nature and scope of the proposed LDCF project; ii) understand the role of the various actors; and iii) elicit ideas on concerns that should be considered and factored into the LDCF project during the design phase. These consultations were important to inform the LDCF project design to ensure coordination with other ongoing and planned initiatives, while avoiding overlap and duplication of activities.

An Inception Workshop (IW) was held on 04 October 2013 in the MNRE Conference Room of the TATTE Building in Apia (see Annex 1: Inception Workshop Agenda). The purpose of the IW was to engage with stakeholders involved in activities related to climate change adaptation and disaster risk management in Samoa. The IW was important to: i) ensure that all relevant stakeholders were aware of how the proposed LDCF project will mobilise resource to advance climate change adaptation and disaster risk management; and ii) solicit stakeholder input to inform project design.

3.1 Inception Workshop

The Hon. Taulealeausumai Malua (CEO: MNRE) officially opened the IW. A brief address was also made by Mr Anthony Wood (Deputy Resident Representative: UNDP). A presentation by Ms Claudia Ortiz outlined the LDCF eligibility criteria and alignment of the project with GEF-LDCF priorities. Mr Dirk Snyman then provided an overview of the project rationale and strategy, including proposed components, outcomes and outputs. Presentations were then given by other members of the PPG team on: i) infrastructure and gender considerations in climate change adaptation and disaster risk management (Mr Fakhruddin and Ms Laqeretabua); ii) capacity building and economic considerations in climate change adaptation and disaster risk management (Drs Quiroga and Svenson); and iii) international developments in disaster risk management (Mr Timothy Wilcox, Sub-Regional Coordinator Pacific: UNISDR).

After the presentations, three thematic working groups were formed in order to discuss specific aspects of the project. The three themes were: i) policy and coordination; ii) communities and livelihoods; and iii) monitoring and evaluation. During these working groups, participating stakeholders were requested to provide insights on: i) current activities; ii) gaps to be addressed; and iii) possible solutions to address these gaps. A summary of the working group findings is provided below.

Working Group: Policy & Coordination

Current activities

- Within Samoa's fifteen sectors, twelve sectors have completed sectoral plans and a further two have draft plans (Transport and Communication). The Construction sector has yet to formulate its sectoral plan.
- Existing plans and activities to address climate change adaptation and disaster risk management include *inter alia*: i) community disaster recovery plans; ii) watershed management plans; iii) coastal infrastructure management plans; iv) NAPA projects; v) climate change adaptation strategies for Tourism, Health and Agriculture; and vi) community development plans. At present, MWCSD sustains village-levels programmes while MAF has a focus on livelihoods (especially in rural areas).

Gaps

- A proliferation of plans – along with limited coordination between these plans – has led to the need to harmonise planning processes within the country. Furthermore there is a need identify those sector plans which do not currently include climate change adaptation and disaster risk management considerations.

- There is a need to improve access to and mobilisation of resources for climate change adaptation. In addition, it is necessary to clearly identify the additional costs of adaptation to build resilience into Business as Usual activities.
- There is limited capacity for implementation of climate change adaptation activities. In addition, there is a gap between modalities of implementation, i.e. between national- and community-level activities.
- There is no sustained source of funding for capacity building of CSOs.
- While the importance of monitoring and evaluation is recognised, current systems are not able to track the success of adaptation interventions.

Possible solutions

- A database of all plans would allow for improved coordination of adaptation activities.
- Core funding for CSOs would provide them with more sustainability and allow them to provide greater support to local communities.
- Hard solutions for climate change adaptation – such climate-smart infrastructure and "building back better" – would safeguard Samoa's built infrastructure against the expected effects of climate change.
- Soft solutions for climate change adaptation – such as compensation for relocations and training/capacity building – would enhance the climate resilience of communities and their livelihoods.
- Development of human resources – especially M&E personnel – and technologies would provide Samoa with more options for implementing and sustaining interventions for climate change adaptation.

Working Group: Communities & Livelihoods

Current activities

- The Strategy for the Development of Samoa (SDS) 2012-2016 and Aid Coordination Division of MoF provide a framework of delivery of adaptation benefits to local communities.
- Watershed Management Plans and Coastal Infrastructure Management Plans are intended to develop interventions to build climate resilience of communities and their livelihood assets. This includes relocation of community assets outside of hazard zones.
- Community Development Sector Plans and the Pilot Programme for Climate Resilience have focussed on adaptation options for local communities, livelihoods and infrastructure.
- Village Sustainable Development Plans have been prepared in selected demonstration sites.
- The Disaster Management Programme has developed some plans for disaster risk reduction and response. The Australian Red Cross has provided funding for some vulnerable villages to be covered under Village Disaster Management Plans, including household surveys of vulnerability and evacuation plans. However, these plans do not include all villages in the country. Consequently, many villages are still at risk.
- A micro-financing project for school canteens provides healthy meals for school-going children. The Family/Village Well-being programme also builds awareness on health care.

- Some aspects of climate change are being integrated into: i) the Trade, Commerce and Manufacturing Sector Plan; and ii) various renewable energy projects.
- LTA has implemented some rebuilding activities for infrastructure damaged during Cyclone Evan. This includes recruitment of a drainage specialist to provide technical input for more climate-resilient infrastructure.
- There is some inclusion of climate change considerations into: i) the Code of Environmental Practice; ii) on-going revisions to building codes; and iii) planning for the Energy Sector.

Gaps

- Much of the information on climate change is currently out-of-date. In addition, planning is based on outdated models for climate change prediction.
- Planning is extremely decentralised between the various agencies, resulting in poor coordination of activities. Sectoral and other lower-level plans do not link with an overarching plan/strategy for addressing climate change.
- There is little support for raising awareness of climate change amongst local communities. Information on climate change is also conceptually inaccessible as it has yet to be translated into understandable language.
- Climate change is not adequately considered in planning and implementation of activities related to: i) renewable energy; ii) communities' livelihoods; iii) improvement of standards of living in communities; and iv) waste water management and sanitation.
- There is concern with the sustainability of projects. Activities stop after project completion when funding is no longer provided.
- There is poor linkage between PPCR and GEF initiatives, even when they impact the same communities. This leads to over-consultation and inefficiencies in delivering benefits to communities.
- Large rates of turnover of valuable staff result in limited capacity for planning and implementing activities for climate change adaptation. For example, there is: i) little local capacity for drainage management; ii) a shortage of qualified field engineers; and iii) poor compliance with existing building/other codes.
- Political influence interferes with implementation of project activities.
- Monitoring and evaluation is not adequately budgeted. This prevents learning from past activities to inform new and on-going initiatives.

Possible solutions

- Improved coordination of plans and projects will allow better sequencing and prioritising of activities. This will lead to improvements in efficiency and coordination, with a resultant increase in the benefits provided to communities.
- Sufficient consultation with communities will identify priorities in a bottom-up approach to allow for needs to be addressed more directly.
- Economic empowerment of communities will allow them to implement interventions for adaptation independently. This will lead to greater ownership of community-level interventions with concomitant improvements in sustainability.
- Existing projects should be built upon to capitalise on structures and lessons learned.
- Interventions for climate change adaptation should be linked to food, water and energy security. This can be achieved by raising awareness and building

capacity of communities to improve their autonomous implementation of activities.
- Building the capacity of key agencies will allow them to continue with the implementation of interventions for climate change adaptation after project completion.

Working Group: Monitoring & Evaluation
Current activities
- Various agencies (e.g. government, donors) have a range of reporting systems.
- Most M&E currently tracks progress in activities, largely through monitoring of project expenditure.
- There is some feedback obtained through community gatherings.
- MoH has implemented a successful M&E system which could be adapted for application in other sectors.

Gaps
- There is little involvement of the media, especially through campaigns for disseminating information on the success of projects and other activities on climate change adaptation.
- Reporting systems are at present quite labour intensive.
- Reporting between different agencies is done in different manners, according to agency requirements.

Possible solutions
- Reporting systems could be harmonised between agencies. This would allow for: i) less labour intensive monitoring; ii) greater comparability of results; and iii) improved tracking of progress at a national level.
- Tracking of impacts – rather than activities – would allow some responsibility for M&E to be passed on to communities. This would reduce the burden on government personnel. In addition, this would be able to directly measure the successes and benefits of adaptation interventions. Consequently, lessons learned will be able to inform future interventions.

3.2 Initial consultations

A series of meetings was held with key stakeholders. See Annex 2 for the full agenda of the Inception Mission. The findings of the Inception Mission have been summarised according to a number of themes. These are presented below.

3.2.1 Economics
Baseline situation
Tourism is an exceptionally important sector for the national economy in terms of employment generation and foreign exchange earnings. It represents 30% of the national GDP, a significant sectoral contribution under any standards. Tourism currently provides livelihood opportunities in the transportation, catering, accommodation sub sectors. It is labour intensive industry, providing 10% of the national employment. Potentially, the knock-on effect of the tourism value chain can

go beyond the direct economic impact nationally. It can have a knock-on effect on local communities through the design of synergetic forward and backward linkages. It can induce a demand-pull in associated labour intensive activities such as agriculture and handicrafts. This in turn induces demand for financial resources which can be channelled through micro finance operations. Additionally, eco-tourism has the potential to retain the youth in the rural sector by providing livelihood opportunities. Perhaps this is the most vital benefit.

In the uplands of Savaii, nearby the village of Aopo, an eco-tourism project-idea has been identified: the Mt.Silisili Hike. It is located in the Central Savaii Rainforest which is globally unique as is the largest continuous patch of intact native forest in Samoa and tropical Polynesia. The main activities would be hiking, camping, bird watching, views.[1]

Perhaps the project's most challenging linkage to ensure synergy is with agriculture. The agricultural development experience from previous decades has shown that the development pathway has been primarily a crop-oriented process as is currently the case in Samoa. A crop-oriented process is based on the continuous advance of improved crop varieties and technologies supported by research and feedback from extension. Large landholders with access to financial resources, complemented by policies and support systems provided by government and private organisations, have been the main beneficiaries. Whereas small land holders who often are land-less and asset-less have not been able to take advantage of the economic potential of the crop-oriented process.[2]

Key stakeholders

From 09/30/13 to 10/11/13, the Consulting Team has interacted with experienced professionals from the public and private sector.[3] The meetings and discussions were carried out under the framework outlined in the PIF, particularly the indicative project framework. Concretely, from discussions with **Samoa Tourism Authority (STA)**, **SPBD Microfinance (Samoa) Ltd.**, **Samoa Chamber of Commerce & Industry**, focal group meeting on micro-business development composed of **Women in Business Development Incorporated (WIBDI)**, **Small Business Enterprise Centre (SBEC)**, **MAF** and others,[4] one project idea emerged within the framework of the National Tourism Climate Change Adaptation Strategy for Samoa 2012-2017.

The **South Pacific Business Development (SPBD)** is a promising partner for both downstream and upstream operations.[5] It could launch micro finance operations

[1] The Mt. Silisili Hike technical description is found in: "Savali – Natural Attraction Site Development Recommendations Report" prepared by the STA staff, August 2012

[2] The success of the "green revolution" was on the whole facilitated by the adoption of high-yielding varieties of rice and wheat by large land holders with capacity to invest on irrigation facilities and adequate levels of fertilisers and other chemicals. Where the technology was introduced in areas characterised by inequitable resource distribution, the impact on productivity has been weak and the pattern of inequity was reinforced. See: Ruttan, V. Induced innovation and the green revolution. In: Binswanger & Ruttan. Induced innovation. Baltimore: The John Hopkins Press, 1978; Quiroga, E.R. *Le rôle des institutions dans le processus du changement technologique: étude de cas du Salvador*.(The role of institutions in the process of technological change: case study of El Salvador) *Thése de doctorat Nouveau Règime. Mention très honorable*. *Département d'Économie et Gestion. Université de Paris VIII à Saint-Denis, France. 1996*

[3] See annex on List of Persons Met

[4] For a comprehensive list, see the annex on List of Persons Met

[5] SPBD has been operating in Samoa for some time and is financially sustainable since 2007. Its mission is to improve the quality of life of families living in poverty by providing unsecured credit, training, and ongoing

geared to market-oriented agriculture coupled with market and marketing elements. Furthermore, it is of considerable importance that SPBD has already conducted operations in life insurance policies. This area of work has the highest relevance to provide insurance against loss from natural disasters. The concept involved in insurance against loss are transferable to community-based financial mechanisms designed to provide immediate financial support after eventual natural shocks to reduce the financial burden placed on displaced families. During the Team's discussions with the management of SPBD it was agreed that the opportunities of providing this kind of insurance would be explored jointly with the Project.

3.2.2 Infrastructure

Baseline situation

Samoa is highly prone to tropical cyclone and tsunami. After the impact of tropical cyclone along the coast, the primary cause of infrastructure damage is the inundation due to storm surge and wind-induced wave action.

Limited government capacity

Although MNRE employs a considerable number of trained experts in all of its divisions, most areas lack technical expertise and equipment for more sophisticated measurement, forecasting and surveying work.

The Meteorology division of the MNRE doesn't have any infrastructure to produce coastal inundation forecasts information to its community. At present they only provide the cyclone track and landfall information. Hence, Upolu is very vulnerable to cyclone and storm surge. Additionally, meteorologist capacity is too limited to make appropriate natural hazards forecasting and prediction, such as tropical and extra-tropical cyclones, inland flooding, and severe weather events and to bridge the science and society with the goal of minimising both human and economic losses.

The water division of MNRE are enable to develop extended and performant water resource modelling because of limited discharge and stage data necessary to set up model boundary conditions. Indeed, there is few water level monitoring stations and no regular observation system in place. Additionally, the division does not have any data storing facilities at their premises.

Limited capacity of local communities:

Local community have currently little understanding and preparedness that prevents them from adapting to climate change.

Key stakeholders

U.S. Agency for International Development (USAID) supported ADAPT Asia-Pacific project to assist eligible Asian and Pacific countries in gaining improved

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motivation and guidance to help them start, grow and maintain micro-businesses, build assets, as well as, finance home improvements and childhood education. It intends to empower women through financial access and economic development to help lift themselves and their families permanently out of poverty and improve self-esteem. It has served 15 000 aspiring women micro-entrepreneurs in Upolu and Savali. It has disbursed over 41, 000 loans [US$ 22 million] and it serves 13,000 saving depositors and 6,000 life insurance policies. Source: //www.spbdmicrofinance.com/spbd-mission-vision Extracted on 28-20-13

access to finance for climate change adaptation. ADAPT Asia-Pacific in partnership with UNDP is supporting the Government of Samoa in addressing a range of climate change related issues through an economy-wide approach that integrates climate change adaptation and DRR/DRM into national development planning and programming, targeting communities as first responders to natural disasters.

The Infrastructure specialist was able to meet with several agencies of **MNRE** and other Ministries to identify the infrastructure related gaps and future needs by the Government of Samoa. MNRE is one of the Samoan government's largest ministries and houses multiple separate divisions dedicated primarily to land, water and environmental planning and management. Hence, it is the largest repository of knowledge and experience on climate and natural resources in the country, with a number of highly trained staff in areas from hydrology to land registry and management to urban planning and beyond. MNRE is also the ministry responsible for producing the key policy documents that guide climate change programming for the country, including the National Policy Statement on Climate Change and the NAPA. It is the designated secretariat for the National Climate Change Country Team (NCCCT), members of which include the CEOs of relevant ministries. The NCCCT has served as the key coordination mechanism for national response to climate change initiatives in the past, but has not remained active.

The **Samoan Meteorological Division** of the MNRE, formally known as the Apia Observatory was founded in 1902 under the Samoan Government Ministry of Natural Resources and Environment. The Division consists of six sections including: Administrations; Climate Change; Climate and Research; Disaster Management Office; Geology/Geophysics; and Weather/Forecasting. The Samoan Meteorological Division provides regional and national weather bulletins; tropical cyclone warnings; rainfall outlooks; monthly rainfall data; earthquake reports; and climate outlooks. Recognising extreme vulnerability of coastal areas to inundation/flooding, and with a view to improve safety-related services for the community, as a fundamental priority of the WMO, the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM) and the WMO Commission for Hydrology (CHy) have initiated the coastal inundation forecasting demonstration project. Its purpose is to address the challenges faced by coastal communities to enhance their safety and to support sustainable development, through the improvement of coastal inundation forecasting and warning systems at the national and regional scale.

The **Land Transport Authority (LTA)** is a Public Trading Body established on 1 December 2008 under MNRE. It brings together the road asset management and road use management functions under the Land Transport Authority Act 2007. The prime objective is to provide a safe and environmentally friendly land transportation network for Samoa.

The **Water Resources Division** under MNRE established to ensure community access to water of suitable quality and appropriate quantities to meet all reasonable health, environmental and economic development needs. It has three major section namely policy, hydrology and watershed. The hydrology is comparatively new as they are together with the Meteorology in the past. Based on the discussions with the ACEO and other staffs, some of the activities that could fit this project are:

The **Planning and Urban Management Agency (PUMA)** was formed in 2002, and was the first real effort to address national and urban planning and development issues through strategic and statutory instruments. The Agency operates under the Planning and Urban Management Act (the Act) and subsequent regulations. The Act created the Agency and Board as a statutory authority responsible for preparing strategic urban planning tools such as planning provisions, plans, and development standards, development consent and compliance of development activity, environmental impact control and compliance, establishes the Planning Tribunal and enforcement provisions. The Agency sees its mission as "development regulatory and strategic planning for a prosperous Samoa". The Agency regulatory model is based on international planning and resource management law and practice.

As the primary government institution for women's issues as well as village governance, cooperation and development, **Ministry of Women, Community and Social Development (MWCSD)** is the entity through which all other government and non-government entities are required to pass for any work involving the local communities. As such, it maintains the closest government ties to the village mayors, village women's leaders and key local development actors. It also warehouses the most extensive data and information on Samoa's nearly 200 villages, much of which has recently been compiled in the MWCSD publication Samoan Village Profiles 2013.

The **Ministry of Works, Transport and Infrastructure (MWTI)** is the government entity principally responsible for establishing, regulating, promoting and monitoring transport and infrastructure legislation and policy to ensure safe, secure and viable transportation modes and infrastructure assets. It focuses mainly on airport, road and port initiatives, but MWTI is also the national ministry in charge of developing, disseminating and monitoring specifications for the national building code, which has been revamped to accommodate the country's objectives in connection with climate change, disaster risk management and "building back better" philosophy. In this area, MWTI has considerable construction experience of relevance for the development of this GEF project.

3.2.3 Capacity

Baseline situation

Context

With regard to capacity for local community development, Samoa is fortunate to have established a number of competent and experienced, if small, civil society and semi-autonomous organisations that are generating significant results at the grassroots level.

Though agriculture only accounts for about 10% of GDP, it is responsible for the majority of the nation's employment. Tourism contributes at least 20% to GDP and appears to be increasingly stable.

Government capacity

The limited capacity prevent the appropriate use of the land, water and natural resource expertise within the **MNRE**. Indeed, most staff does not have direct access to internet and to information produced outside of their individual division. Obtaining

intra-ministerial data requires significant request time and approval of senior division management. Most inter-ministerial information is similarly difficult to acquire. Additionally, most MNRE divisions were created with policy, planning and oversight objectives as primary functions. Project implementation, in many cases, has been an added responsibility and one for which personnel and training background have been limited. Though considerable learning has accrued to the ministry with the extent of donor-driven programming it has taken on in recent decades, issues such as international financial reporting and procurement, among others, still represent challenges for the mainly thematic and policy oriented MNRE staff (particularly given the range of different requirements among donor country organisations). Finally, although MNRE employs a considerable number of trained experts in all of its divisions, most areas lack technical expertise and equipment for more sophisticated measurement, forecasting and surveying work. This still needs to be outsourced and is particularly true for the water and land management divisions. Additionally, MNRE generally covers thoroughly issues related to climatic variation and monitoring, but does not have as much capacity dedicated to management of the broader issue of climate change and its nationwide, cross-sector implications.

The **Ministry of Finances (MoF)** admits to difficulties with gathering relevant data and information from the various sectors and their lead ministries. These difficulties stem from a variety of issues including proprietary mentality, limited resources and capacity, and lack of internal knowledge management systems. This challenge, along with human resource constraints, makes efforts such as the recently launched CRICU difficult to implement. Though MoF has experience with cost-benefit accounting, its application for CC expenditures presents a broader cross-sector task that requires extensive liaising between sectors and expanding upon existing accounting expertise. Moreover, MoF, as the lead governmental financial agency, is principally economics-driven. Though in a position of national coordination, MoF lacks specialists in thematic areas of expertise related to the various sectors it is trying to organise, which may constrain its authority or analytical ability in some situations. For example, while MoF has manuals and procedures for cost-benefit analysis, it does not have the same for climate related cost-benefit analysis, nor does it have the in-house expertise necessary to adapt existing materials and processes to this end.

In spite of the amount of village information and data that passes through the **Ministry of Women, Community and Social Development (MWCSD)**, relatively little is captured systematically and utilised for analytical purposes. The community development sector coordination unit is beginning to do some tracking of village progress against their individual sustainable development plans, but not from the basis of baseline data monitoring and evaluation techniques. Additionally, the unit is quite small (with a single permanent staff member and 2-3 others), so human resource constraints also affect the data collection, monitoring and analysis, resulting in minimal knowledge management and monitoring and evaluation capacity. Furthermore, while MWCSD is officially in charge of administration for the village mayors and women's representatives, ministry authority is often limited due to the influence of traditional village hierarchy, positioning and power structures. It is often difficult, for example, for MWCSD to ensure adequate inclusion of women's perspectives, along with those of other underrepresented and potentially vulnerable populations, in community governance and development initiatives despite the

ministry's official mandate. The same is true for NGO and community-based groups that work through the MWCSD. Finally, private sector and civil society organisations are required to formally utilise MWCSD as their entry point for community related work, the ministries associated with the transport, communication and energy sectors routinely bypass this process and manage their affairs directly with communities across Samoa. This is partly due to the time pressure associated with much of their work, which is largely infrastructural and often related to foreign direct investment, but has had negative implications for information flow and local coordination. These same sectors have been slow to include community development perspectives in their sector plans.

To conclude, there is general ministerial capacity issues. All ministries struggle with project management for donor driven initiatives. Because donor funding can seldom be incorporated into existing national programs or budgets, these projects often entail duplication of staffing, reporting and implementation effort—but with different corresponding parameters and requirements, which further complicates the issue. Given Samoa's small population and labour force, international project management ends up being a capacity problem for all government entities. Additionally, results based management principles (working with baseline indicators, tracking of output, and documentation of concrete results) are relatively new to public sector work in Samoa and not yet fully comprehended or mainstreamed into operational practice. This seems to be true for all government agencies, but particularly so for the MWCSD. As a result, monitoring and evaluation capacity is also weak, as is analytical capacity.

Further capacity difficulties confronting all government entities operating in Samoa include the cost and constraints associated with technological connectivity, the human resources available and the limited national budget. Samoa's human resource limitations have more to do with numbers than with learning potential; Samoa's small population constrains the size of the national labour force, but the education system is reasonable and compulsory until 14 years of age making it possible to build upon existing human resource capability when time and finances allow. Added to this, however, is the issue of turnover and migration. There is always a tendency for better-trained professionals to seek better opportunities—outside the public sector and often outside the country. This contributes to a negative cycle of inadequate capacity for governmental offices.

Stakeholders

The Government of Samoa has determined that 1) the Ministry of Natural Resources and Environment (MNRE) will serve as implementing partner for this GEF LDCF project, and 2) the Ministry of Finance (MoF) will serve as chair of the steering committee for this project, along with two other on-going climate related projects, that of the National Adaptation Fund (NAF) and the Pilot Programme for Climate Resilience (PPCR). Thus, MNRE and MoF are both key ministries in this project; MNRE with regard to administration and implementation, and MoF with regard to strategic coordination and steering. Additionally, given that Component 2, the largest of the project in terms of programming and budget, deals directly with communities, the Ministry of Women, Communities and Social Development (MWCSD) is another critical government counterpart.

MNRE is one of the Samoan government's largest ministries and houses multiple separate divisions dedicated primarily to land, water and environmental planning and management.[6] Hence, it is the largest repository of knowledge and experience on climate and natural resources in the country, with a number of highly trained staff in areas from hydrology to land registry and management to urban planning and beyond. MNRE is also the ministry responsible for producing the key policy documents that guide climate change programming for the country, including the National Policy Statement on Climate Change and the NAPA. It is the designated secretariat for the National Climate Change Country Team (NCCCT), members of which include the CEOs of relevant ministries. The NCCCT has served as the key coordination mechanism for national response to climate change initiatives in the past, but has not remained active. Furthermore, MNRE has been the traditional UNDP GEF implementing partner for Samoa in past years and has amassed experience with both UNDP protocol and GEF reporting procedures. Recently, it has even set up a separate division within the ministry dedicated to managing all GEF administrative work and communications.

The **MoF** is in charge of the centralised database of donor assistance, which comprises close to 20% of GDP[7] annually and through which all external development financing must pass prior to allocation. Direct access to this data, in conjunction with the information compiled on national productivity by the Samoan Bureau of Statistics, provides MoF with the most comprehensive view of national expenditures. This allows for more widespread analysis of cross-sector expenditures, such as those related to issues like CC and DRM. Additionally, MoF was the principal government agency working with UNDP and other international partners on the national Climate Public Expenditure and Institutional Review (CPEIR) project, providing it with extensive background in the concepts of CC fiscal management. MoF, through its Economic Policy and Planning Division (EPPD) is also responsible for the coordination of the country's 14 sectors that contribute to the national development strategy and program objectives in line with a relatively recently adopted sector-wide approach to development. These sectors include finance; agriculture; education; tourism; trade, commerce and manufacturing; health, law and justice; community development; public administration; water; communication; transport; energy; and environment. Construction is also considered but currently as a cross-cutting theme as opposed to a separate sector. MoF conducts bimonthly meetings attended by the coordination units of each sector, along with representatives from relevant MoF divisions such as those pertaining to donor aid, budget, planning, corporate services, procurement, accounts, state-owned enterprises monitoring, and the Climate Resilience Investment Coordination Unit (CRICU). Goals of these meetings include directing sectors toward harmonised accounting and reporting procedures, improved collaboration among related ministries and agencies on advancing development objectives, and better management of national data and information. EPPD responsibility for sector coordination puts the ministry in the best position for facilitating the development of necessary cross-sector mechanisms and structures such as those related to better management of CC and DRM. Finally, MoF has been the implementing partner of

[6] These divisions include the following: Corporate Services, Disaster Management, Environment and Conservation, Global Environmental Facility (GEF), Forestry, Land Management, Legal Services, Meteorology, Planning of Urban Management Agency (PUMA), Renewable Energy, Technical Services, and Water Resources.
[7] See World Bank Data, World Development Indicators: http://data.worldbank.org.

numerous World Bank led development initiatives, which gives the ministry extensive experience with international accounting and reporting procedures as well as donor coordination.

As the primary government institution for women's issues as well as village governance, cooperation and development, **Ministry of Women, Community and Social Development (MWCSD)** is the entity through which all other government and non-government entities are required to pass for any work involving the local communities. As such, it maintains the closest government ties to the village mayors, village women's leaders and key local development actors. It also warehouses the most extensive data and information on Samoa's nearly 200 villages, much of which has recently been compiled in the MWCSD publication *Samoan Village Profiles 2013*. Because of its extensive connection with the villages and its official mandate in the areas of social and community development and gender, MWCSD is also the ministry with the most expertise and experience in local development, productivity and vulnerable populations. It is the ministry in charge of paying each village mayor and women's representative and tends to be among the first official entities involved and consulted in any disaster situation, local governance issue or development assessment. MWCSD has a small community development coordination unit with serves to represent the sector in the bimonthly sector coordination meetings and track progress on village sustainable development plans.

Civil Society Support Program (CSSP) is a program of the Ministry of Finance, overseen by a Steering Committee composed of representatives from key development partners, government and Samoan civil society. Its primary mission is to deliver sustainable social and economic benefits to the people of Samoa through strengthened civil society organisations (CSOs) by granting project co-financing directed toward small, informal enterprises and NGOs. CSSP works closely with the Ministry of Women, Community and Social Development as well as with the Samoan Umbrella for Non-Governmental Organisations (SUNGO). The organisation supports CSOs to develop and deliver well-run projects with measurable social and economic benefits; it does so by offering a single point of contact and a common set of application forms and reporting requirements. It also provides capacity strengthening for project formulation, organisational management, proposal writing and technical implementation. CSSP facilitates information exchange and the sharing of best practice experience among the CSOs involved in its projects and is highly indicator-oriented in its assessment of project potential and results. Since its inception in 2011, it has facilitated 260 projects with total funding of SAT 9,000,000. In its short existence, CSSP has proven to be extremely successful with facilitation of community development projects and would be a valuable partner for any larger project or program with this type of objective.

The **International Red Cross (IRC)** in Samoa works extensively with communities on adapting to changing climactic conditions, reducing risk, developing disaster plans, strengthening livelihoods and building back in post-disaster situations. Through the Community Based Self Resilience program, IRC and Samoa Red Cross have worked directly with local communities to build knowledge and skills to develop solutions that protect people's livelihoods. The group has also helped communities build cyclone-resistant structures to replace those lost in disasters and worked to

include disaster risk management components in five village sustainable development plans to date with plans to bring this total to 30 within the next year.

The **Ministry of Agriculture and Fisheries (MAF)** is the primary government agency providing regulatory and technical advice, training, and support for subsistence farmers, commercial farmers, agricultural processors and exporters. Its mission is to effectively utilise national agriculture and fishery potential in pursuit of 1) food security, 2) income generating opportunities and commercial development, and 3) sustainable resource management. Its six divisions deal specifically with crops, animal production and health, fisheries, quarantine, policy, planning and communications, and corporate services. Specific MAF experience related to potential inputs for this project include its recent collaboration with the World Bank in a five year Samoa Agriculture Competitiveness Project that aims to help local produce capture a larger proportion of the domestic food market and increase rural household incomes. Financing for the initiative comes from an IDA Specific Investment Credit equivalent to US$8 million, along with a US$5 million grant, and is distributed through activities that involve over 2,000 farmers. The project's components are based on 1) livestock production and marketing; 2) fruit and vegetable production and marketing; and 3) institutional strengthening. The first two of these strive to incorporate improved technology and enhance production for better market participation by small farmers. This third component works with government and NGOs to provide research and monitoring services.

The **Ministry of Health (MoH)** is the Samoan government's lead entity for medical and public health related services. Its mission is to provide meaningful and realistic health policy advice; ensure effective regulation and monitoring of the entire health sector in accordance with the Ministry of Health Act 2006 and all relevant legislation; and, through excellent health promotion and prevention services, reverse increasing lifestyle diseases. The 2008-2018 Health Sector Plan makes frequent mention of community collaboration and devotes a significant part of its program to community financing that will serve as a catalyst for village health promotion activities. Through awarding of sub-grants for projects of community-based organisation the initiative will support local women's committees' projects related to health promotion activities consistent with the Health Sector Plan priorities (specifically communal exercise, vegetable gardening, good nutrition, physical activity, exercises for health maintenance, etc.). MoH has worked consistently with MWCSD on local health initiatives and will continue to do so for this programming, which also has potential for linkage with disaster risk preparation and planning.

The **Ministry of Works, Transport and Infrastructure (MWTI)** is the government entity principally responsible for establishing, regulating, promoting and monitoring transport and infrastructure legislation and policy to ensure safe, secure and viable transportation modes and infrastructure assets. It focuses mainly on airport, road and port initiatives, but MWTI is also the national ministry in charge of developing, disseminating and monitoring specifications for the national building code, which has been revamped to accommodate the country's objectives in connection with climate change, disaster risk management and "building back better" philosophy. In this area, MWTI has considerable construction experience of relevance for the development of this GEF project.

The **Private Sector Support Facility (PSSF)** is a project led by the Ministry of Commerce, Industry and Labour with UNDP support that consolidates existing resources through a pooled financing arrangement to provide financing for small to medium sized businesses that employ and engage vulnerable groups. PSSF seeks to build upon existing commercial assets and expertise to strengthen local businesses, especially those in rural areas, and their productivity. It also aims to create a forum for more focused national dialogue on private sector needs and investment priorities. PSSF accepts proposals from organised commercial endeavours run by individuals, groups and organisations through two funding categories: ST$20-50,000 and above ST$20,000. An important tool for PSSF in assessing and consulting for its clients is the concept of the value chain, defined as the sequence of productive stages of a process (whether for agricultural production, manufacturing or service provision) whereby different parties provide specific inputs into the stages that add value to the product being created and eventually contribute to its competitive advantage in the market. Enhancing the value chain in different industries is key to raising both national competitiveness and the sustainability and profitability of individual enterprises.

The **Samoa Chamber of Commerce and Industry** is the country's largest association of and advocacy group for businesses, corporations, industry associations, small businesses and entrepreneurs. It represents the private sector business community in the broadest sense, working closely with other industry association partners, such as the Samoa Hotel Association and the Samoa Association of Manufacturers and Exporters, as well as civil society organisations, such as the Women in Business Development Initiative (WIBDI) and the Small Business Enterprise Centre (SBEC), that facilitate small business endeavours. The Chamber is committed to promoting policies and collaborations that foster sustainable growth and free enterprise. It maintains close ties with government ministries and agencies and represents its members at the national, regional and international levels. Every industry sector is represented, accounting collectively for over 90% of private sector business assets and turnover. The Chamber also organises yearly capacity building workshops covering a range of topics, prioritised according to input from membership. Among the topics with highest member demand are those related to customer services, communications and marketing, leadership and finance.

The **Samoa Umbrella of Non-Governmental Organisations (SUNGO)** is a network of Non-Governmental Organisations (NGOs), Community Based Organisations (CBOs), Civil Society Organisations (CSOs) and Trusts established in 1997 to provide alternative development options and assistance to community groups in Samoa. It has also provided input for government policy and planning processes on issues impacting quality of life for the people of Samoa. It is also part of a regional NGO network involved in implementing international projects and training. SUNGO has more than 110 member organisations of which at least 50% are community based. The SUNGO secretariat receives donor and local support and has 8 full time staff headed by a CEO. It focuses its activities on four key areas: good governance and management (internal strengthening of organisations' policies, decision making and resource management); institutional strengthening (developing membership capacity to deliver needed services); promotion communications and membership; and advocacy. SUNGO delivers NGO, CBO and CSO capacity building through

organised training sessions, workshops, and various forms of mentoring and technical support. It also represents its members on a regional, national and global level in issues of development, and facilitates communication amongst civil society and policy development entities.

The **Samoa Tourist Authority (STA)** was established as the Samoa Visitors Bureau in 1986 and changed its name in 2002 reflecting a shift toward a broader concept of tourism and its increasing contribution to GDP (currently around 20%). Core STA divisions are Marketing and Promotions, Planning and Development, Research and Statistics, Finance and Corporate Services, and Policy Advice. STA works with other government agencies, the private sector, international partners, NGOs and the local community to market and promote Samoa, facilitate development of new and existing tourism products and services, increase community involvement in tourism, and foster information flow, collaboration and coordination among industry actors. One of the goals of the STA 2009-2013 Development Plan is that of generating more community support for and involvement in the industry, particularly with regard to youth and senior citizens.

The **Small Business Enterprise Centre (SBEC)** is a semi-autonomous organisation established in 1994 and its mandate is to provide assistance to all non-multinational businesses in Samoa, though its primary targets are smaller enterprises with the following characteristics: staff of up to five full time employees; cash flow accounting procedures; little prior accessing of credit; activity concentrated in the local market; and sole proprietorship, partnership or cooperative legal structure. The SBEC model for business development includes business training and advisory services, facilitated access to financing, and business nurturing and support services. It works through selected financial institutions and donor partners to guarantee 80% of the loaned funds it delivers to clients fulfilling SBEC prerequisites. SBEC works across a broad range of sectors including agriculture, fisheries, arts and handicrafts, services, manufacturing and tourism and has a team of five advisors that continuously monitor, through weekly visits and bank reports, its over 500 clients.

South Pacific Business Development (SPBD) is a network of microfinance institutions working in Fiji, Samoa, and Tonga dedicated to reducing poverty by providing women in rural and urban villages with opportunities to start, develop and maintain sustainable, income-generating micro-enterprises, build assets, and finance home improvements and childhood education. Of the total number of loans distributed 99% go to women, 80% go to rural clients, 40% go to single mothers and 100% go to the unemployed. SPBD provides clients with a range of training alongside its financial services to better assure sustainability of the micro-initiatives assisted. In Samoa, SPBD currently services over 13,000 families, or an estimated 78,000 individuals, 2 of every 5 Samoans. It uses a modified Grameen Bank methodology, which involves the following components

- Provision of unsecured financing to underprivileged women
- Incorporation of clients' personal funds to run micro-businesses
- Obligatory attendance at weekly business meetings held in the villages
- Inclusion in self-formed groups of 5 women that co-guarantee its members' loans
- Additional savings and life-insurance products.

The Women **in Business Development Initiative (WIBDI)** is a non-government organisation founded in 1991. With funding from Oxfam and New Zealand, WIBDI focuses its programs on individual families as opposed to entire village communities or individuals. By working with families, WIBDI deals directly with a single head of household and has been able to generate a stronger sense of ownership and responsibility for its projects, thereby making them more sustainable. The organisation works across various sectors but concentrates on agriculture and organic farming supporting semi-commercial (not subsistence) operations. WIBDI has become a leader in organic systems of the South Pacific and is currently working with over 700 families in Samoa on 33,000 hectares of land who are fully organically certified to international standards (NASAA, the National Association for Sustainable Agriculture, Australia). It has also certified five processing plants and four villages for organic production. The organisation is trying to work with farmers and different value chain components to bring more organic products to international markets and to local hotels and restaurants. To this end, it is currently supplying Body Shop with organic coconut oil and working with renowned chef Robert Oliver to include more indigenous food in the menus of Samoan tourism establishments. In addition to agriculture, WIBDI also works to support enterprises engaged in fine mat production and local handicrafts. In all areas, WIBDI offers both financial and technical client support. Its training methods are based on the lessons in *A Guide to Small Businesses,* a course from the Open Polytechnic of New Zealand and commissioned by The Commonwealth of Learning and UNESCO and have been developed and adapted for the Samoan village context.

3.2.4 Gender

Baseline situation

According to the Gender and Climate Report and Monitoring Framework prepared for Samoa's Climate Programme on Climate Resilience (PPCR) and the World Bank, gender differentiated impacts of climate change exist in Samoa, and are predominately framed and based on the fa'a Samoa (the Samoan way, Samoan customs and traditions; Samoan culture), status, divisions of labour, roles and responsibilities.

'Gender' in the context of Samoan society shifts over time and place, due to a number of factors such as changes in customs, traditions, culture, practices and socio-economic conditions, and it appears gender-balance has increased in the past decade, especially in areas of disaster management. Indeed, disasters have demonstrated that they exacerbate negative social and economic situations in existence at the time of disruption (Enarson and Morrow 1998) The increased vulnerabilities to hazard risk align with inequities that exist in everyday life; access to water, food and resources; knowledge and skills to address risks, access to information and communication systems, income levels, access to health care and access to livelihoods and employment opportunities. Climate change will exacerbate these risks because it can make climate disasters even greater or it can severely stress key areas of the environment that provide protection within the eco system such as coral reefs or forests and this results in declining resilience. Food Security, water availability, household nutrition, and livelihoods were identified as the most affected sectors from gender-differentiated impacts of climate change.

South Pacific Business Development Microfinance (Samoa) (SPBD) Ltd is a Grameen Bank replication works on all 4 islands and nearly every village in Samoa and have been financially sustainable since 2007. The organisation is dedicated to eradicating poverty by empowering women in rural villages with the opportunity to start, grown and maintain sustainable income generating micro-enterprise. SPBD is currently impacting over 13,000 families or 78,000 individuals which corresponds 40% of the population or 2 in 5 Samoans. Additionally, small-scale businesses predominately owned and operated by women are diversifying their businesses and investing in insurance coverage, as part of 'disaster-climate' proofing their businesses.

The Samoa Village Profiles project developed by MWCSD is a first attempt to develop a gender monitoring framework of activities that contribute to adaptive capacity. Gender considerations has been included in national disaster risk management plans. Collaborations with Samoa Red Cross Society have initiated a village risk and vulnerability assessment project to gather details at household levels to address risks. The funding currently targets 20 communities with intent to expand the project in the future.

Gender and climate considerations in small business finance and insurance that promote 'no regrets' and 'green growth' have been encouraged and demonstrated successes in dealing with disaster risks. The CSOs working with emerging businesses at the village level recognise the small business owners, particularly women who have not earned income in the formal employment sector, have reduced access to capital for business development and for recovery from hazards. The Small Business Enterprise Centre (SBEC) has considered hazard risks in business development plans and encouraged clients to purchase insurance. However, there are few instruments available. Women's in Business Development (WiBDI) has developed a strategy to diversify products and supply including training to other Pacific Island countries to ensure that market demand does not disappear. Organic farming cooperatives have been encouraged as an informal mechanism of support where insurance may not be available.
Gender sensitive monitoring at the village level is underway and demonstrates implementation of adaptive capacity projects. As a part of these efforts, MWCSD developed a monitoring system of village activities called Village Profiles. The project profiles each village, tracks the types of projects implemented in each village and provides a tool for identifying sector needs in each village, and provides a tool for identifying sector needs in each village. Within the CRIP/PPCR 16 districts and 81 villages (population of 75,871 with 39,002 males and 36,869 females) the villages have received capacity building projects from 1995 through 2012 in the sector areas of Health (197) Community (322), Environment (205) Agriculture (214), Education (140), Disaster Management (108), Water (59) Communication (12), Electricity (9) and Infrastructure (3).

The recent disasters experiences in Samoa have provided opportunities to consider important data in the context of the Post Disaster Needs Assessment (Government of Samoa 2013). The Samoa Bureau of Statistics (SBS) gathers and maintains significant amount of data and has the ability to disaggregate most data sets by sex. SBS can provide data sets for use by Government but the understanding of the

importance of using this data can be enhanced to build awareness of the value of this information.

The Post Disaster Needs Assessment (PDNA) that was developed by the Government of Samoa following Tropical Cyclone Evan supports the need for gathering and monitoring basic socioeconomic information that improves the understanding of impacts in people and livelihoods and then helps examine reasons for increased risk and strategies to reduce these risks (Government of Samoa 2013).

The Samoa National Disaster Response Management Office (NDMO) has already incorporated gender into the National Disaster Response Plans and in the Joint National Actions Plans for Disaster Risk Reduction and Climate Change Adaptation (Government of Samoa, 2011b, 2011c). Projects by NDMO and the Samoa Red Cross Society use a gender approach to identify vulnerability and propose risk reduction measures. Additionally, gender mainstreaming initiatives have targeted increasing the numbers of women in technical and scientific roles in disaster agencies. The effort to increase the numbers of women, however does not ensure that gender considerations will be followed or integrated in risk reduction measures.

Key stakeholders

Already Met	**Further Consultation Required**
Women in Business Development International	Samoa Victim Support Society
Samoa Business Enterprise Centre	
South Pacific Business Development	SPBD
Ministry Women Community Social Development	MWCSD
Samoa Chamber of Commerce	Samoa Red Cross Society
UN Women	Ministry of Health
Civil Society Support Program	Samoa Youth Council
Samoa Tourism Authority	LGBT Organisations
Samoa Umbrella of NGOs	

4 Way forward

A second mission is required to consult further with key stakeholders. This will allow the PPG team to obtain the necessary details required to finalise the project design. The second mission is planned from 26 November - 06 December 2013. The Environmental Economist, Infrastructure Specialist and Social, Cultural and Gender Specialist will all participate in this second mission. The second mission will focus on identifying potential cost-effective options for strengthening the resilience of infrastructure and other adaptation solutions to support the long-term climate resilience of community facilities and infrastructure investment in a complementary manner. Activities to be completed before, during and after the second mission include:

- Completion of literature review.

- Identification of community livelihood projects to be supported under the LDCF Project.
- Identification of vulnerable populations to be supported with methodology for identification of these vulnerable populations.
- Review of all Outcome Areas to identify entry points for gender mainstreaming. (In line with the request for Gender considerations to be mainstreamed throughout the whole Project).
- Preparation of a zero draft of the project document by mid-December 2013.

5 Milestones for on-going project design

A preliminary plan for the development of the project design is outlined in the table below. This is dependent on the outcomes of the second mission in November 2013.

Action Item	Date	Responsible party	Status
Assemble Project Team	Sep-13	UNDP CO, MNRE (OFP)	Completed
Perform background research on projected CC impacts, available research reports, other relevant projects and policies	Ongoing 2013	MNRE (OFP), CCAS, PDS	Ongoing
Launch project preparation phase and hold first project preparation/inception meeting with government representatives	30th September – 11th October 2013	MNRE (OFP), UNDP CO, CCAS, IS, EE, PDS, SCGE, CAE, RTS	Completed
Stakeholder consultations, technical assessments, drafting of individual sections of project documents	Oct-13	MNRE (OFP), UNDP CO, CCAS, IS, EE, PDS, SCGE, CAE	Ongoing
Draft Strategic Results Framework available for review by UNDP CO and RTA	30-Oct-13	MNRE (OFP), CCAS, PDS, EE, IS (review by UNDP CO, RTS)	Pending
Co-financing setup defined and co-financing letters solicited	30-Oct-13	MNRE (OFP), CCAS, UNDP CO	Pending
Implementation and management arrangements defined	30-Oct-13	MNRE (OFP) CCAS, UNDP CO	Pending
First draft of project document available and	10-Dec-13	PDS	Pending

shared with UNDP CO, and RTA for review			
Review of 1st draft completed and feedback by UNDP CO and RTA provided	16-Dec-13	MNRE (OFP), UNDP CO, RTA	Pending
Remaining consultations and clarifications to address review comments completed	20-Dec-13	MNRE (OFP), CCAS, PDS, IS, EE	Pending
Second draft of full-size project document including final SRF, budget, AMAT, all annexes	30-Jan-14	PDS	Pending
Revised draft of full-size project document circulated to national stakeholders, and UNDP for final review and comments	30-Jan-14	MNRE (OFP), UNDP CO, CCAS	Pending
All co-financing letters and LoEs available	30-Jan-14	MNRE (OFP), UNDP CO, CCAS,	Pending
Final revisions completed	10-Feb-14	PDS	Pending
CEO Endorsement template compiled	28-Feb-14	MNRE (OFP), PDS	Pending
Complete submission package sent to Bangkok for final review/fine-tuning	1-Mar-14	MNRE (OFP), PDS	Pending
Complete submission package sent to NY for technical and financial review and clearance	14-Mar-14	RTS, PTA	Pending
Final Submission to GEF SEC	28-Mar-14	MNRE (OFP) UNDP HQ	Pending

Notes:

- CAE – Capacity Assessment Expert: ***Nanette Svenson***
- CCAS – Climate Change Adaptation Specialist: ***Nadia Meredith-Hunt***
- EE – Environmental Economist: ***Eduardo R. Quiroga,***
- IS – Infrastructure Specialist: ***Mr Fakhruddin***
- MNRE OFP – MNRE Operational Focal Point: ***Taulealeausumai Laavasa Malua/Anne Rasmussen***
- PDS – Project Development Specialist: ***Dirk Snyman (Team Leader)***
- RTA – Regional Technical Advisor: ***Claudia Ortiz***
- SCGE – Social, Cultural, Gender Expert: ***Ana Silika Laqeretabua***
- UNDP CO – UNDP Country Office: ***Marta Moneo***

Annex 1: Inception Workshop Agenda

Time	Description	Presenter/Facilitator
8.30 am	***Registration***	
9.00 am	***Opening Prayer***	***t.b.c***
	Introductory Statement	***CEO – MNRE***
	Opening Remarks	***ACEO – Aid & Loan***
		UNDP Representative
9.30 am	***Morning Tea & Group Photo***	
10.00 am	***Workshop Objectives & Agenda*** ***Project Background & Logframe*** ***Roundtable Discussion***	***ACEO – GEF*** ***LDCF Project Team Leader*** ***UNDP Regional Technical Advisor*** ***CEO - MNRE***
11.00 am	***Thematic Presentations*** ***(a) Infrastructure & Gender*** ***(b) Capacity & Economics*** ***(c) Climate Change Adaptation & DRM***	 ***LDCF Team*** ***LDCF Team*** ***UNDP***
12.00 pm	***Lunch***	
1.00 pm	***Group Sessions:*** ***Group 1 – Policy & Coordination*** ***Group 2 – Communities & Livelihoods*** ***Group 3 – Monitoring & Evaluation***	***LDCF Project Team***
3.00 pm	***Group Presentations***	***Group Leaders***
3.30 pm	***Afternoon Tea***	
4.00 pm	***Wrap Up and Way Forward***	***LDCF TL /ACEO – GEF***

Annex 2: Inception Mission Agenda

Date	Time	PPG Team Members	Organisation	Purpose	Participants	
					Name	Designation
Mon 30th Sep	10.30am	Dirk/Claudia/Bapon/ Marta/Sara/Nadia		PPG team logistics		
	3pm	Dirk/Claudia/Bapon/ Marta/Sara/Anne/Nadia/Muliufi	MNRE	Introductory meeting	1. Taulealeausumai L. Malua	1. CEO
	4pm	Dirk/Claudia/Bapon/ Marta/Sara/Anne/Nadia/Muliufi	MOF	Introductory meeting	2. Tupaimatuna I Lavea 3. Noumea Simi 4. Litara Taulealo	2. CEO 3. ACEO Aid & Debt Management 4. PPCR Coordinator
Tues 1st Oct	8.30am	Dirk/Claudia/Marta/Sara/Nadia		PPG team logistics		
	9am – 12 pm	Dirk/Claudia/Marta/Sara/Bapon	MNRE	Site Visit	5. Malaki Iakopo	5. Principal WRD Officer
	2pm – 4pm	Dirk/Claudia/Bapon/ Marta/Sara/Nadia/Muliufi	MNRE, MOF, MWCSD	Introductory Meeting with key implementing agencies	6. Filomena Nelson 7. Lita Lui 8. Sulu Amataga 9. Fiasosoitamalii Siaosi 10. Josephine Stowers-Fiu 11. Andrew Riplinger 12. Rosa Toese-Siaosi 13. Lameko Osana	6. ACEO DMO 7. Principal Aid Officer 8. ACEO WRD 9. WRD 10. ACEO Legal 11. Fulbright 12. Sector Coordinator 13. WRD

					14. Mulipola A Titimaea 15. Malaki Iakopo	14. ACEO Meteorology 15. WRD - PRO
Wed 2nd Oct	8.30am	Dirk/Claudia/Bapon/ Eduardo/Ana/Nanette/Marta/Sara/Nadia/ Muliufi (All)	PPG Team	Internal Meeting		
	10 am	All	MNRE (PUMA, WRD, Land Management, Land Technical Services)	Focus group meeting on Land Use and Management	16. Suluimalo Amataga Penaia 17. Malaki Iakopo 18. Pau Ioane	16. ACEO WRD 17. Principal WRD Officer 18. Principal LTS Officer
	11.30 am	All	MWTI LTA MNRE (PUMA)	Focus group meeting on Infrastructure	19. Leasi Galuvao 20. Seimaleula Sinapati Ulberg 21. Ferila Brown	19. LTA CEO 20. LTA ACEO Procurement & Planning 21. PUMA Acting ACEO
	1.30 pm	Claudia/Marta/Anne/ Nadia	MOF	Focus group meeting on Climate Finance	22. Noumea Simi 23. Lita Lui 24. Litara Taulealo	22. ACEO Aid & Debt 23. Principal Aid Officer 24. PPCR Coordinator
	3pm		MAF MWCSD MCIL STA	Focus group meeting on Livelihoods and Communities	25. Rosa Toese Mene 26. Salote Meredith 27. Amiafolau Afamasaga	25. MWCSD Community Sector Coordinator 26. MCIL Trade Sector Coordinator 27. STA Climate

						Change Coordinator
Thurs 3rd Oct	9am – 3pm	All	PPG Team, RTA, CO only	Workshop Preparations		
			PPG Team, RTA, CO only	ProDoc sections and responsibilities, Environmental and Social Safeguards, Impact assessments pilot & M&E and Reporting, Capacity assessments, Summary and Next Steps		
Fri 4th Oct	9am – 4pm		Inception Workshop		(See Annex 2)	
Mon 7th Oct	9-12pm	Dirk/Eduardo/Ana/Nanette/Sara/Nadia (All)		Internal Team Meeting		
Tues 8th Oct	9.30 am – 10.30 am	All	MWCSD	Capacity needs assessment	28. Faafetai Koria	28. ACEO - Planning
	11.00 am – 12.00 pm	All	WIBDI SBEC MAF	Focal group meeting on micro-business development	29. Alberta Vitale 30. Faumuina Felolini Maria Tafuna'i 31. Lafaele Enoka 32. Goretti Fau 33. Naomi Fili - Falo	29. WIBDI Associate Director Program 30. WIBDI Media Officer 31. Agriculture Sector Coordinator/SACEP Project Manager 32. SBEC Manager

						Recovery 33. SBEC Manager Training
	2.30 pm	Dirk	MOH	M & E	34. Aaone Tanumafili	34. Principal Officer
	3.30 pm	Nanette/Eduardo/Sara/Nadia	MOF	Capacity needs assessment and cost benefit	35. Litara Taulealo 36. Henry Ah Ching 37. Maleliga Peseta 38. Lita Lui 39. Jean Viliamu 40. Iloauila Aumua	35. PPCR Coordinator 36. ACEO EPPD 37. Principal Sector Officer 38. Principal Aid Officer 39. PPCR Officer 40. PPCR Officer
	3.00 pm	Dirk/Ana	SUNGO	Micro-business development	41. Tauvini Fonoti 42. Raymond Voight	41. CEO 42. Treasurer
Wed 9th Oct	9.00 am – 11.00 am	All	MWCSD LTA MNRE (PUMA, WRD, DMO,) Red Cross	Focal group meeting on integration of key plans: - CIMS - Watershed - CDCRM - Village Plans	43. Filomena Nelson 44. Vaitoa Toelupe 45. Ferila Brown 46. Kirisimasi Seumanutafa 47. Seimaleula Sinapati 48. Charles Martin-Shields 49. Andrew Riplinger 50. Rosa Toese-Siaosi 51. Litara Taulealo 52. Lameko Osana 53. Fata Eti Malolo 54. Malaki Iakopo 55. Mase 56. Ruseta Taaloga	43. ACEO DMO 44. CDCRM 45. PUMA Acting ACEO 46. PUMA Senior Officer 47. Manager PPD 48. Fulbright 49. Fulbright 50. Sector Coordinator 51. CRICU 52. WRD 53. WRD 54. WRD - PRO 55. Engineer 56. Principal Traffic and Drainage
	11.30 am	Ana	SPBD	Livelihoods &	57. Ajay Verma	57. General

	– 12.30 pm			Communities		Manager
	1.30 pm – 2.30 pm	Ana/Eduardo	STA	Gender	58. Amiafolau Afamasaga	58. Tourism Climate Change Coordinator
	1.30 pm – 2.30 pm	Dirk/Nanette	MOF	Village level climate finance	59. Litara Taulealo	59. PPCR Coordinator
Thurs 10th Oct	9.30 am	Dirk/Eduardo/Ana	MCIL	Livelihoods & Communities	60. Pulotu Chu Ling	60. ACEO Investment Development & Promotion (PSSF Secretariat)
	10.00 am	Nanette	MNRE	Capacity Needs	61. Ferila Brown 62. Kirisimasi Seumanutafa	61. Acting ACEO 62. Principal Officer
	11.00 am	Nanette/Nadia	MNRE	Capacity needs	63. Elisara Talouli	63. ACEO – Corporate Services
	1.00 pm	Nanette/Nadia	MNRE	Capacity needs	64. Frances Brown 65. Malaki Iakopo	64. Water Sector Coordinator 65. Principal WRD Officer
	2.00 pm	Nanette/Eduardo	CoC	Capacity needs and livelihoods	66. Ane Moananu 67. Annabel Yager	66. CEO 67. Policy Analyst
	3.00 pm	All	CSSP	Livelihoods	68. Kilali Alailima	68. Programme Manager
	3.00 pm	Nanette/Eduardo	MNRE	Capacity needs	69. Mulipola Ausetalia Titimaea	69. ACEO Meteorology Division
	4.00 pm	Nanette	MNRE	Capacity Needs	70. Faainoino Laulala	70. Principal Officer
Fri 11th	8.45 am	Ana/Eduardo	STA		71. Kari Martin 72. Dulcie Wong Sing	71. AVID Volunteer 72. Tourism Sector

Oct						Coordinator
	10.00 am	Nanette	MNRE	Capacity needs.	73. Anne Rasmussen	73. ACEO GEF Services
	2.00 pm	Nadia	MNRE		74. Pau Ioane	74. Principal LTS Officer
	2.00pm	Dirk	MOH		75. Palanitina Tupuimatagi Toelupe 76. Dr. Robert Thompsen	75. CEO 76. ACEO
	3.30 pm	All	UNDP	Wrap Up	77. Nileema Noble 78. Anthony Woods 79. Gabor 80. Marta Moneo	77. Resident Representative 78. Deputy Res Rep 79. RTA – Climate Change 80. Environment, Climate Change and Crisis Prevention and Recovery

Capacity Review

Project: ***Economy-wide integration of Climate Change Adaptation and Disaster Risk Management/Disaster Risk Reduction to reduce climate vulnerability of communities in Samoa***

UNDP Samoa
March-April 2014

FINAL REPORT

Consultant: Nanette Svenson, MBA, PhD

Contents

Acronyms

CC	Climate Change
CCA	Climate Change Adaptation
CCPP	Climate Change Programme and Plan
CCU	Climate Change Unit
CIMP	Coastal Infrastructure Management Plan
CPEIR	Climate Public Expenditure and Institutional Review
CRICU	Climate Resilience Investment Coordination Unit
CRIP	Climate Resilience Investment Programme
CSO	Civil Society Organization
CSSP	Civil Society Support Program
DMO	Disaster Management Office
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
EPPD	Economic Planning and Policy Division
GEF	Global Environment Facility
IFI	International Financial Institution
IRC	International Red Cross
LTA	Land Transport Authority
MAF	Ministry of Agriculture and Fisheries
MCIL	Ministry of Commerce, Industry and Labor
MNRE	Ministry of Natural Resources and Environment
MOF	Ministry of Finance
MOH	Ministry of Health
MWCSD	Ministry of Women, Community and Social Development
MWTI	Ministry of Works, Transport and Infrastructure
NAPA	National Adaptation Programme of Action for Climate Change
NCCCT	National Climate Change Country Team
NGO	Non-Governmental Organization
PFM	Public Finance Management
PPCR	Pilot Programme for Climate Resilience
PSC	Project Steering Committee
PUMA	Planning and Urban Management Agency
SBEC	Small Business Enterprise Center
SCF	Strategic Climate Fund
SCOC	Samoa Chamber of Commerce and Industry
SDS	Samoa Development Strategy
SPBD	South Pacific Business Development
SROS	Scientific Research Organization of Samoa
STA	Samoa Tourism Authority
SUNGO	Samoa Umbrella for Non-Governmental Organizations
UNDP	United Nations Development Programme
VSDP	Village Social Development Plan
WB	World Bank
WIBDI	Women in Business Development Incorporated

Executive Summary

This capacity review offers an assessment of existing versus required organizational capacity in Samoa as it relates to the implementing partner and responsible parties of the United Nations Development Programme (UNDP) Global Environmental Facility (GEF) Least Developed Countries Fund (LDCF) project *Economy-wide integration of Climate Change Adaptation (CCA) and Disaster Risk Management/Disaster Risk Reduction (DRM/DRR) to reduce climate vulnerability of communities in Samoa* currently under preparation by the UNDP Country Office in Samoa. The overall objective of the project is to establish an economy-wide approach to CCA in Samoa, with efficient integration and management of CCA and DDR/DRM principles into national development planning and programming, and enhanced resilience of communities' physical assets and livelihoods to climate change and natural disasters.

The Ministry of Natural Resources and Environment (MNRE) will serve as implementing partner for the project and chair of the project steering committee. The Ministry of Finance (MOF) will also be involved in this project as one of the key responsible parties; MOF is also chairing the steering committees of two other on-going climate related projects—*Enhancing Resilience of Samoa's Coastal Communities to Climate Change* (Adaptation Fund) and the Pilot Programme for Climate Resilience (PPCR). The other responsible parties in charge of key activity areas within this project and also assessed in this review include the Land Transport Authority (LTA), the Scientific Research Organization of Samoa (SROS) and the Women in Business Development Incorporated (WIBDI).

The information analyzed for this evaluation comes from a desk review of organizational documents and references corresponding to the implementing partner and responsible party entities; the results of an exploratory project preparation mission to Apia, Samoa, September 30-October 12, 2013; and additional follow-up capacity input received from the involved parties. Conclusions from the review indicate that much of the capacity required to successfully complete the activities contemplated in this GEF LDCF project appears to be in place already within the entities selected for implementation. Regarding existing capacity gaps, most stem from issues related to Samoa's size and geographic position and the effects of these on the professional labor pool and breadth of programming experience. As a result, international resources will be necessary for filling some of the capacity needs.

In the case of MNRE, capacity recommendations for the project focus primarily on developing additional CC expertise in the ministry and CC coordination with the MOF; improved IT infrastructure, connectivity and knowledge management; the utilization of international best practice for design and implementation of national CC/DRM systems; and the incorporation of more long-term international project management training. There is some degree of overlap with capacity recommendations for the MOF given their joint oversight responsibilities for various activities, with the added suggestion that international best practice also be researched and utilized for capacity strengthening of the ministry's Climate Resilience Investment Coordination Unit (CRICU), particularly with regard to building the requisite skill set for Climate Public Expenditure and Institutional Review (CPEIR) operations. For the rest of the responsible parties, the capacity recommendations are

primarily related to inclusion of additional personnel and upgrading of technical and technological infrastructure.

I. Introduction and context

This review provides an evaluation of existing versus required organizational capacity in Samoa as it relates to the implementing partner and responsible parties of the United Nations Development Programme (UNDP) Global Environmental Facility (GEF) Least Developed Countries Fund (LDCF) project *Economy-wide integration of Climate Change Adaptation (CCA) and Disaster Risk Management/Disaster Risk Reduction (DRM/DRR) to reduce climate vulnerability of communities in Samoa* currently under preparation by the UNDP Country Office in Samoa. It examines the components of the project and the associated outcomes, outputs and activities for each and juxtaposes these against the apparent capacity of the corresponding entities responsible for the work.

The Government of Samoa has determined that the Ministry of Natural Resources and Environment (MNRE) will serve as implementing partner for the project, and 2) the Ministry of Finance (MOF) will serve as chair of the steering committee for this project, along with two other on-going climate related projects, that of the National Adaptation Fund (NAF) and the Pilot Programme for Climate Resilience (PPCR). The other responsible parties in charge of key activity areas within the project and also assessed in this review include the following: the Land Transport Authority (LTA), the Scientific Research Organization of Samoa (SROS) and the Women in Business Development Incorporated. (WIBDI).

Project background

The overall objective of the project is to establish an economy-wide approach to CCA in Samoa, aimed at efficient integration and management of CCA and DDR/DRM principles into national development planning and programming, and enhanced resilience of communities' physical assets and livelihoods to climate change and natural disasters. Toward this end, the main GEF LDCF project components include: 1) strategic integration of CCA and DRM/DRR in national development policy, planning and budgeting through an economy-wide approach; 2) enhanced resilience of communities as first responders of climate change-induced hazards; and 3) improved systems for monitoring and evaluation and knowledge management. A copy of the full project logframe with these components and their outcomes, outputs and activities is presented in Appendix 1.

The table below presents a synopsis of these with an indication of the entities responsible for the corresponding activities. The project structure and accompanying activities were approved by all involved stakeholders at a validation workshop held in Apia, Samoa on March 26, 2014. Additional responsible parties appear in certain activities beyond the MNRE, MOF, LTA, SROS and WIBDI; however, this review is confined to as these entities as they will be responsible for producing the majority of the intended project results. The capacities reviewed for each of these entities relate directly to their responsibilities within the context of this project as shown in the table below.

Table 1
Responsible parties by project outputs and activities

Outcome 1.1. Policy, strategies and institutional strengthening	
Output 1.1.1. National Adaptation Strategy developed including integration of climate change considerations into sector plans.	
1. Integration of medium and long-term climate change risks and opportunities into sector plans	MNRE; MOF; Line ministries
2. Develop concrete recommendations to be taken into account for the new Strategy for the Development of Samoa, to reflect climate change risks and opportunities	MNRE; MOF
3. Produce the National Adaptation Strategy aimed to mobilize the integration of adaptation in medium and long-term planning and budgeting processes in Samoa	MNRE; MOF
Output 1.1.2. Institutional and operational frameworks for coordination of climate change adaptation strengthened.	
1. Define roles for MOF and MNRE units to ensure coordinated climate policy-making, planning, and implementation	MNRE; MOF
2. Conduct updated stocktaking of all current and planned climate change adaptation projects, plans, reports and assessments	MNRE; MOF; Donors
3. Strengthen climate change coordination to improve decision-making and project management of national climate change activities	MNRE
4. Develop specific guidelines for CRICU functions including accounting, budgetary and fiscal mainstreaming of climate change initiatives	MOF
Outcome 1.2. Public finance management at the national and village level	
Output 1.2.1. National- and village-level governance structures have enhanced capacity to manage and monitor climate finance.	
1. Develop guidelines for communities on financial management of projects, incorporating CCA and DRR/DRM	MOF; CSSP
2. Train communities on managing finances for climate change adaptation and DRM	CSOs; MWCSD
3. Develop guidelines/toolkits for preparation of a bi-annual CPEIR-style report to analyze climate change expenditure	MOF
4. Produce one bi-annual report on climate change expenditure as a means for harmonizing government agencies' monitoring of climate change	MOF
Outcome 2.1. Protection of communities' physical assets and livelihoods	
Output 2.1.1. "Ridge-to-Reef" Integrated Watershed Management Plan for Greater Apia	
1. Develop Integrated Watershed Management Plan (IWMP) for the Greater Apia area	MNRE: WRD, PUMA, DMO, Forestry
2. Design flood protection measures (feasibility study, climate resilient design, cost-benefit, EIA, SIA, etc.)	LTA; MNRE: PUMA, DMO; MWCSD
Output 2.1.2. Hard and soft measures for protection of community assets	
1. Build flood protection infrastructure along Vaisigano River	LTA; MNRE: PUMA, DMO
2. Implement ecosystem-based approaches to watershed management and flood mitigation	MNRE: WRD, Forestry
3. Reconstruct community assets following "building-back-better" approaches	MNRE; MWCSD
Output 2.1.3. Sustainable micro-businesses for youth and women on agro-food and manufacture with a sustainable and resilient value chain approach to promote diversified livelihoods	
1. Assess value chains (including product development and cost-benefit analyses) for breadfruit, coconut, cocoa, *misiluki*, papaya, *laupele* and taro	WIBDI; SROS
2. Assess value chains (including product development and cost-benefit analyses)	WIBDI

for handicrafts such as wood carvings and *siapo*	
3. Train women and youth on technical skills for selected agricultural value chains	WIBDI; SROS
4. Train women and youth on technical skills for selected handicraft value chains	WIBDI
5. Provide planting materials and household processing facilities for agricultural products	WIBDI; SROS
Outcome 2.2. CCA/DRR plans and implementation	
Output 2.2.1. Building on the work of DMO, village plans designed and implemented to develop the capacities of communities to prepare, respond, recover and manage CC risks.	
1. Conduct household surveys to map vulnerability to climate-induced natural disasters	MNRE: DMO; MWCSD;
2. Analyze data from household surveys to identify most vulnerable groups and communities	MNRE: DMO; MWCSD;
3. Develop Village Disaster Management Plans	MNRE: DMO; MWCSD;
4. Provide training on the implementation of Village Disaster Management Plans	MNRE: DMO; MWCSD;
Outcome 3.1. Knowledge about CCA and DRR is captured and shared at the regional and global level	
Output 3.1.1. Knowledge management strategy developed, including national awareness campaigns and information sharing through existing international platforms and new multimedia platforms	
1. Develop protocols for storage and sharing of information/data between government institutions	MNRE
2. Establish a national climate and disaster risk database that is centralized and accessible to all Ministries	MNRE
3. Develop and pilot plan for systematized uploading and monitoring of data and information generated in Samoa on international platforms	MNRE
4. Conduct awareness campaigns on water resources, land management, village development, climate change adaptation and DRR/DRM following the R2R approach	MNRE; MWCSD
Output 3.1.2. M&E system established to strengthen institutional coordination and enhance the effectiveness of the interventions on adaptation with an economy wide approach	
1. Review current M&E systems to identify best practices and opportunities for standardization of reporting modalities	MNRE; MOF
2. Establish a national M&E framework with guidelines for collecting, analyzing and reporting of data on water resources, land management, village development, climate change adaptation and DRR/DRM	MNRE; MOF
3. Develop a standardized reporting modality to enable harmonized monitoring, evaluating and reporting of expenditure and progress of interventions for climate change adaptation	MNRE; MOF

Source: UNDP Samoa 2014

Methodology

The information upon which this review is based comes from 1) a desk review of organizational documents and references corresponding to the implementing partner and responsible party entities; 2) the information produced from an exploratory project preparation mission to Apia, Samoa, September 30-October 12, 2013; and 3) answers to follow-up capacity questions received from the implementing partner, MNRE, and the key responsible parties MOF, LTA, SROS and WIBDI. The September-October 2013 mission included a group of high level consultants, experts in the areas of climate change, disaster risk management, Samoan development, community and social development, gender, infrastructure planning, environmental economics and capacity development. During the mission, the team conducted a

series of workshops, focus group discussions and key informant interviews. The team also reviewed additional materials relevant to the project preparation, which included national development and infrastructure plans, climate change and disaster risk related assessments, social and economic development studies, and internal ministerial documentation.

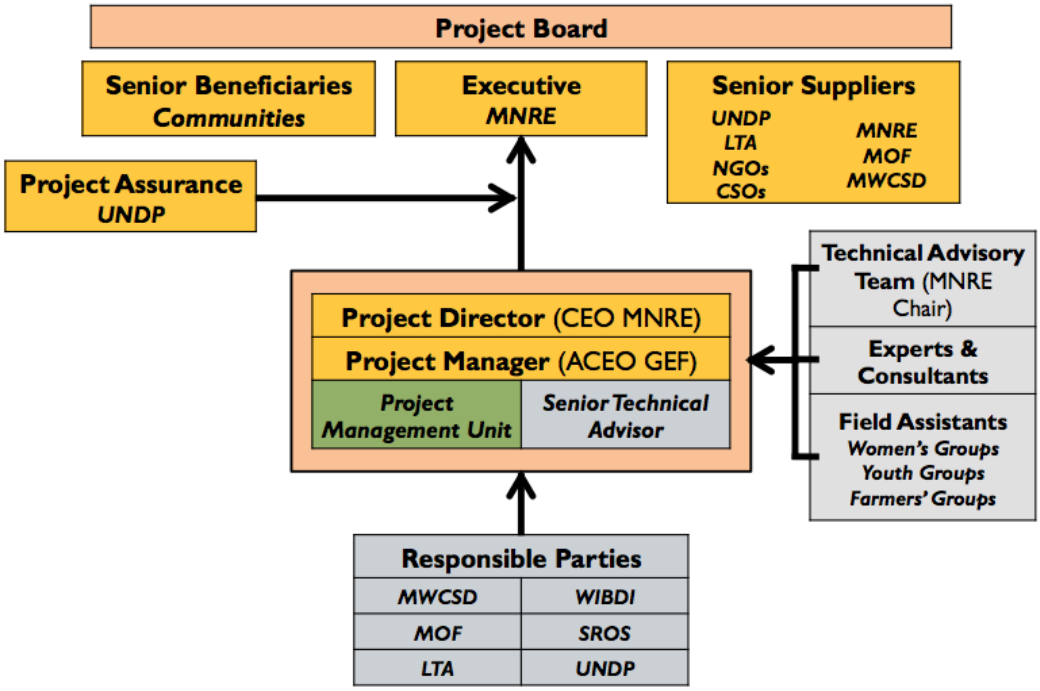
Appendix 2 contains a list of references for the internal documentation reviewed for the entities included in this capacity review. Appendix 3 presents a list of the organizations involved in the workshops, focus groups and interviews conducted in the September-October 2013 mission and a list of the background references. Appendix 4 provides the follow-up capacity questions directed at the entities evaluated in this review. The UNDP Programme and Policy Procedures (POPP) Capacity Assessment for Project Implementation – Implementing Partner Checklist guided the development of the structure and contents for this capacity review; it also helped determine the areas emphasized for investigation with regard to the entities assessed.

This review of the implementing partner (MNRE) and principal responsible parties (MOF, LTA, SROS and WIBDI) aims to contribute to the project preparation phase by identifying major opportunities for strengthening capacities to positively affect project outcomes. Since this comes at the outset of the project, it allows for productive capacity development to be built into the project design and implementation as early as possible. This review does not, however, constitute a full capacity assessment of any of these entities; thus, it may be determined that more complete assessments are required in the initial phase of the project activity.

II. Implementing Partner - Ministry of Natural Resources and Environment

As implementing partner, MNRE has general responsibility for organizing and overseeing all phases of the project as well as for coordinating all other responsible parties involved. As noted above, MOF will serve as steering committee chair for this project and for the National Adaptation Fund (NAF) project and the Pilot Programme for Climate Resilience (PPCR). Additionally, a range of public and private entities will also contribute to specific activities. Still, MNRE must demonstrate considerable leadership on the technical aspects of the project and for effectively integrating the contributions of the multiple participants to achieve project objectives, as depicted in the figure below.

Figure 1
Project Management Structure



Source: UNDP Samoa 2014

In line with the information presented in Table 1 and Figure 1 above, the following sections will describe in more detail the MNRE responsibilities associated with this project and the managerial, technical, financial and administrative capacities required to comply with these. This review of capacities, relying on the information described in the previous section on methodology, will lead to an analysis of the apparent MNRE capacity assets and gaps with regard to the ministry's responsibilities for this project and, ultimately, recommendations for strengthening MNRE capacity for effective project delivery.

Project responsibilities

MNRE responsibilities in line with the first component of the project involve incorporating more complete CCA/DRM/DRR analysis and mechanism in ongoing national policy, strategy and institutional strengthening endeavors. These are largely shared with MOF and focus on 1) better addressing CCA in the sector plans, the new Strategy for the Development of Samoa, and the National Adaptation Strategy; and 2) developing a more complete inventory of all ongoing and projected CCA work—along with mechanisms for maintaining this—and improved national CCA coordination and planning.

MNRE responsibilities in line with the second component of the project involve activities aimed at protection of communities' physical assets and livelihoods against climate change and disaster. These responsibilities include the development of Integrated Watershed Management Plan for the Greater Apia area as well as the design and implementation of ecosystem-based approaches to watershed management

and flood mitigation. Other responsibilities are shared with LTA for developing flood protection measures (such as feasibility studies, climate resilient designs, cost-benefit analyses and Environmental Impact Assessments, for example) and building flood protection infrastructure. The last activities under this component MNRE will carry out primarily with MWCSD and these involve research on climate and disaster vulnerable populations and the development and implementation of Village Disaster Management Plans.

Finally, MNRE responsibilities related to the project's third component include 1) improving CC and DRM/DRR knowledge management throughout the country and 2) establishing a CCA M&E system to better institutional coordination and intervention effectiveness. The first involves development and implementation of a national CC/DRM/DRR centralized database along with protocols for updating and maintaining this, along with general public awareness campaigns on CCA and DRM. The second, a responsibility with MOF, involves the review of current M&E systems and the design and implementation of a national M&E framework for CCA and DRM, along with the appropriate protocols for updating and maintaining this new M&E system.

Managerial capacity

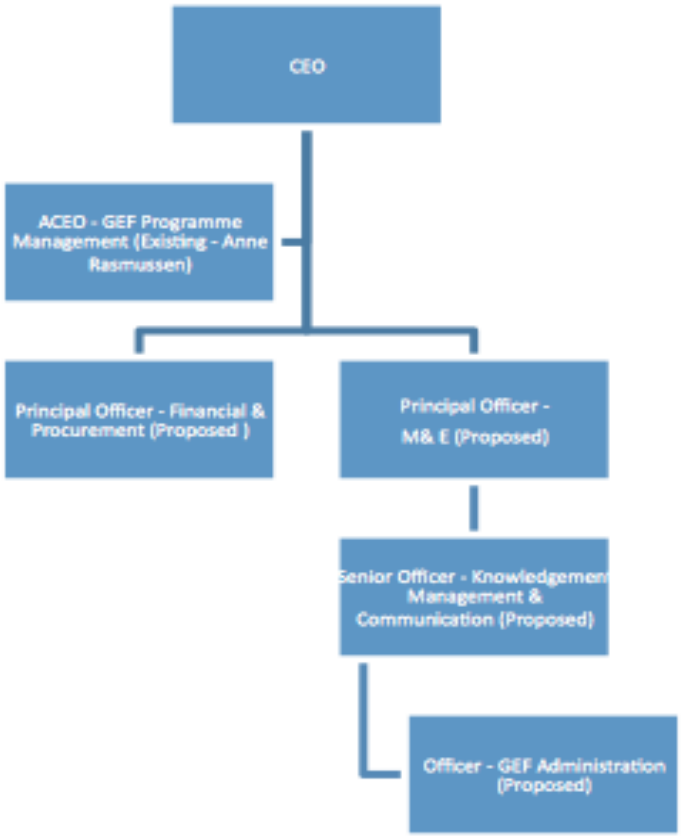
The MNRE leadership and management are dedicated and willing participants in this project and intend to strengthen the GEF Programme Management Division within the ministry as evidence of this commitment. This relatively new GEF division is an evolution of continued and increasing MNRE involvement in national GEF activity (Appendix 5 presents a chronological list of GEF programming in Samoa) and a formal proposal is now under review for further development of the MNRE GEF division. As a primary GEF implementing partner, MNRE has gained considerable experience with both UNDP protocol and GEF reporting procedures. In 2008 MNRE created a new position in the ministry, exclusively charged with these tasks. Initially the position corresponded to a GEF consultant and this later evolved into an ACEO position within the MNRE 2011-12 budget. The appointed ACEO for this position has been responsible for coordinating all official development assistance within the ministry relating to GEF focal areas. The division is in charge of coordination and management of all GEF administrative requirements, development of project identification, preparation and communications for the areas detailed under the Rio Conventions.

Last year, the MNRE was designated as the GEF operational focal point in Samoa, assuming this responsibility from the Ministry of Foreign Affairs and Trade (which still maintains its function as the GEF political focal point). All of these decisions respond to the growth of GEF programming in Samoa over the past decade, from USD 3 million to over USD 30 million of implementation currently. They should provide for more focused national attention on GEF programming as well as increased capacity development within MNRE for the range of activity that comes with the programming responsibility.

The profiles of the professionals leading both the ministry and the GEF Programme Management Division are in line with the international standards for education and experience associated with the level of these positions. Additionally, the proposed

plan for the management structure of the division is reasonable given its projected activity as described in the 2013 Proposal for MNRE GEF Programme Management Division (see Figure 2 below). To date, however, most of these positions remain to be financed and filled; thus, the division's capacity is still relatively limited beyond the general managerial and coordination functions and will depend largely on its ability to enlist assistance from other MNRE divisions and units. Because of the need to rely on data and input from multiple MNRE divisions, coordinated management of information flows between divisions and units will be critical. This has been a challenge for MNRE in the past because of the independent nature of most divisions and their traditional ways of working, bureaucratic procedures for inter-departmental information sharing, irregular internet access across units and employees (not all employees have equal access to the internet), non-digitalization of certain information, and the lack of MNRE intra-net configuration.

Figure 2
GEF Programme Management Division - Proposed Management Structure



Source: Government of Samoa, MNRE, Proposal for MNRE: GEF Programme Management Division, 2013.

For the GEF LDCF project, MNRE management estimates that managerial and administrative staff within the GEF Division, DMO, WRD and PUMA have the necessary capacity to undertake the majority of the activities associated with the project; however, they note that there will be constraints with regard to time that arise from having to work the additional project activities into the existing MNRE workload. Some of these constraints may be alleviated by the hiring of additional

local personnel for the GEF Division, DMO and Forestry and by obtaining the necessary IT hardware and software for the added staff.

Technical capacity

MNRE is one of Samoa's largest ministries and is comprised of numerous relatively independent divisions in charge of land, water and environmental planning and management. These divisions include the following: Corporate Services, Disaster Management, Environment and Conservation, Global Environmental Facility (GEF), Forestry, Land Management, Legal Services, Meteorology, Planning of Urban Management Agency (PUMA), Renewable Energy, Technical Services, and Water Resources. MNRE hosts the largest repository of knowledge and experience on climate issues and natural resources in the country. The MNRE divisions most directly involved with this project include GEF, Water Resources, Meteorology, Forestry, PUMA and the Disaster Management Office (DMO).

MNRE is also responsible for producing key policy documents on climate change programming for the country, such as the National Policy Statement on Climate Change and the National Adaptation Programme of Action for Climate Change. It is the designated secretariat for the National Climate Change Country Team (NCCCT), the members of which include various CEOs of thematically relevant ministries. In the past, the NCCCT served as the key coordination mechanism for national CCA response initiatives; currently, however, the body is not operational.

All MNRE divisions employ a number of well-trained experts but most still lack the necessary technical expertise and equipment for undertaking more complex and sophisticated measurement, forecasting and surveying work. As a result, some of this work must still be outsourced. This is particularly true for the water and land management divisions. MNRE has a predominantly young workforce (the majority are under 30 years of age), with less than five years of experience in the ministry and less than one-third on permanent contracts. This is both indicative of and exacerbated by relatively high staff turnover. Though turnover has decreased slightly in the past few years, it remains high because of competing and often better-paid opportunities in the private sector and abroad. Moreover, the MNRE mandate covers climactic variation and monitoring activity, yet the ministry does not yet have sufficient capacity dedicated to these areas or to broader CC management and its corresponding national cross-sector implications. These limitations will likely affect MNRE in its responsibility for activities related to components one and two of this GEF LDCF project.

The MNRE Corporate Review of June 2011 contains an MNRE Capability Plan for 2011-2012. This is the most recent plan produced by MNRE that addresses ministry capacity as it relates to factors affecting management objectives. Some of the specific capacity limitations indicated in the plan that may affect key MNRE divisions for the current GEF LDCF project appear in the table below (DOM is the only division relevant to this project that is not included in the report and, therefore, not included in the table). It is unclear to what extent action has been taken since 2011 to address these limitations since no follow-up reporting is available. Nevertheless, these areas should be reviewed in the context of the GEF LDCF project and the MNRE responsibilities for each of the project's components in order to prioritize required capacity development efforts and determine how these may be linked to broader

management goals.

Table 2
MNRE Capability Plan 2011-2012 – Capacity Gaps by Division

Division	Capacity Gaps Identified
Meteorology	• Absence of relevant acts and policies • Lack of proper information management system for response and relief coordination • Limited budgetary support/ability of customers to pay for services • Limited resources for training opportunities • Lack of technical equipment/rigs/lab testing • Lack of community communication methods; low recognition and awareness of services • Shortage of appropriate specialized qualified staff in technical areas • Overloading of current staff • Limited skills to apply new technology
Water resources	• Shortage of specialized/qualified staff for watershed surveys; hydrological assessment and monitoring; enforcement, inspection and monitoring • Lack of expert driller to man the rig • Limited capacity in hydro-geological technical expertise, horticultural, landscaping, and soil analysis work • Limited monitoring and assessment equipment for analysis and forecasting • Lack of operational knowledge and skills of existing & new technology • Lack of effective equipment for mapping groundwater resources • Limited cooperation and support from landowners; varying community involvement ▪ Weak monitoring and enforcement/policy formulation and implementation skills ▪ Shortage of staff ▪ Uncertain reliability of data and records on water resources and water related issues ▪ Issues with data ownership/accessibility and sharing of information ▪ Limited cultural understanding and oratory skills for consultations and limited negotiation skills for conflict resolution ▪ Lack of documentation of traditional knowledge
PUMA	▪ Limited technical, administrative, and decision making skills ▪ Limited IT resources (laptops, global positioning systems, desk top computers, etc.) ▪ Low community awareness ▪ Weak legal support for procedures, compliance and enforcement, and systems development ▪ Vacant positions
Forestry	▪ Lack of staff, planning and policy section for SAMFRIS data ▪ Limited skills in specialized areas of agro-forestry, biomass energy, plant science and biology, forest entomology and pathology, computer literacy and report writing ▪ Limited equipment for vegetative propagation regarding mass seedling production ▪ Need to update SAMFRIS data for mapping purposes due to massive change in forest cover since the tsunami of 2009 ▪ Limited and outdated software programs (Microsoft 2007) and hardware ▪ Limited understanding of policies regulating logging activities ▪ Number of registered farmers not increasing at an acceptable rate ▪ Limited information available for stakeholders regarding timber properties (structure, color, texture) ▪ Lack of community commitment ▪ Unclear boundary of community/villages land; problematic land ownership
GEF	• Limited staff • Lack of transport • Inconsistencies in methodology and technology application/limitations with relevant hardware and software and lack of standardization of these across MNRE • Limited information dissemination due to unclear data/information structures, IT usage and document management solutions • User reluctance to accept new technology

Source: MNRE Capability Plan 2011-2012
For the current GEF LDCF project, MNRE management notes the need for GEF Division local and international technical assistance. Within this technical assistance, an activity for immediate attention is the development of an M&E framework for the National Environment Sector Plan (NESP).

Given the scope of MNRE technical responsibilities for the GEF LDCF project, other critical capacity decisions to address include the following:

1. Assignment of CC experts to lead the various CC linked project activities: the inclusion of CCA components in sector plans; the inventory of ongoing and projected CCA related work; the review of current CC/DRM M&E systems and design of a national framework for this and for a centralized CC/DRM database, both with accompanying protocols for updating and maintenance; and the preparation and implementation of a general CC/DRM awareness campaign.
2. Incorporation of new and/or training of existing MNRE professionals to lead the IWMP activity for the Greater Apia area; implement eco-system based approaches to watershed management and flood mitigation; and develop flood protection measures (such as feasibility studies, climate-resilient designs, cost-benefit analyses, EIAs, SIAs, etc.).
3. Incorporation of expert capacity to lead research on climate and disaster vulnerable populations as well as the formulation of Village Disaster Management Plans.

For all of the capacity decisions detailed above, and in line with recent corporate planning, MNRE must also determine whether this expert technical capacity can or should be incorporated into the permanent structure of the ministry, and if so, within which division or divisions.

Administrative, planning, budgeting and financial management capacity

Based on the information contained in its most recent corporate and workforce plans and the past ministry experience with GEF projects, MNRE appears to be in reasonable condition administratively to undertake the planning and management for implementing this GEF project. The same is true for the requisite budgeting and financial administration involved, though the bulk of this responsibility will reside with the MOF. Nevertheless, recruitment and personnel management capacity constraints may be a concern and will need to be addressed. Some of these appear to be market driven, as noted above, but also the long and cumbersome processes involved in government recruitment can have a negative impact on project implementation and should be streamlined where possible.

It must be noted, also, that most MNRE divisions were established for purposes related to policy, planning and oversight. Project implementation, for the most part, is an additional responsibility for which current personnel have limited training and experience. Over the years, MNRE has developed considerable capacity in various aspects of project implementation through donor funded programs; nevertheless, areas such as international financial reporting and procurement, among others, still

represent major challenges for many MNRE professionals. This is compounded by the specific and varying requirements of individual donor countries and organizations providing assistance to Samoa, which are seldom consistent or uniform.

With regard to administrative infrastructure and equipment, many pertinent capacity references affecting the MNRE divisions involved in this project are reflected in Table 2 presented above. Almost universally, adequate IT hardware, software and access are an issue and will need to be addressed to the extent possible with the allocated funding linked to this project.

The IT issue is also closely connected to knowledge management and certain M&E activity. Limitations with technology access, hardware and software prevent much of the technical expertise in MNRE from being fully utilized. As noted previously in this review and in other official reports, many if not most MNRE staff do not have direct internet access, which thwarts capacity for research and effective communications with other stakeholders inside and outside of MNRE. It is also difficult for MNRE employees to access information produced outside of their particular division. Intra-ministerial data transfer requires significant lead-time for request and approval of senior division management, which diminishes efficiency and effectiveness. Expanded external and internal virtual communication (through broader internet and intranet utilization) and improved information sharing has the potential to improve both the timeliness and the quality of output ministry-wide and beyond. Less than fluid information flows appear to be one of the biggest hindrances to coordination within MNRE and the same seems true for other government ministries. A 2013 Audit Office review of MNRE also calls attention to these difficulties and recommends the creation of a centralized intra-ministerial knowledge center.

Also affecting MNRE knowledge management is the limited access most staff have to professional networking and learning opportunities, particularly outside of Samoa. Because of Samoa's relative size and isolation, lack of exposure to external knowledge, practice and experience will necessarily constrain development of national capacity on various fronts, technically and administratively.

Capacity recommendations

Based on the discussions above on MNRE internal capacity and information from the previous scoping mission, the following recommendations emerge as viable next steps. These recommendations aim to strengthen MNRE implementation of the GEF LDCF project and MNRE capacity for future programming and policy initiatives.

1. **Cultivation of permanent CC expertise within MNRE** – A stable team of CC professionals, with a designated leader, should be developed and maintained in the ministry (either housed within a specific division, such as Meteorology as has been discussed previously, or formed as an inter-divisional unit) so that MNRE has a visible and cohesive cadre of CC talent available to represent MNRE in this project and all CC related policy and programming. This already exists to some degree but functions in a more ad-hoc manner. Making the formation of this group more official—and adding or developing whatever specific CC skills and knowledge are currently lacking through internal training or periodic incorporation of outside talent--

will raise the level of CC as a thematic concern within the ministry and give MNRE an organized, professional team to which to delegate related policy and programming tasks. It will also help ensure consistency of CC input across projects and programs, which will benefit the GEF LDCF activity and other ongoing projects as well as future endeavors. This is also logical from the perspective of Samoa's natural geographical vulnerabilities and the amount of CC involvement MNRE has had to date. And it makes sense given the amount of international development assistance funding currently available for programming in this thematic area; with a more professional CC team in place, MNRE will be in better position to access more of this type of funding directly.

2. **Formation of a joint MNRE/MOF CC project committee** – A small committee should be created with select CC professionals from both MNRE and MOF to jointly and consistently deal with the different groups within each ministry that will be involved in this project. This committee should be responsible for defining from the outset the individual and joint roles for specific MOF and MNRE units, within the context of this project and also with a view to improved coordination for climate policy-making, planning, and implementation at the national level for present and future activity. The committee could also serve as the M&E oversight body for the project.

3. **Utilization of existing external best practice for local level project activity** – Because significant knowledge, experience and materials already exist within non-profit entities external to MNRE for certain CC/DRM local level activity, it is not necessary to develop this type of capacity internally. Rather, it is logical to incorporate expertise from the outside. Specific examples of this include the Red Cross experience with formulation of Village Disaster Management Plans and the Civil Society Support Program experience with surveying vulnerable populations.

4. **Conducting of additional technical capacity assessments** – This should be done, even through informal evaluations, to determine the levels and degrees of professional and infrastructural capacity requirements for the project's hydrology related activities linked to watershed management and flood mitigation. These assessments or evaluations should also determine which capacities related to these issues should be developed in house and which should be imported or outsourced.

5. **Improvement of IT and internet access** – This is a major priority for MNRE. As much as possible should be done in the context of this project and budget to facilitate reliable and consistent internet access for as many MNRE professionals as possible. This includes acquisition of needed equipment, implementation of necessary technological training, and widespread provision of adequate and reliable internet service. MNRE should also consider establishing a cross-divisional intranet for more effective ministerial data management; this could be set up either as a general information platform and communication vehicle or for CC/DRM specific content and professionals.

6. **Professionalization of international project management** - Internal MNRE training and mentoring for international program procurement, reporting, and M&E should be conducted to more firmly establish project implementation skills within the ministry for future utilization. This could also be done in collaboration with other

major ministries that have need of similar expertise to extend the reach of such capacity development and potentially reduce costs.

7. **Utilization of international best practice for national CC/DRM system** – MNRE and MOF should jointly research past and ongoing examples of projects centered on establishment of regional and national CC/DRM database and M&E systems for input to inform the design and implementation of similar systems for Samoa. Those that have been set up in small developing island nations may prove particularly useful. There is significant information compiled on this and considerable international expertise available to draw on. The UNFCCC can serve as a valuable contact in this regard, as can GIZ, the German development agency, and Inter-American Development Bank (IDB) that have financed a number of these projects. Some initial cases to investigate include the following:

- Philippines M&E System for the National Climate Change Action Plan, http://unfccc.int/files/adaptation/cancun_adaptation_framework/adaptation_committee/application/pdf/developing_an_me_system_for_the_nccap_-_giz_2013.pdf
- GIZ – M&E Adaptation at Aggregated Levels: A Comparative Analysis of Ten Systems, https://gc21.giz.de/ibt/var/app/wp342deP/1443/wp-content/uploads/filebase/me/me-guides-manuals-reports/GIZ_2013-M+E_of_Adaptation_Comparative_analysis.pdf
- Caribbean Disaster Emergency Management Agency (CDEMA), http://www.cdema.org/

III. Responsible Parties

Ministry of Finance

Project responsibilities

Although it is not the implementing partner, MOF plays a large and critical role in this project. As reflected in Table 1 above, MOF has responsibility for much of the activity associated with the project's first component outcomes and outputs. Half of this is to be carried out with MNRE and involves 1) addressing CCA more completely in the sector plans, the new Strategy for the Development of Samoa, and the National Adaptation Strategy; and 2) developing a complete inventory of all ongoing and projected CCA work—along with mechanisms for updating and maintaining this inventory; and 3) defining roles for both MOF and MNRE that will lead to improved national climate policy-making, planning, and implementation. The other half of this activity MOF will manage independently and this will involve: 1) developing detailed guidelines for CRICU functions (for accounting, budgetary and fiscal mainstreaming of climate change initiatives), along with guidelines for communities on financial management of projects that incorporate CCA and DRR/DRM; 2) developing guidelines/toolkits for preparation of a bi-annual CPEIR-style report on climate change expenditure and 3) producing one of these bi-annual reports as a means to harmonizing government agencies' CC M&E.

Additionally, in line with the project's third component and jointly with MNRE, MOF is responsible for 1) reviewing current CCA/DRR/DRM M&E systems to identify

best practice and opportunities for creating reporting standardization; 2) establishing a framework and guidelines for a national standardized CCA/DRR/DRM M&E system to report data on water resources, land management, village development and other pertinent topics; and 3) developing a standardized reporting modality for harmonized M&E of CCA interventions' spending and progress.

The MOF divisions that will be most involved in the GEF LDCF project work will be the Climate Resilience Investment Coordination Unit (CRICU), the Economic Policy and Planning Division (EPPD), and the Aid Coordination and Debt Management Division. MOF estimates that for most of the project activities, existing capacity within these ministry divisions should be sufficient in terms of administrative ability, middle management, IT systems and office space to handle the additional work required. Several points related to MOF management and experience help to substantiate this view.

First, as chair of the steering committee for this project, as well as those of the National Adaptation Fund (NAF) and the Pilot Programme for Climate Resilience (PPCR), the MOF is in a prime position to promote coherent coordination for national CC related programming. Also, through its involvement with the first phase of the PPCR, the CRICU has now been fully mainstreamed in the MOF with absorption of staff and an allocation in the ministry's 2013-14 budget. The unit will have operational responsibility for coordination of all climate resilience activities in Samoa. Through EPPD, MOF is already responsible for the coordination of the country's 14 sectors that contribute to the national development strategy and program objectives. It conducts bimonthly meetings attended by the coordination units of each sector and selected MOF officials that work toward harmonized accounting and reporting procedures, improved collaboration among related ministries and agencies, and better management of national data and information. Thus, EPPD is in the best position for facilitating the development of cross-sector CC/DRM mechanisms and structures as well as for coordinating input for related national strategy and policy. Even with the official coordination responsibilities mandated for CRICU and EPPD, however, the MOF does admit to difficulties with gathering relevant data and information from the various sectors and their lead ministries. These difficulties are rooted in various issues—including proprietary mentality, limited resources and capacity, and lack of internal knowledge management systems—and will affect the coordination required for some of the outputs associated with the first project outcome.

Additionally, as the leading state financial entity, MOF manages the centralized database of donor assistance through which all external development financing must pass prior to allocation. Direct access to this data, along with the information compiled on national productivity by the Samoan Bureau of Statistics, provides the MOF with the most comprehensive view of national expenditures. This, in turn, allows for widespread, macro analysis of cross-sector expenditures related to CC and DRM. From its extensive experience with World Bank projects, the MOF has developed expertise with international accounting and reporting procedures as well as donor coordination.

Also, the MOF has been the principal government agency working with UNDP and other international partners on the national Climate Public Expenditure and

Institutional Review (CPEIR) project, which has provided the ministry with a background in concepts of CC fiscal management. For the revised, more in-depth CPEIR methodology, however, the MOF will need to rely on outside technical assistance, which could come from local and/or international sources, depending upon professional availability. Also for this, within the broader Asia Pacific region, the CPEIR experiences from Thailand, Nepal and possibly the Philippines may serve as useful sources of information and talent.

Capacity recommendations

1. **Formation of a joint MNRE/MOF CC project committee** – See above recommendation for MNRE.

2. **Utilization of international best practice for national CC/DRM system** – See above recommendation for MNRE.

3. **Incorporation of international experience for CRICU/CPEIR development –** Other countries inside and outside the Asia Pacific region have broader experience with developing the professionals and systems necessary to monitor, coordinate and report on climate related public spending and investment. This experience should be leveraged for the development of MOF CRICU officials and for the production of the desired CPEIR guidelines, templates and documentation. If possible, this type of capacity building should take place over the extended period of the project as opposed to in isolated training sessions. Research should be done to identify international professionals willing and able to conduct several missions throughout the project timeline and also be available for online consultations between visits. This type of intervention ensures that consultancies are conducted with a view to developing sustainable expertise within the MOF for future application to national projects. The Thai, Nepalese and Filipino experiences referred to above may useful for this.

Land Transport Authority

Project responsibilities

As presented in Table 1 above, LTA responsibilities within the context of this project revolve around 1) the constructions and supervision of flood protection measures (e.g. drainages, feasibility studies, climate resilient designs, cost-benefit analyses, environmental and social impact analyses, etc.); and 2) building flood protection infrastructure along the Vaisigano River. These activities will involve primarily the management and technical staff of the LTA Procurement and Programming Division as well as the Road Operations Division. LTA also usually out-sources portions of its work, based on the available internal capacity. In terms of the design of the flood protection measures, the ultimate responsibility for this rests with MNRE via the Water Sector (PUMA and WRD). The actual designs, depending on the measures, are usually outsourced as well.

From a review of LTA leadership credentials, information contained in the latest LTA Corporate Plan and Capability/Workforce Plan, and feedback from LTA professionals close to the project, it appears that LTA has the requisite fundamentals in place to take on the additional activities connected with the GEF LDCF project and that this

participation will contribute to LTA's overall strategic plan and development of its core functions. Though only in operation since 2009 as an independent agency, the LTA has its antecedents in the national Ministry of Works, Transport and Infrastructure. Mandated by the Land Transport Authority Act of 2007, LTA brings together the Road Asset Management and Road Use Management functions previously carried out by the MWTI in an effort to focus concentrated attention on the development of a safe and environmentally sound national land transport network.
Because of certain human resource and technical constraints, however, some capacities will need to be incorporated into the LTA and/or outsourced as a means to complying with all of the responsibilities the corresponding activities entail. The capacities targeted for development in LTA in conjunction with this project include the following:

- Design and/or supervision consultancy advising
- Flood modeling software and technological training for technical staff on its utilization
- Training for technical staff on flood modelling, asset management, procurement and project management
- Calibration and upgrading of laboratory equipment pertinent to the project
- Contracting of a drainage engineer to work with the drainage team within the Procurement & Programming Division

It is likely that the majority of the inputs for developing these capacities will need to be sourced internationally. While the design and supervision consultancy advising could potentially be provided by local professionals, the size of the Samoan labor pool combined with the availability of key technical professions may prove challenging.

Capacity recommendations

1. **Conducting of more thorough technical assessement** – More in-depth study should be applied to the detailing of specifications for needed technical capacities related to flood modeling software, technical training, laboratory equipment upgrading, and the contracting of an outside drainage engineer. Additionally, research must be done to determine the best potential sources for developing these capacities.
2. **Establishment of a Project Coordinating Unit (PCU) within the LTA** – should be done so that the knowledge and skills developed within the course of this project can be successfully transferred to LTA professionals and documented in appropriate formats so this learning can be sustained within LTA for futrue application.

Scientific Research Organization of Samoa

Project responsibilities

In line with the information from the project logframe in Table 1, SROS responsibilities for this project correspond to the second component outputs and include 1) the assessment of value chains (including product development and cost-benefit analyses) for breadfruit, coconut, cocoa, *misiluki*, papaya, *laupele* and taro

production; 2) the training of women and youth on technical skills for selected agricultural value chains; and 3) the provision of planting materials and household processing facilities for agricultural products. All of these activities are to be carried out in jointly with WIBDI.

SROS is an independent corporate body constituted and operating under the provisions of the Scientific Research Organization of Samoa Act of 2008. At present, SROS is core funded by the Government of Samoa with a commitment to strengthening its earning capacity to reduce its dependency on public funding. Ongoing revenue streams currently come from its technical and consultancy services provided to key stakeholders. SROS contribution towards the priority areas of the Strategy for the Development of Samoa's (SDS) 2012-2016 occurs across all four critical sectors mentioned: agriculture, economics, health and environmental sustainability. Thus, the objectives of this project and the SROS role within it coincide thematically and strategically with national interests.

Reviewing the SROS Corporate Plan for 2014-2016, previous annual reports and input from its leadership, SROS appears to possess the general capacity required for it to comply with its project responsibilities. But time constraints will still be an issue, as is the case with other responsible parties. Existing middle and senior management staff likely have the professional capacity to undertake the additional activities involved in the project, but their current responsibilities with other ongoing work will compete for their time. Major challenges in this regard may affect the collation of information for the value chain analysis and certain training, especially that related to SROS based projects such as those involving cocoa fermentation and breadfruit flour.

Given that funding capacity is available for the required material, local expertise and transport costs associated with project activity, the biggest professional capacity concern is that of technical assistance and coordination, which could be provided by a project coordinator who would manage and consolidate project inputs from the various SROS divisions involved and other key stakeholders. This type of professional could also be hired from within Samoa without having to recruit internationally.

SROS management indicates that the recent Integrated Climate Change Risks in the Agriculture and Health Sectors (ICCRAHS) project that SROS was involved with has lessons to offer for this project as well. ICCRAHS was a project that aimed to link long-term climate change and short-term seasonal variability information and advice to agricultural and health services, among other objectives, to inform and improve upon national policies and implementation of the sector plans. It had a project coordinator position that was placed within the Ministry of Agriculture and Fisheries (MAF) and this arrangement worked well for all involved. Something similar could be attempted with SROS for this project. Additional lessons from ICCRAHS could be applied with regard to the livelihoods component of this project

Capacity recommendations

1. **Local hiring of a Project Coordinator or similar professional** – This person would work with SROS to manage and consolidate project inputs from the various SROS divisions involved and from other key stakeholders. Thorough documentation

of activities and trainings commissioned would ensure that learning stays within SROS for future reference in spite of the temporality of the position.

2. **Building on ICCRAHS experience** – Lessons from this project can be used to transfer (or replicate) the MAF-located vehicle to SROS to link with the GEF LDCF activities. Also, ICCRAHS lessons with demonstration plots and agricultural livelihoods may also be applicable to aspects of the GEF LDCF project activity.

Women in Business Development Incorporated

Project responsibilities

The involvement of the non-profit Women in Business Development Incorporated (WIBDI) in the GEF LDCF project is similar to that of SROS but somewhat more extensive. It centers on the following: 1) the assessment of value chains (including product development and cost-benefit analyses) for breadfruit, coconut, cocoa, *misiluki,* papaya, *laupele* and taro as well as for handicrafts such as wood carvings and *siapo*; 2) the training of women and youth on technical skills for selected agricultural and handicraft value chains; and 3) the provision of planting materials and household processing facilities for agricultural products.

WIBDI is one of Samoa's most successful non-governmental organizations. Founded in 1990 with the aim of involving women in business, the group's mission has evolved to focus on strengthening village economies in ways that complement indigenous traditions and promote fair trade. The organization relies on funding from Oxfam New Zealand and the New Zealand Aid Programme, but it is also working toward securing more of its income through project related activity. WIBDI works to empower and equip rural families and help them establish sustainable businesses. It also works with global and regional trading partners, several of which are large conglomerates like The Body Shop, All Good Organics and C1Espresso that are interested in organic agricultural production. This combination has been extremely successful with connecting rural families to larger cash economies and global trade. It is also a convenient fit for the objectives of the second component of this GEF LDCF project.

Reviewing WIBDI annual reports, work plans, strategies, case studies and internal feedback, the organization appears to have sufficient capacity within its mid-level and senior management, IT systems and organics production team to handle the responsibilities detailed for its involvement in this project. It would need to add a number of temporary staff members, acquire some additional IT hardware and software, but all of these additional human and infrastructural capacities should be available locally.

Capacity recommendations

1. **Local hiring of a Project Coordinator** – This person would work with WIBDI to manage and consolidate project inputs from inside the organization and also from key external stakeholders. It might also be advisable to combine this position with the similar post described for SROS above, especially given their overlap with project planning and implementation objectives. Thorough documentation of activities and

trainings commissioned would ensure that learning stays within WIBDI for future reference in spite of the short-term nature of the position.

2. **Detailing of required IT hardware and software** – Additional attention should be devoted to detailing, documenting and costing the specifications for needed IT components to assure maximization of available budget for the project necessities as well as for the WIBDI infrastructure.

IV. Conclusion

Much of the capacity required to successfully complete the activities contemplated in this GEF LDCF project appears to be in place already within the entities selected for implementation. MNRE, the implementing partner, and the other major responsible parties—MOF, LTA, SROS and WIBDI—all have significant national programming experience which should provide adequate preparation for most of the project activities they will lead in the context of this project.

Regarding existing capacity gaps, most of those noted in this review stem from issues related to Samoa's size and geographic position and how these affect its professional labor pool and breadth of programming experience. As a result, international resources will be necessary for filling some of the capacity needs.

In the case of MNRE, capacity recommendations for the project focus on several major issues: 1) the development of additional CC expertise in the ministry, the organization of this CC expertise into a more formal structure within the ministry, and the officilization of the CC coordination functions with the MOF; 2) improved IT infrastructure, connectivity and knowledge management; 3) more in-depth assessment for particular technical requirements, especially with regard to hydrology; 4) the utilization of international best practice for design and implementation of national CC/DRM systems; and 5) the incorporation of more long-term international project management training for MNRE officials. There is some degree of overlap with capacity recommendations for the MOF given their joint oversight responsibilities for various activities, with the added suggestion that international best practice also be investigated and utilized for capacity strengthening of CRICU, particularly with regard to building the requisite skill set for CPEIR operations. For the rest of the responsible parties, the capacity recommendations are primarily related to inclusion of additional personnel and upgrading of technical and technological infrastructure.

Appendix 1
Project logframe

Economy-wide integration of Climate Change Adaptation and Disaster Risk Management/Disaster Risk Reduction to reduce climate vulnerability of communities in Samoa

Proposed activities and rationale

COMPONENT 1. STRATEGIC INTEGRATION OF CLIMATE CHANGE ADAPTATION AND DRM IN NATIONAL POLICY FRAMEWORKS AND DEVELOPMENT PLANNING THROUGH AN ECONOMY-WIDE APPROACH

OUTCOME 1.1. Policy Strategies/Institutional Strengthening: CC Adaptation, DRR and DRM mainstreamed in relevant policies, sectoral strategies, sub-national strategies and budgeting processes through enhanced coordination of government institutions.

Output 1.1.1. National Adaptation Strategy developed including integration of climate change considerations into sector plans.

Budget: US$300,000

1. A proposed National Climate Change Adaptation Strategy will be developed. This would form a building block of the National Adaptation Plan process. In addition, the project will facilitate integration of climate change adaptation and DRM into the Strategy for the Development of Samoa as well as sectoral planning. Explicit consideration of climate change in sectoral and development plans will support climate-resilience of all aspects of Samoa's planning and budgeting for recurrent expenditure.

2. Activities will include:
   - **1.1.1.1** Integration of medium and long-term climate change risks and opportunities into sector plans.
   - **1.1.1.2** Develop concrete recommendations to be taken into account for the Strategy for the Development of Samoa (2017–2021) to reflect climate change risks and opportunities.
   - **1.1.1.3** Produce the National Adaptation Strategy aimed to mobilise the integration of adaptation in medium and long-term planning and budgeting processes in Samoa

Output 1.1.2. Institutional and operational frameworks for coordination of climate change adaptation strengthened.

Budget: US$300,000

3. The respective roles and responsibilities of MNRE and MoF with regard to coordination of policy-making, planning and implementation of climate

change activities will be defined. This will support the mainstreaming of climate change adaptation into sectoral and development planning (as outlined under Output 1.1.3).

4. A stock-taking exercise will be undertaken to update the inventory of all current and planned climate change adaptation projects in Samoa on the status of all current and planned climate change adaptation projects in Samoa. Based on this stock-taking, capacity for the coordination of climate change activities will be strengthen. This will serve to prevent duplication of initiatives and identify gaps in planning and implementation. The resulting improvements in efficiency and coordination will increase the benefits provided to local communities.

5. Specific guidelines for CRICU's functions will be prepared to guide fiscal mainstreaming of climate change adaptation into budgetary and accounting frameworks. This will enable more streamlined and efficient management of climate finance that will support sequencing and prioritising of climate change activities.

6. Activities will include:
   - **1.1.2.1** Define roles for MoF and MNRE to ensure coordinated climate policy-making, planning, and implementation.
   - **1.1.2.2** Conduct updated stocktaking of all current and planned climate change adaptation projects, plans, reports and assessments.
   - **1.1.2.3** Strengthen climate change coordination to improve decision-making and project management of national climate change activities.
   - **1.1.2.4** Develop specific guidelines for CRICU functions including accounting, budgetary and fiscal mainstreaming of climate change initiatives.

OUTCOME 1.2. Public finance management at the national and village level: Capacity to access, manage, implement and monitor use of climate change funds is enhanced at the national and village level.

Output 1.2.1. National- and village-level governance structures have enhanced capacity to manage and monitor climate finance.

Budget: US$225,000

7. Communities will be training on accessing and managing finances for climate change adaptation. This training will include identification of adaptation priorities, project design, funding proposals and financial management of projects. Communities will be better able to apply for funding to implement community-based adaptation activities independently of government- and donor-driven projects.

8. The methodology of the CPEIR will be refined to produce guidelines for preparation of a bi-annual report on climate expenditure. Based on the revised methodology, one bi-annual report will be piloted to finalise the guidelines and toolkits. This will support improved M&E of climate expenditure to enhance

the mainstreaming of climate change in sectoral planning and budgeting under Outcome 1.1.

9. Activities will include:

1.2.1.1 Develop guidelines for communities on financial management of projects, incorporating CCA and DRR/DRM.

1.2.1.2 Train communities on managing finances for climate change adaptation and DRM.

1.2.1.3 Develop guidelines/toolkits for preparation of a bi-annual CPEIR-style report to analyse climate change expenditure.

1.2.1.4 Produce one bi-annual report on climate change expenditure as a means for harmonising government agencies' monitoring of climate change.

COMPONENT 2. ENHANCE RESILIENCE OF COMMUNITIES AS FIRST RESPONDERS OF CLIMATE CHANGE-INDUCED HAZARDS

OUTCOME 2.1. Protection of communities' physical assets and livelihoods: Increased resilience, and decreased exposure and susceptibility of communities to climate change and natural disasters by protection of household and community assets and promoting resilient livelihoods.

Output 2.1.1. "Ridge-to-Reef" Integrated Watershed Management Plan for Greater Apia.

Budget: US$1,200,000

10. An integrated watershed management plan for catchments the Greater Apia area will be developed to identify root causes of climate vulnerability. Based on the vulnerabilities identified, climate-resilient flood protection measures will be designed to protect communities from climate risks.

11. Activities will include:

2.1.1.1 Develop an integrated watershed management plan for the catchments in the Greater Apia area.

2.1.1.2 Design flood protection measures to build resilience of communities (including feasibility study, climate-resilient design, cost-benefit, EIA, SIA, etc.).

Output 2.1.2. Hard and soft measures for protection of community assets.

Budget: US$7,900,000

12. Based on the climate-resilient designs produced under Output 2.1.1, flood protection measures will be build to protect community assets and livelihoods as well as critical infrastructure in the Greater Apia area from climate risks. In addition, ecosystem-based approaches to watershed management will be implemented in the upper catchment areas address the root cause of flood risks. Community assets (e.g. houses, sanitation, drinking water sources) in

high risk areas will be reconstructed following the "building-back-better" principle. This output will serve as a demonstration of integrated management of climate risks following a "Ridge-to"Reef" approach.

13. Activities will include:
2.1.2.1 Build flood protection infrastructure along Vaisigano River.
2.1.2.2 Implement ecosystem-based approaches to watershed management and flood mitigation.
2.1.2.3 Reconstruct community assets following "building-back-better" approaches.

Output 2.1.3. Sustainable micro-businesses for youth and women on agro-food and manufacture with a sustainable and resilient value chain approach to promote diversified livelihoods.

Budget: US$830,000

14. Income-generating opportunities for communities will be improved by diversifying community livelihoods. Sustainable value chains for crops and handicrafts will be identified. Based on the value chain analysis, women and youth groups will receive technical training related to crop production and processing as well as manufacture of handcrafts. Strengthened livelihoods will enhance communities' capacity to adapt to climate change independently.

15. Activities will include:
2.1.3.1 Assess value chains (including product development and cost-benefit analyses) for breadfruit, coconut, cocoa, *misiluki*, papaya, *laupele* and taro.
2.1.3.2 Assess value chains (including product development and cost-benefit analyses) for handicrafts such as wood carvings and *siapo*.
2.1.3.3 Train women and youth on technical skills for selected agricultural value chains.
2.1.3.4 Train women and youth on technical skills for selected handicraft value chains.
2.1.3.5 Provide planting materials and household processing facilities for agricultural products.

OUTCOME 2.2. <u>CCA/DRR plans and implementation:</u> Increased adaptive capacity of communities for implementation of effective risk management and protection of household and community assets.

Output 2.2.1. Building on the work of DMO, village plans designed and implemented to develop the capacities of communities to prepare, respond, recover and manage CC risks.

Budget: US$630,000

16. Household surveys will be conducted to identify vulnerabilities of communities to climate risks. Based on the household surveys, Village Disaster Management Plans will be developed to support communities to act as

"first responders" to disasters. Community members will be trained on the implementation of the disaster management plans. This will enable communities to prepare for, respond to, recover from and manage climate risks.

17. Activities will include:

2.2.1.1 Conduct household surveys to map vulnerability to climate risks.

2.2.1.2 Analyse data from household surveys to identify most vulnerable groups and communities.

2.2.1.3 Develop Village Disaster Management Plans.

2.2.1.4 Provide training on the implementation of Village Disaster Management Plans

COMPONENT 3. MONITORING AND EVALUATION AND KNOWLEDGE MANAGEMENT

OUTCOME 3.1. Knowledge about CCA and DRR is captured and shared at the regional and global level.

Output 3.1.1. Knowledge management strategy developed, including national awareness campaigns and information sharing through existing international platforms and new multimedia platforms (feeding into R2R programme)

Budget: US$230,000

18. Based on the databases developed through the NAPA projects – and in coordination with the work of the Rio+ project – a national climate and disaster risk database will be established. This database will be linked to the national M&E framework (see Output 3.1.2) and will provide information on *inter alia*: i) climate change scenarios; ii) expected effects of climate change; iii) international best practices on climate change adaptation and DRM; and iv) lessons learned from national adaptation activities. This will improve the access of government institutions, donor agencies and NGOs to knowledge on climate change risks. Line ministries will consequently be better able to plan and budget for climate change adaptation (supporting work under Component 1 of this project). In addition, awareness campaigns on climate change adaptation and DRM will target village leaders and the general public. "User-friendly" media – especially video – will translate scientific findings into useful guidance for the general public.

19. Activities will include:

3.1.1.1 Develop protocols for storage and sharing of information/data between government institutions.

3.1.1.2 Establish a national climate and disaster risk database that is centralised and accessible to all Ministries.

3.1.1.3 Develop and pilot plan for systematised uploading and monitoring of data and information generated in Samoa on international platforms.

3.1.1.4 Conduct awareness campaigns on water resources, land management, village development, climate change adaptation and DRR/DRM following the R2R approach.

Output 3.1.2: M&E system established to strengthen institutional coordination and enhance the effectiveness of the interventions on adaptation with an economy wide approach.

Budget: US$120,000

20. A standardised M&E framework will be established to support harmonisation of reporting systems between government institutions as well as the private sector, NGOs, CSOs and villages. The national M&E framework will feed into the national climate database (Output 3.1.1) as well as the bi-annual climate expenditure report (Output 1.2.1). This would enable: i) less labour intensive monitoring; ii) greater comparability of results; and iii) improved tracking of progress at a national level. Consequently, the mainstreaming of climate change adaptation into sectoral and development planning will be based on up-to-date information on national adaptation activities.

21. Activities will include:

3.3.1.1 Review current M&E systems to identify best practices and opportunities for standardisation of reporting modalities.

3.3.1.2 Establish a national M&E framework with guidelines for collecting, analysing and reporting of data on water resources, land management, village development, climate change adaptation and DRR/DRM

3.3.1.3 Develop a standardised reporting modality to enable harmonised monitoring, evaluating and reporting of expenditure and progress of interventions for climate change adaptation.

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Documentation reviewed for capacity analysis

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Appendix 3
Information sources for project preparatory mission, September-October 2013

Entities consulted:

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- International Red Cross
- Land Transport Authority (LTA)
- Ministry of Agriculture and Fisheries (MAF)
- Ministry of Commerce, Industry and Labor (MCIL)
- Ministry of Finance (MOF)
- Ministry of Health (MOH)
- Ministry of Natural Resources and Environment (MNRE)
- Ministry of Women, Community and Social Development (MWCSD)
- Ministry of Works, Transport and Infrastructure (MWTI)
- Samoa Chamber of Commerce and Industry
- Samoa Tourism Authority (STA)
- Samoa Umbrella for Non-Governmental Organizations (SUNGO)
- Small Business Enterprise Center (SBEC)
- South Pacific Business Development (SPBD)
- United Nations Development Programme (UNDP)
- Women in Business Development Incorporated. (WIBDI)

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Appendix 4
Follow-up capacity questions for implementing partner and responsible parties
UNDP Samoa GEF LDCF project
March 2014

Project: *Economy-wide integration of Climate Change Adaptation and Disaster Risk Management/Disaster Risk Reduction to reduce climate vulnerability of communities in Samoa,*

Participants: Key focal point(s) in each of MNRE, MOF, LTA, SROS and WIBDI

Instructions: In reference to the logframe for the UNDP Samoa GEF LDCF project indicated above, and with regard to the project activities for which your entity will be responsible, please answer the following questions, as precisely and specifically as possible:

1. Which specific capacities (administrative staff, middle management, senior management, IT systems, office space, etc.) and departments will be most taxed with the additional GEF LDCF work?

2. What types of inputs could best alleviate this situation (additional temporary admin, outside consultants, additional IT hardware or software, office space, etc.)?

3. Regarding the inputs listed in (2) above, which are likely to be available from within Samoa and which will need to be obtained from external sources?

Appendix 5

GEF supported projects in Samoa, 1998-2014

Scope and Project	Area*	IA/ExA	GEF Approval date
National: Preparation of National Biodiversity Strategy and Action Plan, and First National Report to the COP of the CBD	BD	UNDP	March 1998
National: Additional Funding of Biodiversity Enabling Activity	BD	UNDP	July 2001
National: Initial Assistance to Samoa to Meet its Obligations under the Stockholm Convention on POPs	POPs	UNDP	September 2001
National: Programme of Action for Adaptation to Climate Change	CC	UNDP	December 2002
National: Marine Biodiversity Protection and Management	BD	WB	January 1999
Regional: Pacific Islands Climate Change Assistance Programme	CC	UNDP	October 1995
Regional: Pacific Islands Climate Change Assistance Project Phase II	CC	UNDP	July 2000
Regional: Pacific Islands Renewable Energy Program	CC	UNDP	February 2002
Regional: South Pacific Biodiversity Conservation Programme	BD	UNDP	May 1991
Regional: Implementation of the Strategic Action Programme of the Pacific Small Island Developing States	IW	UNDP	July 1998
Global: Biosafety	BD	UNEP	2004
National : Clearing House Mechanism Enabling Activity	BD	UNDP	September 2000
National: National Capacity Self-Assessment for Global Environmental Management	MF	UNDP	June 2004
National: LDC/SIDS Portfolio Project: Capacity Building for Sustainable Land Management in Samoa	LD	UNDP	May 2006
Regional: Pacific Islands Greenhouse Gas Abatement through Renewable Energy Project	CC	UNDP	June 2005
Regional: Pacific Islands Oceanic Fisheries Management Project	IW	UNDP	April 2005
Small Grants Program	MF	UNDP	2005
Global: Community-based Adaptation Program	CC	UNDP	August 2006
National: Integrating Climate Change Risk and Resilience into Forestry Management in Samoa (ICCRIFS)	CC	UNDP	2009
National: Integrating Climate Change Risks into the Agriculture and Health Services in Samoa (ICCRAHSS)	CC	UNDP	2009-2013
GEF/LDCF "Economy wide integration of Climate Change Adaptation and DRM/DRR to reduce climate vulnerability of Communities in Samoa"	MF	UNDP	2014-2020

***Note:** Area thematic description corresponds to the following: BD=biodiversity; CC= climate change; IW=international waters; LD=land degradation; MF= multi-focal.

Source: Government of Samoa, MNRE, Proposal for MNRE: GEF Programme Management Division, 2013.

USAID
FROM THE AMERICAN PEOPLE

USAID Climate Change Adaptation Project Preparation Facility for Asia and the Pacific (USAID Adapt Asia-Pacific)

ECONOMY WIDE INTEGRATION OF CC ADAPTATION AND DRR/DRM TO REDUCE CLIMATE VULNERABILITIES OF COMMUNITIES IN SAMOA

SOCIO-CULTURAL GENDER REPORT

PHOTO CREDIT: Courtesy of WIBDI Website

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For Asia And The Pacific (USAID Adapt Asia-Pacific)

ECONOMY WIDE INTEGRATION OF CLIMATE CHANGE ADAPTATION AND DISASTER RISK MANAGEMENT/ DISASTER RISK REDUCTION TO REDUCE CLIMATE VULNERABILITY OF COMMUNITIES IN SAMOA

SOCIO-CULTURAL GENDER CONSIDERATIONS

DISCLAIMER

The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

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TABLE OF CONTENTS

ACRONYMS

ADB	Asia Development Bank
CBO	Community Based Organization
CBDAMPIC	Capacity Building for Development of Adaptation Measures in Pacific Island Countries
CCA	Climate Change Adaptation
CC	Climate Change
CEDAW	Convention for the Elimination of All Forms of Discrimination Against Women
DRR	Disaster Risk Reduction
DRM	Disaster Risk Management
GoS	Government of Samoa
LDCF	Least Developed Country Fund
MAF	Ministry of Agriculture & Fisheries
MNRE	Ministry of Natural Resources, Environment and Meteorology
MWCSD	Ministry of Women Community and Social Development
NAPA	National Adaptation Programme of Action
NGO	Non-Governmental Organization
NOLA	Nuanua O le Alofa
PDNA	Post Disaster Needs Assessment
PICs	Pacific Island Countries
PIF	Project Implementation Framework
SBEC	Samoa Business Enterprise Centre
SPBD	South Pacific Business Development
SSVG	Samoa Victim Support Group
UNDP	United Nations Development Programme
WIBDI	Women in Business Development Incorporated
YEP	Youth Employment Project

FOREWORD

EXECUTIVE SUMMARY

The increased recognition that climate change seriously threatens human development has contributed to the recognition of the need to pay more attention to the different effects that climate change has on different segments of society based on their gender, age and economic level. Climate change may increase inequality the world over if attention is not paid to its causes and effects.

This report has been commissioned to provide an assessment of social participation in the conceptualization, decision-making and implementation of development interventions in targeted communities, as they relate to all the planned activities of this specific project in Samoa and to provide direction for the implementation of specific activities to address the vulnerable populations, particularly women. Women in Samoa are recognized as vulnerable due to the socio-political tradition of the country that is largely patriarchal with economic, social and cultural factors promoting the ascension and power of men more than women, in public life and at home. This vulnerability is increasing with the transition to a cash-based economy.

The project focus is on an economy wide/integrated approach to DRR/DRM and CC with a key focus on enhancing the resilience of communities as first responders of climate-induced hazards. This assessment seeks to provide direction for a broad approach within which all socially vulnerable groups, in particular women's groups can be identified/considered and have their adaptive capacity strengthened through the Project.

The assessment used as a basis the six socially vulnerable groups in Samoa identified in a report on poverty, vulnerability and social protection conducted in 2012. Other vulnerable groups include youth, children, elderly, people living with disabilities and rural communities. It assessed the social participation of women and these five other groups in decision-making and in development interventions with an extensive literature review done and a rapid appraisal in country, during two field visits.

The report has a specific focus on enhancing the resilience of women to respond during climate change induced hazards with a focus on the development of business incubators for women with a sustainable and resilient value chain, to promote diversified livelihoods in accordance with Output 2.1.1 of the Project Implementation Framework.

On a broad level, the assessment identified the following:

- The need to conduct a comprehensive vulnerability assessment for the whole of Samoa.
- The need to develop more in-depth understandings of resilience and adaptation within communities in a creative, facilitated, interactive manner.
- The need to strengthen communities and individuals through better planning for disasters and to ensure that the most vulnerable are able to access support during relief operations.
- The need to develop a systematic approach to relief distribution and the governance of relief distribution at the community level, and shelter management with holistic care for a range of people, including vulnerable groups.

On a gender specific level:

- The need to review the impact of livelihoods projects on women's empowerment.
- The need to further train and build capacity among women in Samoa in CCA.
- The need to work with existing organizations such as Women in Business Development International to build on and expand specific interventions that contribute directly to enhancing the resilience of women to respond to climate change induced hazards and contribute to environmental sustainability.

As a result of the assessment, a number of interventions have been proposed within the three Project components directly linked to the following recommendations.

Recommendation 1:
The LDCF provides support to the systematic identification of where the socially vulnerable communities are in Samoa through the gathering of household survey data and the proper analysis of the data.

Recommendation 2:
The LDCF project allocates support towards the analysis of past livelihoods initiatives and the impact on vulnerable populations in particular the empowerment of women in Samoa.

Recommendation 3:
The LDCF project provides grant support for Women in Business Development International to build on existing projects that directly benefit women, enhance their adaptive capacity to respond to climate induced hazards and enhance environmental sustainability.

Recommendation 4:
The LDCF project ensures that all relevant NGO and CSO working with socially vulnerable populations be strategically engaged in the delivery of the project through its Project Management Framework.

Recommendation 5:
The LDCF project provides support towards capacity building and training for representatives from socially vulnerable communities, specifically women's groups and contributes to monitoring the effects of climate change and providing an in-depth understanding of resilience and using a creative, facilitated, experiential approach.

1 INTRODUCTION

Climate change is a multi-dimensional problem that is today a priority on the international development agenda. While affecting people generally, these conditions render women and the poor particularly more vulnerable. According to UNDP, because projections indicate that climate change will cause less secure means of subsistence, more vulnerability to hunger and poverty, exacerbation of social inequalities (including gender inequalities) and more environmental degradation, the poorest and most vulnerable countries will be most affected.[1]

There is also more recognition that climate change seriously threatens human development. Depending on social categories such as gender, age, economic level and ethnic groups, climate change has and will have different effects. If attention is not paid to its causes and effects, climate change may increase inequality the world over.

In view of this reality, ensuring the participation of women, men, young people, boys and girls in developed and less developed countries alike is not only a matter of social justice and respect for human rights in the present, but also one of great significance for future generations. UNDP recognizes that there can be no effective and efficient battle against climate change unless there is equitable representation of all segments of society in decision-making at all levels. [2]

In recognition of the high exposure and vulnerability of Samoa to the impacts of natural hazards and climate change, the Government of Samoa is proactively pursuing a number of strategies to reduce risks associated with these hazards and mitigate and adapt to present and future climate change.

[1] UNDP Resource Guide on Gender and Climate Change, 2009.
[2] Ibid.

The objective of this particular project is to establish an economy-wide approach to climate change in Samoa that provides for efficient integration and management of adaptation and DRR/DRM into national development planning and programming and for enhancing the resilience of communities to CC and natural disasters.

In line with the focus of the project on an economy wide/integrated approach to DRR/DRM and CC, this assessment seeks to provide direction for a broad approach within which all socially vulnerable groups can be identified/considered and have their adaptive capacity strengthened as part of the project.

1.1 BACKGROUND

In the effort to ensure the equitable representation of all segments of Samoa in the project, the Socio-Gender and Cultural Specialist carried out an assessment of social participation in the conceptualization, decision-making and implementation of development interventions in targeted communities, as they relate to all the planned activities of the project.

The Specialist was required to identify shortcomings, challenges and obstacles in the active engagement of all social groups and the consideration of their specific needs in these processes, as well as opportunities to strengthen their roles and bring about transformational change in their lives and communities in the context of activities that will be implemented with financing from the LDCF. In line with the specific requirements of USAID Adapt Asia-Pacific, a specific gender activity is also included, which identifies specific interventions to addressing gender inequality through the empowerment of women.

The project aims to achieve its objective through a strategic combination of technical assistance and investments in adaptation pilot demonstration of hard measures through three main components:
1) Strategic integration of climate change adaptation and DRM in national policy frameworks and development planning through an economy-wide approach;
2) Enhancing resilience of communities as first responders of climate change-induced hazards; and
3) Monitoring and Evaluation and Knowledge Management.

The project seeks to address the barrier of a fragmented policy approach, by putting in place an enabling framework that will guide interventions on climate change and DRR/DRM, and will make adaptation to climate change a priority of "economic and social concern". Interventions in the project will focus on implementing activities 1, 5 and 7 of Samoa's National Adaptation Program of Action (NAPA) document, namely: securing community water resources; agriculture & food security sustainability; and coastal infrastructure for highly vulnerable districts, conducting mobilization and capacity-building of women, youth, and CBOs across the country, to enable them to more effectively prepare for and manage risks, natural hazards, and adapt to climate change.

The project document makes specific reference to an integrated adaptation and DRR/DRM response that enables communities to better prepare and manage risks, shore up their assets, both natural and physical, and increase their resilience to natural hazards and CC. The community level interventions are aimed to focus on:

- Increasing resilience, and decreasing exposure and susceptibility of communities to climate change and natural disasters by protection of household and community assets, and promoting resilient livelihoods.
- Increasing the adaptive capacity of communities for implementation of effective risks management and protection of households and community assets.

This is proposed to be achieved through investments in increasing employment and livelihoods opportunities for the most vulnerable or sources of income through micro-businesses development and/or strengthening with intrinsic linkages to agriculture, manufacturing and tourism. Proposed interventions are also proposed to be achieved through empowering women and young leaders to drive the development capacities of communities to prepare, respond, recover and manage risks as well as strengthening linkages between government and village governance system including community leaders, women and youth committees.

1.2 COUNTRY CONTEXT

The Independent State of Samoa is a small archipelago in the center of the South Pacific, approximately halfway between New Zealand and Hawaii. Samoa consists of two main islands (Savai'i and Upolu) and several smaller islands and uninhabited islets, with a land area of 2,934 square kilometers and an exclusive economic zone of 98,500 square kilometers, the smallest in the Pacific. Samoa differs from other PICs in that its population is concentrated on only two islands that have relatively developed road and communications infrastructure. However, there are significant gaps between the two major islands, with Savai'i lagging behind Upolu in both economic growth and human development indicators.[3]

The strong development pattern that has emerged across Samoa is one in which rural and urban villages are located in close proximity to the coast, along the fringing plains. Approximately 98 per cent of the population lives in these narrow coastal plains, which include the capital city of Apia on the island of Upolu. Apia is the only true city in Samoa, with a population of approximately 38,000 (2006 census). Traditional districts run from the mountains down to the developed coastal plain. Samoa's 11 districts encompass 330 villages. The population is largely homogenous, with an estimated 93 percent native Samoan.[4]

Given the concentration of the majority of Samoa's population along the coast of the two main islands of Upolu and Savai'i Samoa's communities' livelihoods are most threatened by climate change as they are dependent on the environment and natural resources for their survival. The Project Implementation Framework (PIF) identifies agriculture and tourism as the two primary sectors affected in terms of entrepreneurial activity and job loss, particularly for males. This has confounded pressures upon the informal sector already existing since 2009, particularly due to drastic job cuts in manufacturing.

Furthermore, the reliance on natural resources and subsistence growth means that the traditional tendency for short-term gain takes precedence ahead of investment or maintenance in entrepreneurial and agricultural project development.

As highlighted in the PIF, the increasing frequency of natural hazards – two significant events, the tsunami in 2009 and cyclone Evan in 2012, within a 3-year period, make a compelling case

[3] AusAID Pacific Social Protection Series: poverty, vulnerability and social protection in the Pacific: A Samoa Case Study: Commonwealth of Australia, March, 2012.
[4] Ibid.

for greater integration of CC and DRR/DRM policies/strategies and ground level rapid response, through enhanced resilience building programmes at the community level.

Samoa consists of approximately 300 villages or traditional units of settlement. Villages are largely self-governing under the direction of the village council of chiefs who are heads of extended family groups in the village. Chiefs can be either male or female, although traditionally chiefs have been predominantly males because of prevailing cultural attitudes and beliefs. More and more females however are being bestowed chiefly titles as potential leaders for families and village communities, evident in a marked increase in female chief numbers in recent years. The village council of chiefs is supported by other well-defined subsidiary groups and bodies to which all village adults belong usually on the basis of gender, capability, age and status[5].

The village council of chiefs continues to govern and manage village affairs in accordance with Samoan traditional practices and values of political organization in line with the Village Fono Act 1991 and the Constitution of Samoa. Samoa has had no separate system of local government and continues to rely today on village government for local administration in the areas of law and order, economic and community development, environmental and natural resource management.

Village government is generally credited for the political and social stability Samoa enjoys today. In this case, the rule of chiefs in the village is the platform upon which the community leadership is asserted in order to facilitate community mobilization and management of all village affairs.

The requirements to be a member of the various village entities is based on factors such as one's age, marital status, political status and whether or not one is born in the village or married into the village. Thence the opportunities to have influence over village affairs varies between individuals and raises issues around the roles of, for example, untitled men, daughters-in-law and chiefs' wives in village governance.

Samoan village communities, however, are becoming more closely linked to the world outside as the local subsistence economy gives way to an economy largely based on remittances, and on the exchange of goods and services with the rest of the world. Government investment in rural infrastructure and services in recent times is aided by rising disposable incomes from remittances.[6]

[5] Ibid.
[6] Ibid.

1.3 METHODOLOGY

In order to achieve the objectives of the ToR the following methodology was adopted:

Literature Review

An extensive literature review of documentation relevant to gender and climate change adaptation, DRR and DRM in Samoa. The literature review also included a focus on gender and livelihoods in accordance with Outcome 2 of the project.

Rapid Appraisal

A rapid appraisal included one on one interviews, focus group discussions and in country consultations with a range of Government partners, NGO and CBO representatives and included an Inception Workshop with key partners in Samoa.

The literature review and rapid appraisal sought to identify the following:

- Who are the socially vulnerable in Samoa?
- What mechanisms existed (or not) in the identification and engagement of vulnerable communities during disasters and in the implementation of climate change adaptation initiatives in Samoa?
- What approach is used to target the most vulnerable during times of disaster and when implementing CCA initiatives?
- What are ongoing activities which seek to address increasing resilience, increasing adaptive capacity, targeting women and addressing gender inequality
- What opportunities exist to empower women; youth and other marginalized social groups to increase community resilience and adaptive capacity in the protection of household and community assets?

2 FINDINGS

2.1 SOCIALLY VULNERABLE IN SAMOA

A Samoa case study developed as part of an AusAID Pacific Social Protection series reviewing poverty, vulnerability and social protection in the Pacific in 2012, uses the ADB definition of vulnerability which is defined as the inability of certain individuals or groups due to their age, health, social or economic status to maintain their current welfare because of adverse impacts from multiple stressors, including deterioration of economic conditions or natural hazards to which they are exposed.

The report recognizes that new vulnerabilities in Samoa are emerging from the transition to a cash economy, urbanization and changing societal norms and identified six vulnerable groups through the study – *women, youth, children, older people, people living with disability and households in rural areas.*

It notes that vulnerable individuals are more likely to be living below the poverty line and may not have access to basic needs and services. They are more susceptible to, and less easily able to recover from, adverse shocks and natural disasters. Vulnerability in Samoa is linked to an inability to participate in income-generating activities.

The report links ***Women's vulnerability*** to Samoa's socio-political tradition that is largely patriarchal with economic, social and cultural factors promoting the ascension and power of

men more than women in public life and at home and recognizes women's vulnerability as increasing with the transition to a cash-based economy.

Youth vulnerability is in part a result of Samoa's young age structure with the most pressing challenge limiting employment opportunities. Youth also face health-related challenges, including mental health and suicide, sexual and reproductive health, and substance abuse. These challenges are compounded by youth marginalization and voicelessness in Samoan society.

Households with children are one group in Samoan society facing the greatest hardship, as highlighted in the UN report *Protecting Pacific Island Children and Women During Economic and Food Crises* (2009). The report found children (and women) faced a potentially 'very high' impact from the current economic crisis.

Older people in Samoa are increasingly vulnerable because of rural-to-urban migration and traditional social structure erosion. Older people rely heavily on family members and collective community assistance. However, this support structure is changing as more young people shift from working in agriculture to cash-generating jobs in urban areas.

In Samoa there are minimal opportunities for ***people with disability***, a result of lack of access to appropriate services and facilities. This group is more likely to have less than three years of schooling and is unlikely to find paid employment. According to the HIES (2008), approximately 53 per cent of people with disability over 15 years of age have not received formal education.

Households in rural Samoa face barriers to developing sustainable livelihoods and improving human capital. Formal employment opportunities are very limited. Transportation and communications infrastructure is far less developed than in urban areas. Rural households largely depend on subsistence agriculture, but have limited or no access to markets for their crops and are being left behind as Samoa transitions to a monetized economy. Rural families are vulnerable to fluctuations in the prices of traditional produce (coconut and copra), which can reduce cash flow dramatically. In Savai'i and rural Upolu, imported foods are likely to be more expensive because of internal transport costs and lower levels of local competition.

2.2 EXISTING MECHANISMS TO ENGAGE THE SOCIALLY VULNERABLE

2.2.1. Ministry of Women, Community and Social Development

The Ministry for Women, Community and Social Development (MWCSD) is the responsible Ministry delegated to oversee Government commitments to Samoa's vulnerable and marginalized groups and serves as Government's entry point to the community.

Under the MWCSD Strategic Plan 2013-2017 sectoral collaboration within the Ministry and across government is a key approach undertaken to maximize on resources including available technical expertise. The Ministry is recognized across government as a key player in coordination of community and social development programs.

The MWCSD has nine divisions, which include:

- Internal Affairs and Village Governance
- Advancement of Women
- Youth Development
- Policy Research and Evaluation
- Corporate Services and Performance Management

- Government Printing
- Community Development Sector Coordination
- Communications and ICT
- Child Protection

Addressing Gender Inequality and Women's Empowerment

Government Women Representatives (GWR)
The MWCSD has facilitated the establishment of a number of initiatives and projects within communities to address gender inequality. This includes the coordination of the network of Government women representatives (GWR) who are liaison officers between Government and the village. Each of the GWRs is nominated by their own village women's committees and nominations are submitted to Cabinet for endorsement. GWRs are paid $125.00 (USD50.00) a fortnight by the Government through the MWCSD. They play the role of village level focal points for the advancement of women and the protection of children for Government and their village.

There are 326 villages that make up the settlements of Samoa and currently there are 102 GWRs serving the traditional villages in Upolu (where the capital city is situated) and 86 women for the traditional villages in the big island of Savaii. Non-traditional villages do not have Cabinet appointed GWRs but they do have village mayors (mostly males) who are also managed under the auspices of the MWCSD.

According to MWCSD, the work of the GWRs is managed using a performance management system which is a results-based tool that sets out the requirements of the tasks, monitoring indicators of these tasks and the expected outcomes for the GWRs in line with the strategic direction of the Ministry. The MWCSD conducts monthly meetings for the GWRs and these meeting provide the GWRs with information on development programs and or issues that women at the village level must know.

GWRs are responsible to their Village Women's Committees and therefore have an obligation to relate back to the village women's committees all information from these meetings as a form of capacity building for the village women. GWRs are also expected to be at the forefront of any village based development program in particular the ones that target women and children.
Examples of these programs are: the Family and Community Wellbeing Programme (Aiga ma Nuu Manuia Program that focuses on sanitation and hygiene), Birth Registration of all babies born in the village, safe water, smoke free homes, natural disaster preparation and awareness, micro-finance schemes and Livelihood and Skills Building trainings, HIV & AIDS prevention, Domestic Violence Prevention and other social and economic programs spearheaded by Government.

The work of the GWRs and the network of church women's fellowships, have also allowed for the participation of rural women in the economic and social programs delivered by staff of the MWCSD in partnership with other Government Service providers on Second Chance Education learning. GWR's and village women's committees have also been responsible for the implementation of community-based projects on Climate Change and Gender. In 2008, a total of seventeen projects were managed and implemented as part of the MNRE 'climate change and sustainable development' programs.

These projects ranged from coastal/beach tree planting to stop sand erosion and mangrove replanting and village waterpool rehabilitation. Projects that focus on coastal infrastructure and management plans, which involve both the women's committees and the village councils in 41 villages, have also been carried out. Village selection is based on at risk areas because of their geographical location therefore considered most vulnerable.

Water Sector Support Programme (WASSP)

The MWCSD is one of the implementing agencies for the Water Sector Support Programme (WASSP) to improve water supply to rural villages and improve the drainage systems for flood prone areas in town areas. The MWCSD is responsible for the Independent Water Scheme (IWS) component of the programme with a focus on the use, protection and management of village owned watersheds or water pools to supply the entire village as well as that of the neighboring villages that cannot access the main water supply because of their geographical locations. A selected village committee whose membership consists of 50% females manages these independent water schemes. An Independent Water Scheme Association consisting of one representative from each of the individual village committees has been established under the support of the MWCSD as part of the WASSP. This Association is chaired by a woman, and is currently housed with the Division for Internal Affairs of the MWSCD.

The MWCSD is also the lead agency for the 'community sector' known to 'cut across' all sectors including health, education, law and justice, agriculture, the environment, infrastructure, the private sector, and others where plans have been developed.[7] The community sector is made up of villages, village councils, community based organizations (CBOs) such as village women's committees, churches, village school committees, youth groups, the private sector including Chamber of Commerce, non-governmental organizations (NGOs) and other interest civil society groups. The GoS has accorded significant responsibility to this sector in terms of achieving the ultimate vision of "Improved Quality of Life for All" and in terms of advancing gender equality. The Community Sector Plan focuses on the implementation of the National Policy for Women and Plan of Action, in line with Samoa's obligations as a state party to the Convention.

Livelihood Initiatives for Women

In 2008 alone, funding assistance from AusAID has enabled more than 12 village women's committees in the rural areas (Upolu and Savai'i) with more than 50 members per committee to purchase sewing machines as part of their income generation activities. The coordination of some of these projects is through the Catholic Family Ministry with the MWCSD providing the qualified trainers for the conduct of garment making and other handicraft making assistance.

More community based women's organizations are receiving and further seeking funding from other development partners such as the European Union, AusAID and NZAID to provide resources to expand their income generating programs conducted at village level. Government's CEDAW report states that these opportunities have helped raise the morale of women especially those in rural communities as it has enabled them to access opportunities available at national level to assist them with their community based projects. These efforts are making a difference in the lives of women in terms of improving their quality of life and are making some positive contributions to the revival of the village economy. [8] These existing income generation projects can be further built on when addressing livelihoods of village communities and building resilience.

[7] Community Sector Plan 2008.

[8] GoS 4th & 5th report to the CEDAW Committee, 2012.

While significant efforts have been made to ensure women's participation and engagement in development projects, the role of women and girls in Samoan society remains largely unchanged at village levels, despite the relatively high education attainment of girls compared to boys.[9]

People Living With Disabilities

According to the 2006 population census, the total number of people with disabilities living in Samoa is 2,096, females 941 and males 1,155. The advancement and full protection of women and girls with disabilities is an area that is addressed under the Policies and Plans for Women, Young People and Children in Samoa. A discussion paper submitted to Cabinet on the absence of adequate legal and policy protection for people with disabilities noted the vulnerabilities of people with disabilities, in particular women and male toddlers. It contributed to the immediate revival and relocation of the National Disability Taskforce under the MWCSD, given its existing mandates, to develop the policy and national strategy for people with disabilities.

Since 2008, the MWCSD through a Cabinet directive is now the government national focal point for Persons Living with Disabilities (PLWD) and is responsible for the coordination of programs and promotion of the rights of PLWD, including the coordination of the National Disability Taskforce. Various consultations with different organizations and community groups in particular those residing in the rural communities (where 80% of those with disabilities reside) and people with disabilities were conducted to develop the National Policy and National Plan of Action for PLWD.

The Nuanua O le Alofa, a council for people with disabilities, and Loto Taumafai Education for children with physical disabilities have been at the forefront of these consultations, whilst conducting their own advocacy programs on bringing into the mainstream of policy and program implementation the rights and needs of people with disabilities. Cabinet has endorsed these two documents for implementation.

The MWCSD has also prepared a discussion paper for the National Disability Taskforce on some key considerations regarding Samoa's progress towards becoming a party to the Convention on the Rights of People with Disabilities with consultations on this issue ongoing at the time of this assessment.[10]

Youth Initiatives

Samoa has a youthful population, with 41% of Samoan population below the age of 15 years and over 60% under 30, according to the 2006 Census. An average of 5,000 young people leave the school system annually with 35% of young people aged 15-19 not at school, according to the MCWSD's Division of Youth report (year). Young adults (15-29 years) make up 34% of the workforce and a third was employed in the agriculture sector. The 20-29 year age group remains the most vulnerable, having accounted for 43% of those imprisoned by the District court for 2005-6 and 50% of those imprisoned by the Supreme Court[11]. According to the Demographic and Health Survey 2009, sexually transmitted infections were 40.9% of prevalence rate amongst the age category of 15-24 and 18.1% for the age range of 25-49. In addition teenage pregnancy rates are relatively increasing amongst young women in the age group of 15-29 years[12].

From 2006-2011, the MWCSD coordinated the implementation of the TALAVOU (Youth) Programme to offer technical and funding assistance for a range of sub–programs such as

[9] Samoa Millennium Development Goals Progress Report, 2010, page 16.
[10] Ibid.
[11] Youth Crime Drivers Survey, National University of Samoa, 2005.
[12] Samoa National Youth Policy 2011-2015, Division of Youth, Ministry of Women, Community and Social Development.

creating business incubators and income generation, livelihoods skills for young entrepreneurs, improving self-worth and life-skills development training to address HIV & AIDS, gender inequality and domestic violence as well as leadership and negotiation skills trainings for young people and empowerment of youth parliamentarians in decision-making. An evaluation of the project has informed the development of a subsequent Youth Employment Project (YEP) with the objective of ensuring greater opportunities for youth (including disadvantaged youth with disabilities) to secure decent work and income and to enhance inclusive economic growth and sustainable development of Samoa. The YEP is expected to be implemented by the newly formed Samoa Youth Council under the guidance of MWCSD.

The YEP proposes a strong focus on enhancing livelihood opportunities for youth in organic agriculture through training trainers and extension providers from organic associations in sustainable organic production methods. These agricultural extension providers provide ongoing mentoring and support to young farmers and link youth agricultural enterprises with existing organic certification and market chains. It will offer youth of Samoa training in crop specific organic agriculture, food and cuisine, gainful employment up to and including the time of the SIDS conference (Sept 2014) which provides an opportunity to showcase this "farm to plate" model for youth employment. The project also provides a continuing opportunity for longtime employment, through the partner organization Women in Business Development International's existing Organic Tourism Project, to supply the export markets with suitable products.

In the area of climate change mitigation and adaptation, the project aims to promote youth employment and entrepreneurship opportunities through climate change mitigation and adaptation activities which establish "service delivery platforms" that offer policy advice, capacity building, financing options, information, and increased access to new or adaptable technologies. It will promote environmental awareness, action, and foster the conservation of and ensure sustainable use of natural resources in order to reverse the current trends of environmental degradation, habitat loss, and overexploitation of resources. The project will encourage "Green/ Blue Jobs" as an employment strategy.

Elderly

In Samoa, parents, their children and married children all live together in one compound area in separate houses. It is common for families to have many children. Elders are traditionally accorded a high status among the Samoan community and are generally cared for by their families. The GoS 4th and 5th CEDAW report notes that care for the elderly and children in Samoa is seen predominately as the role of women.

2.2.2 Women in Business Development International (WIBDI)

WIBDI was first registered as an NGO in Samoa in 1991 and was established to support, promote and advance women in Samoa. The focus was on training, accessing funds, the creation of jobs and the application of new technologies. Following two cyclones in 1990 and 1991 and the Taro leaf blight, which destroyed the entire taro production industry in 1993, WIBDI's response changed from an inward focus to an outward far-reaching effort to create income generation activities for rural families who were severely affected by the cyclones and Taro leaf blight. According to a paper developed on the WIBDI story, the importance of recognizing the vulnerability of Samoa to environmental events has seen a conscious effort by WIBDI to explore issues around sustainability and disaster mitigation.

Following the September 2009 Tsunami, WIBDI carried out the following core activities to help Samoa recover from the devastating event:

- Raising seeds/seedling for distribution to most affected families;
- Distribution of seeds/seedlings to replace the lost crops in the tsunami (Manono Yai, Vavau, Lepa, Saleapaga, Siumu Sasa'e, Poutasi and Lalomanu);
- Identification of families already working with WIBDI and other vulnerable people who needed assistance;
- Replacement of lost tools for farm and home gardening;
- Ensuring all family members, both women and men as well as people with special needs (disabilities) and other vulnerable groups (including youth), have access to livelihood opportunities;
- Working closely with other NGO's, the Private Sector and Government Ministries (e.g. collecting information, distributing aid and working in the community); and
- Educating communities about the importance of healthy native fruits and vegetables.

WIBDI cites five core projects on its website, which include fine mats, organics, crafts, micro-finance and disaster mitigation.

Fine Mats & Crafts
The fine mats project was developed to provide women with an income and also to revitalize a Samoan tradition. WIBDI approaches prominent women in selected villages and helps them to run the workshops to pass on the art of fine mat weaving. These workshops not only focus on transferring weaving skills to women, they also include financial and time management training for the wider community. The project has been viewed as successful, particularly in regard to its contribution towards the revitalization of traditional Samoan art and culture. WIBDI staff has recorded several interviews with their clients as part of the "Most Significant Change" reporting project. Several weavers noted that the weekly income they generated enabled them to pay school fees for their children and make improvements to their homes. Other significant improvements include new water tanks and showers and a greater sense of self-worth from an elevation in status within their communities, as they are able to contribute to the village. WIBDI continues to support other handicrafts by finding regular overseas buyers for products such as tapa cloth, carving and woven baskets.

Organics
A recent WIBDI report states that WIBDI has assisted approximately 350 farmers to obtain organic certification through the National Association for Sustainable Agriculture (NASAA) in a range of products including the highly successful organic virgin coconut oil supplied to The Body Shop under an exclusive international contract. WIBDI plays a vital role in organizations such as NASAA and as a member of the Regional Organic Task Force (ROTF). Other developing products include honey and bananas. As part of the Most Significant Change project, two WIBDI organic farmers discussed the impact of the organics project on their lives. One of the farmers described the reliance his family previously had on remittances; however, after the farm was fully certified they began to benefit from the newly generated income. As a result the family has been able to pay all its bills and obligations to the church and has extended its home and built two garages on the property. At a social level, the farmer felt he could now voice his opinion within the church as he now has a solid financial foundation to support him.

Local Organic Markets
WIBDI has introduced a fortnightly organics market and weekly organic basket sales. The local products compete with the more expensive imported products. As a result WIBDI is facilitating relationships between organic growers and local resorts and restaurants. While there are some issues that still need to be resolved regarding guaranteed supply and quality assurance, a boost to perceptions about the quality of locally-grown products has resulted from the launch of the

Pacific cookbook Mea Kai by Lincoln University planning director Dr. Tracy Berno and chef Robert Oliver.

Micro-finance

The initial micro-finance program was originally administered by the MWCSD. WIBDI has taken over the administration of the program and focuses on providing finance for income-generating projects. The loans provided are very small and contribute to setting up businesses; they are also part of a wider effort to transfer knowledge about managing finances. WIBDI provides workshops and training for families about budgeting, savings and managing money. Loans are secured against savings. When clients have proven they are able to save and pay back loans, they can apply for larger loans through the ADB micro-finance funds administered by the Development Bank of Samoa. Since 2005, WIBDI's involvement with the ADB program has been scaled down. However, WIBDI's own micro-finance scheme, which was adapted to suit the needs of rural Samoans, continues to assist in financial management training as well as in introducing first time earners to a banking system they can relate to and which is available where they live.

2.2.3 Ministry of Agriculture and Fisheries

Ongoing Livelihoods Initiatives

The Ministry of Agriculture and Fisheries (MAF) continues to focus on several areas to enhance food security. Increased production of root crops is supported by supplying high quality planting materials from the Ministry's nurseries to growers on request. Revitalizing traditional crops is supported through the development and promotion of coconut virgin oil and organic farming, with government assistance through ADB funded projects, which have been devolved to the Women in Business Development Inc. and Samoa Small Business Enterprises. The availability of farming information to all has been developed through the active use of radio and television; and competitions between village farmer groups are conducted to encourage people to utilize their land for personal benefit. Since its formation in 2005, the Samoa Crops Cooperative Association has been actively raising the concerns of farmers and exporters.[13]

2.2.4. Ministry of Natural Resources, Environment and Meteorology

MAF and the Ministry of Natural Resources, Environment and Meteorology (MNRE) have worked together to monitor and manage the marine environment in the interests of better conservation and sustainability of fisheries resources. The village communities' capacity for management of fisheries resources has been strengthened through workshops, training and consultation, so that these communities are engaged effectively in the application of by-laws, implementation of management plans and the creation and management of fisheries reserves.

Sixty-four (64) village-owned fisheries reserves were established and 80 villages have formulated village fisheries by-laws. In addition, integrated fish farming systems, lagoon bivalve nurseries and farming of tilapia, freshwater prawns, eels and crabs have been developed. Suitable coastal areas and land that are appropriate for aquaculture have been identified and technical advice has been provided through the development and dissemination of information sheets on aquaculture farming, fish management and fisheries regulations.

[13] Ibid.

Two projects on the protection of marine areas are being implemented by two separate village women's committees under the MNRE World Bank funded small grants scheme. Community fish farming competitions have been supported.[14]

2.2.5. South Pacific Business Development (SPBD)

Up until 2011, South Pacific Business Development (SPBD) has disbursed a total of $26 million Samoan tala worth of micro loan financing since it began its operations in Samoa in 2000, promoting micro enterprise and businesses for women.

2.2.6. Samoa Victim Support Group (SVSG)

The Samoa Victim Support Group (SVSG) runs three shelters for abused children in Samoa with the shelters currently home to some children with disabilities. Since it was established in 2005, SVSG has assisted with approximately 400 victims, provided shelters for close to 300 children and provided technical assistance for over 200 court cases reported from communities.

2.3 IDENTIFICATION OF THE MOST VULNERABLE

A number of different mechanisms are being used in Samoa to assist with the targeting of vulnerable populations for assistance. The MWCSD Internal Affairs Division conducts household surveys in villages using a comprehensive form to gather information on the household occupants, in the identification of type of housing, people living with disabilities, people with chronic illness, income and expenses.

Given that most households in Samoa live in extended family units, the forms make allowances for the capture of information on sub-households. The survey also provides information on utilities and communications types. The Samoa Red Cross uses the forms and a toolkit in the roll-out of the Community Disaster and Climate Risk Management (CCDRM) program in Samoa's villages. At the time of the mission, the Samoa Red Cross had only rolled out the toolkit in five villages though household data had been gathered from 25 villages.

While the data from the 25 villages were available, it was unclear how the data were being used to inform program implementation. The Civil Society Support Program (CSSP) jointly established by the Australia Government, the European Union, and the Samoa Government provides small grants to civil society organizations to improve skills and implement sustainable projects. The program also supports CSO's to represent and advocate on behalf of their communities, especially in support of vulnerable groups. CSSP has a specific vulnerability criteria which has been informed by figures from the Bureau of Statistics (BoS) and looks at areas with the lowest levels of education, and unemployment with applications, which are further weighted for rural women's groups and PLWD, etc.

Other NGO's such as ADRA and WIBDI conduct their own assessments dependent on the services they provide. For example, WIBDI works with individual households in communities and choose to work with households who express an interest in organic farming, who have no other regular source of income except remittances and those who have access to land and agricultural produce such as coconuts, banana's, fetau, etc. ADRA, on the other hand, worked alongside Government in the re-building of shelters following the cyclone of 2012 and their assistance was partially based on Government's recommendations and others that were identified from their own assessments on the ground. NOLA has access to a PLWD database

[14] Ibid.

for Samoa, though there is no systematic approach to assistance except through the schools that have been established.

WIBDI has developed a unique approach to facilitating entrepreneurship and enterprise that is borne from experience and an understanding of the community and culture within which the organization is operating. With this experience, WIBDI has developed the innovative approach of focusing on family units rather than whole villages and wider community groups. By recognizing the core unit of Samoan society, the family, WIBDI has been able to maintain interest and support from within the community.[15] WIBDI has organically certified four villages and has more than 600 families involved in organic farming around the country.

SVSG is another NGO that has put in place its own mechanisms to identify vulnerable groups in the community and has more than 400 village representatives based in villages and communities around the country. While some of the 400 are village mayors, the SVSG primarily works with those in the community who are committed to ending VAW&G and also to protecting the welfare of children and children living with disabilities.

The community representatives are the eyes and ears of SVSG in the community, who continue to refer cases of child sexual abuse, incest, child abuse to SVSG and the Police. Due to the absence of a welfare system in Samoa, SVSG works with the Police to bring justice upon the perpetrators who are often immediate family members of the victims. This network of community representatives can be used as an entry point when trying to identify targeted assistance to the marginalized in the community. SVSG currently runs a livelihoods program for women who are married into villages, as these women are known to be marginalized within the village setting and often subject to abuse and exploitation.

The PPCR Final Report and Monitoring Framework on Understanding the Gender Differentiated Impacts of Disaster and Climate Change in Samoa, released in June 2013, recommends the use of the Village and Expert Gender Assessment (VEGA) as a tool to reveal gender differentiated climate impacts and adaptive capacities that exist within the community in the implementation of projects and the incorporation of other social assessment methods, such as household surveys.

The BoS has developed a system to gather sex-disaggregated data, with the PPCR report recommending a centralized database or password protected website to allow for the dissemination of data and enable improved analysis to inform development decisions.

2.4 EXISTING GAPS

According to a Capacity Assessment and Enhancement Report on Climate Resilience in Samoa (2012), despite all of the good work there has not yet been a comprehensive vulnerability assessment for the whole of Samoa. The CBDAMPIC project provided a useful framework for this and highlights the focus on:

- A strong emphasis on physical vulnerabilities, rather than social or community vulnerabilities.
- An expectation that projects will bring funding to address identified physical vulnerabilities, prior knowledge of which may have conditioned prioritization by communities.
- A tendency to target what are identified as the most vulnerable communities and the development of a vulnerability culture as a result. This vulnerability culture was evident in two sessions held with village mayors and women representatives.

The report also highlighted the need to develop more in-depth understandings of resilience and identified

[15] The WIBDI Story, Technology, Trade and Tradition; Duncan Suzanne & Gray Brendan.

a lack of on-going in-depth engagement with communities and consequently a lack of genuine ownership. The project-by-project focus tends to emphasize project components that include community consultation and/or piloting in identified communities. These become one-off activities rather than fostering long-term ownership. According to the report,

- There is a lot of national-level information going out to communities, not just relating to climate change, with the same people being targeted all the time. Key information, such as CIM Plans, is only in the hands of a few.

- The majority of local people are visual, oral and experiential, which requires more than information transfer through expert presentations and feedback sessions during community engagement, and calls for a more interactive method of learning

- Climate change projects to-date have not focused on identifying the resilience characteristics of the environment and communities in Samoa. Since the report was published in 2012, a number of reports have been produced that focus on resilience characteristics on a project case-by-case basis.

- There has been no systematic identification of relevant knowledge and actions already in existence or happening that are contributing to resilience building.

The Post Disaster Needs Assessment (PDNA), conducted after Cyclone Evan, 2012, highlights the suffering faced by individuals with low incomes and those depending on subsistence livelihoods in the post-disaster period due to reduced incomes and food sources. PDNA identifies these as requiring support in the short term to meet minimum needs and to avoid negative coping strategies (for example, pulling children out of school or selling productive livelihoods assets) that could harm livelihoods and human and social well-being in the long term.

The PDNA recommended that future efforts should take into account what worked well in rural settings and urban settings and the need to clearly explain relief eligibility and how to access it. Assistance should address issues such as equity versus equality in relief distribution, governance of relief distribution at the community level, and shelter management with holistic care for a range of people, including vulnerable groups.

While there are a range of mechanisms in place to identify vulnerable communities it is evident that this is not being done in a systematic way with a clear need for a uniform approach not only in the identification of vulnerable populations but also in targeted assistance considering equity versus equality and with clear explanations of relief eligibility, not only for relief but also for targeted program interventions. According to the PDNA, following Cyclone Evan in 2012, the Ministry of Works did damage assessments with assistance prioritized by the level of household damage. The PDNA conducted a Social Impact Assessment that sought to both mainstream human and social issues into sectoral assessments and to conduct qualitative research on key human and social issues related to the impacts of the disaster with some of their findings highlighted earlier in this report.

The PDNA also highlighted a serious and major need for psychosocial services for three distinct groups: (a) the affected population (communities) that was severely affected by the cyclone; (b) volunteers; and (c) public servants, particularly the first responders (medical, police, emergency services) and others working on a daily basis with the response. Evidence indicated that the overall need for psychosocial services is both large and varied given the trauma faced by the affected population. While the needs in this area are being further explored, the PDNA stressed immediate strengthening to service the needs of the population affected by the disaster.

Concerns were raised during the rapid assessment of assistance and interventions not always reaching the most marginalized in society. The complex and unique nature of Samoa's village and governance structure requires that the formal entry to communities and villages is through the MWCSD who have direct contact with the Village Mayors and Village Women's representatives. A number of NGO's

consulted during the rapid assessment considered the traditional approach through the MWCSD burdensome as it requires significant organizing within the villages and communities and is considered to add a further strain on communities with already limited resources. Due to these concerns, a number of NGO's have developed their own approaches to reaching the most marginalized in rural communities.

While these approaches are seen to go against the status quo, they are recognized as having an impact in terms of targeting vulnerable communities. As mentioned above, the Samoa Red Cross works through the MWCSD to conduct household surveys and to identify vulnerable groups.

While the MWCSD has compiled a comprehensive list of the types of community projects that have been implemented in villages and settlements, no comprehensive assessment of the gender impacts of these livelihoods projects and how socially vulnerable groups have benefited from the initiatives appeared to be available. The 2010 GoS MDG Progress Report recommends that the MWCSD should be strengthened in terms of capacity building as well as the provision of financial resources that would enable gender issues to be adequately addressed, recognizing a weakness in analysis and the availability of sex disaggregated data.

2.5 OPPORTUNITIES

The ongoing extensive work conducted on the ground by CSO, NGO's and Government for the benefit of vulnerable communities provides a number of opportunities which can be built on and up-scaled through the LDCF project. These opportunities include projects on coastal/beach tree planting to stop sand erosion, mangrove replanting and village waterpool rehabilitation carried out by the MWCSD, the review of CIM plans, which involve women's committees and livelihood projects currently being carried out by WIBDI. The recommendations, which encompass assistance to all vulnerable groups with a specific focus on the empowerment of women as identified in the specific gender recommendations, are picked up under this assessment.

3 GENDER COMPONENT

The gender component aims to directly address the vulnerability of women in Samoa, enhance their adaptive capacity to respond to climate-induced hazards and enhance environmental sustainability.
In reviewing the impact of climate induced hazards on women and men, a recent assessment on Understanding the Gender-differentiated Impacts of Disasters and Climate Change in Samoa highlighted the following impact of climate change in each sector and the different impacts on women and men.

Sector	Impact	Gendered Impact	Adaptation Options
Agriculture and Food Security	Loss of crops and food production	Impact on men primarily economic. Decline of subsistence food to family, decline of nutrition, extra burden on women and families can add to tension in household	Development of skills to gain access and control over resources and benefits
Forestry		Impacts on handicrafts for men & women with potential loss of key species for handicrafts; loss of soil and vegetation (men's primary roles in agriculture); loss of water supply (women's primary	Implement strategies for reforestation, deforestation reduction and soil degradation reduction Consult with women to ensure their knowledge and practices related to

		role). *Can contribute to double burden of women's labor*	environmental resources are included
Water	Decreased rainfall (drought) or extreme rainfall (flooding); decline in plants and vegetation; effects on reproductive capacity of plants; loss of ecosystem services	Impacts on agriculture (men's primary economic sector); impacts on water supply (women's primary responsibility); impacts on health (impacts on most vulnerable people: ill, elderly, children, poor). *As primary care-takers, women carry an increased burden as a result of impacts in the water sector*	Divert fresh water to areas where there is a water shortage Can lengthen and further burden women's productive and reproductive work day by placing water sources in distant zone
Health	Increased risk of disease vectors, increased incidence of gastrointestinal diseases; decline in nutrition	Impacts on public health (women's primary role in villages and households); impacts on resources for traditional healing (men and women) *As primary care-takers, women have a key role to play*	Increased awareness of risk, establish community support mechanisms, ensure women and men have equal access to protection systems
Biological diversity	Loss of key species; increased numbers of invasive species; loss of soil	Impacts on marine and terrestrial ecosystems, which further impact livelihoods (men and women's roles and responsibilities; loss of resources that support livelihood activities (men/women) *Loss of livelihood activities impact families as a whole but again women as primary caretakers carry the burden of care*	Establish natural protected areas and biological corridors
Fisheries	Loss of species; shifts in pelagic fisheries; changes in reproductive cycle; loss of habitat for	Impacts on primary economic sector (men) impact on household nutrition (women) *Leads to women as primary carer-takers not being able to provide adequate nutrition for*	Establish aquaculture including to compensate for losses in food production caused by extreme climate events

	spawning	*family which can contribute to health problems, onset of non-communicable diseases; morbidity of population is tending towards NCD's according to Samoa MDG Progress report 2010*	
Trade & Industry	Loss of resources and products for trade and industry; decline in government economy and impact on services	Impact on industry and commerce (affects both men and women's employment sectors); impacts on handicraft livelihoods (men and women at village level); impacts on vulnerable groups and poor from loss of government and social services (affects men's and women's formal employment and livelihoods; affects elderly, with greater numbers of women *The 2006 Population and Housing Census noted that out of a total of 38,297 people in paid employment, 42% were employed in the private sector; of this total, 54.8% were females and 45.2% males* *According to Samoa MDG Progress report 2010, conditions of financial hardship, whilst not widespread, do nevertheless have the potential of leading to increased social and domestic tensions, rising crime and a deteriorating quality of life for those most affected*	
Works, Transport & Infrastructure	Impacts from disasters on critical facilities and infrastructure; sea level effects on coastal	Impact on men's primary sector; impacts on community activities and livelihoods (men and women village activities)	

	roads; loss of access to services		
Tourism	Loss of coastal tourism areas; decline in tourism; loss of key natural features; increased risk from disasters	Impacts on small businesses and local operators (men and women's roles, with more accommodations operated by women) Loss of income;*according to a recent report, there is increased involvement of women in small businesses including in new areas such as tourist-related small business ventures [16] and loss of income would contribute to increased vulnerability*	
Urban planning & development	Impacts on land management; impacts on coordination among urban sectors; loss of funding for development plans	Impacts on activities in freehold areas and government lands; *in practice Samoan women have limited access to customary land and are largely excluded from dealings in customary land, such as customary leases; although Samoan women have equal rights over freehold land, they do not fare well in practice, as women do not often avail themselves of the right to be included on the title as a registered owner*[17]	
Coastal environments	Impacts to sand, reefs, marine biodiversity; loss of shoreline; loss of protection for communities	Impacts gleaning activities (women); impacts habitat for healthy fisheries (men); loss of sand and reef protection (men and women's roles in community management); *many of the impacts have affected women's livelihood activities of*	Introduce native and salt tolerant plants and animals to protect/re-vegetate the coast Could have negative effect on women's interest and needs in coastal zones, if varieties introduced affect resources specifically used by them

[16] Gender Considerations report on Enhancing the Resilience of Tourism reliant communities to climate change risks in Samoa, ADAPT Asia Pacific

[17] (IFC) Samoa Gender & Investment, Climate Reform Assessment, 2010, page 11

		gleaning the near shore areas; additional impacts are from declining nutrition as women struggle to supply food to their families; during the consultations, there was heightened awareness about the adverse effects of seawalls, whereas previously, seawalls were considered the only coastal adaptation measure for protecting the community from erosion; seawalls may address rising sea level and coastal erosion concerns, but cause extensive damage to beaches, a source of income for many families	
Energy	Loss of power from disasters; loss of fuel for household activities; more intensive labor for cooking; rising costs for supply of energy; secondary impacts in sectors such as communications, technology, tourism, business, etc.	Impacts livelihood activities and domestic duties (women's primary roles in villages); effects on formal employment roles (more men than women employed in formal sector); effects on small business operations (women and men in small business); effects on income generation (women and men)	Build structures to obtain alternative energy sources e.g. dams, windmills, geothermal wells May change or exhaust some of the resources women use for agricultural work, productive activities and household consumption

The PPCR Final Report and Monitoring Framework Report highlighted the fact that gender differentiated impacts exist and vary by sector and there have been significant shifts in gender roles and responsibilities over the last ten years due to increasing government and partners investment in human capacity and public awareness and education.

The assessment found that projects at community level have better outcomes when gender considerations are taken into account. Moreover, communities are better informed about disaster risk management and climate change, most likely as a result of government and partners' investments and increase in the number of disasters affecting Samoa during the assessment period. This has implications

for planning in each of the productive sectors.

The report states the need to pay attention to the differential vulnerabilities and capacities of men and women in disaster risk management and sustainable development contexts in order to achieve the best possible outcomes.

The report highlights the fact that gender differentiated coping mechanisms and adaptive capacities relate to the divisions of labor roles, and responsibilities impacted by disasters and climate change with the ability to address these impacts depending on gender specific knowledge, institutional mechanisms, and targeted access to resources. Developing and enhancing adaptive capacities to build resilience demands consideration of entry points to target gender sensitive approaches to reduce risks from disasters and climate change.

3.1 SPECIFIC ACTIVITIES

In line with these recommendations and in keeping with Component 2 of the LDCF project aims to enhance the resilience of communities as first responders of climate change-induced hazards through:

- Investments in increasing employment and livelihoods opportunities for the most vulnerable
- Increased sources of income through micro-businesses development
- Strengthening of intrinsic linkages to agriculture, manufacturing and tourism.

The following interventions are recommended under the Gender Component with further details in the table profile sheets.

Household Surveys

Conduct household surveys using the survey tool developed as part of the CCDRM Project in an additional 150 communities. Train enumerators to gather gender sensitive data.

Description

The household surveys will provide sex and age disaggregated information on each household and sub-household in a village. The survey forms capture information on PLWD and the type of disability as well as people living with chronic illnesses, the type of dwelling, utility and communication types as well as income and expenses per week. The Samoa Red Cross has completed detailed household surveys in 25 villages with funding received for a total of 30 villages. SRC estimates the cost of conducting the household surveys at $,5000 tala ($2,200 USD per village). The surveys will provide significant baseline data on where the socially vulnerable are located in each village and will contribute to more targeted interventions to building community resilience of the most vulnerable. For example, the identification of single mothers living in a community can contribute to involving them in income generating activities and as such build their capacity and ensure they are more resilient and not severely disadvantaged during a disaster.

Budget: $330,000

Risks/Capacity Building: The household survey gathers information based on the current structure of Samoan society and reflects the presence of sub-households under each household. It does not clearly identify the number of untitled men and women in a village who are usually the ones most disadvantaged as they have limited access to ownership of any assets within society. These dynamics need to be further unpacked and understood with enumerators trained to gather this level of information and reflect it in the overall assessment and recommendations portion of the forms.

Gender Analysis of Household Information

Assess the information on vulnerable populations; develop a quota system to ensure vulnerable populations are engaged at all levels of project delivery and implementation. Provide reports to all relevant stakeholders

Description
Data has already been gathered from household surveys in 25 communities but there is no clear commitment to the use of the data to inform any interventions. This activity will ensure the data is assessed systematically and reports are generated on socially vulnerable populations in villages, how they have been impacted and how they can be effectively engaged in building community resilience through livelihoods initiatives and other adaptation interventions. These vulnerable communities will be empowered through the process of engagement and contribute to identifying solutions within their specific communities and context. This process of engagement will ensure that vulnerable populations, i.e. untitled women, youth, elderly, PLWD, are not negatively affected by the interventions and are strategically engaged in the processes.

Budget: $30,000 - National Consultant to assess data, develop methodology for quota system for the engagement and tracking of socially vulnerable populations in specific interventions and produce relevant reports for circulation.

Risks/Capacity Building: The approach of engaging those who are socially vulnerable needs to be done systematically. While the reports produced are expected to provide evidence and data to be able to do this, the approach needs to be piloted in a few villages. It also needs to be factored into the monitoring and evaluation, knowledge management component of the project, e..g. # of untitled women, untitled men, young women, and young men engaged in specific livelihoods activities.

Capacity Building and Training for Women's Representatives

Execute training for all Government Women's Representatives, representatives of PLWD, youth representatives in sustaining climate resilience and building strategies for adaptation.

Description
Specific training targeted towards GWR, youth representatives identified through the Samoa Youth Council and representatives of PLWD will increase resilience of vulnerable groups and will contribute to understanding climate change as a socio-ecological phenomenon. It will contribute to effective adaptation practices that enhance Samoa's capacity for development effectiveness and avoid negative social impacts and will contribute to anchoring decision-making processes in an inclusive bottom-up participatory approach. Given the visual and creative nature of Samoan communities, it is recommended that the training involve a creative participatory process to motivate engagement and facilitate community action. An approach that has been used effectively by the University of the South Pacific Centre for Environment and Sustainable Development (PACE-SD) is the Creative Spiral Model, a creative facilitated process of engaged problem solving, drawing from behavioural science, learning science, design thinking and learning from nature's patterns of problem solving. It involves an application through ongoing practices in their own contexts, sharing through self-organised communities of practice and in time becoming able to spread it through networks within the community.

Risks/Capacity Building: The training detailed above involves a specific creative approach that has been successfully implemented by PACE-SD with the training of 15 In-Country Coordinators in the region. This activity would require outsourcing of the training to include the facilitated approach outlined.

Budget: $40,000 to include 3-4 workshop sessions, consultant fees, and advisory services.

Upscale WIBDI Projects

Support to be given to WIBDI to increase employment and livelihoods opportunities for women in Samoa through:

- Identification of one agricultural product through a value chain assessment
- Identification of one handicraft product through a value chain assessment

WIBDI has established itself as an organization which provides assistance to women and families in Samoa to improve their well-being through establishing sustainable, organic fair trade enterprises. WIBDI's model of economic and social development appears to have succeeded where other

community-based initiatives by NGO's, charities and government agencies have struggled or failed. WIBDI's success has been attributed to a strong organizational culture, which encourages empowerment. Its business policy is to by-pass central (i.e. government) and negotiate with local (i.e. village or tribal) political structures to deal directly with key economic drivers in developing communities, which are often women and families.

Fine Mat Project
The WIBDI Fine Mat project transfers weaving skills to women, trains them in financial and time management, and links weavers with sponsors who approach WIBDI to order fine mats through word of mouth or the WIBDI website. The sponsors are encouraged to commission or sponsor the making of a fine mat. Weavers who meet weekly progress goals are given a weekly income. This requires intensive monitoring by WIBDI field workers, who must ensure successful and timely completion and also that a high level of quality is maintained. Issues that have been identified in relation to the fine mats project relate to maintaining the motivation of the weavers, ensuring the quality standards and quotas are met, ensuring the income from fine mat weaving is spent well, and creating change within the families of weavers. WIBDI continues to support other handicrafts, by finding regular overseas buyers for products such as tapa cloth, carving and woven baskets. The identification of women to participate in the project is conducted through WIBDI's field officers, who identify vulnerable women who could benefit from the project, while visiting villages and through word of mouth. In some instances women also register their interest with the WIDBI office in Apia. WIBDI's criteria for identification include a strong commitment from the women to delivering what is required within the weekly timeframes given.

Organic Farming Initiative
According to the Government of Samoa MDG Progress Report, 2010, the highest proportion of persons employed was in the agriculture sector (32 percent) with women only accounting for 7% of agricultural work. However, there is the contention that women's role in agriculture is under reported and the report states the need for gender analysis of the division of labor for all levels of agricultural work.

The WIBDI Organics project is central to the WIBDI ethos of sustainability. The organic practices ensure that the land used for producing export products is managed properly and not destroyed through chemical contamination and soil exhaustion. Farmers have regular visits from WIBDI field workers to ensure organic certification standards are maintained. While the maintenance of organic certification, the documentation required for certification and the financial obligations can be difficult, WIBDI notes that the benefits and rewards are significant.

Women farmers have benefited from the project with the planting of vanilla beans, fruits, vegetables and coffee. WIBDI recently embarked on a Farm to Table initiative that links the organic produce from the farmers to hotels and restaurants around Samoa. The initiative is expected to boost the farming and tourism industry.

Micro-Finance
WIBDI's micro-finance scheme is adapted to suit the needs of rural Samoans. WIBDI provides workshops and training for families about budgeting, savings and managing money and works very closely with the Samoa Business Enterprise Centre (SBEC). SBEC has developed Sector Profiles, which explore important industries within the Samoan economy. The profiles provide case studies and figures on the number of businesses involved in the various sectors. In many cases, the profiles describe successful businesses and successful loan repayments from WIBDI graduates. WIBDI also features significantly in figures relating to the training of participants in various business sectors.

Under the LDCF project, support can be offered to WIBDI to identify women to be assisted under the micro-finance scheme and the specific sectors to be linked to.

Risks/Capacity Building: WIBDI currently faces some challenges to its future viability with NZ AID withdrawing core funding to the organisation. Also the organisation relies heavily on the leadership, management and networking capacities of two key executives with the future of the organisation dependent on their leadership. WIBDI also appears to be competing with larger scale initiatives by

central government agencies such as the Ministry of Agriculture & Fisheries to provide agricultural business development assistance. Should WIBDI loose the support it gets from several current senior politicians, then its future independence could be threatened.

Proposed Intervention

No.	Category	Socio-Gender Cultural considerations
1.	**Project Title**	Economy wide integration of climate change adaptation and disaster risk management/disaster risk reduction to reduce climate vulnerability of communities in Samoa.
2.	**Thematic Area**	• NAPA Adaptation Strategies 1, 5 and 7 • Output 2.1.2. Development of micro-businesses (business incubators for youth/women; business hubs for youth; etc.) on agro-food, manufacture and tourism with a sustainable and resilient value chain approach, to promote diversified livelihoods • Outcome 2.1. Protection of communities' physical assets and livelihoods. Increased resilience and decreased exposure and susceptibility of communities to climate change and natural disasters by protection of household and community assets and promoting resilient livelihoods Cross-cutting • Gender/special needs groups • Youth
3.	**Province**	Nationwide
4.	**Site Description**	The Economy-wide project is aimed at enhancing the resilience of communities, physical assets and livelihoods across Samoa to climate change and natural disasters
5.	**Target Communities**	This project will target women and youth from coastal villages identified as the most vulnerable to the impact of climate change
6.	**Project Description**	This initiative involves the following component: i) Provision of training to support women and youth in adapting to climate change through programs designed to improve food security and livelihoods. Through training of women and other vulnerable groups in the production of one agricultural product and one handicraft product, identified through a value chain assessment, women and vulnerable groups will be empowered through an additional source of income and through gaining an additional skill.
7.	**Rationale – addressing what climate change issue**	**Problem Identification:** • Samoa's communities' livelihoods are most threatened by climate change as they are dependent on the environment and natural resources for their survival. Agriculture and tourism are two primary sectors affected in terms of entrepreneurial activity and job loss, particularly for males. This has confounded pressures upon the informal sector

		already existing since 2009, particularly due to drastic job cuts in manufacturing. • Furthermore, the reliance on natural resources and subsistence growth means that the traditional tendency for short-term gains takes precedence ahead of investment or maintenance in entrepreneurial/ agricultural project development. • The increasing frequency of natural hazards – two significant events, the tsunami in 2009 and cyclone Evan in 2012within a 3-year period -- make a compelling case for greater integration of CC and DRR/DRM policies/strategies and ground level rapid response, through enhanced resilience building programs at the community level. • Although community-based businesses have been established through micro-credit channels, particularly for women and youth, with some success, project sustainability remains a challenge in this regard. Livelihoods sustainability is also affected by the lack of management skills and literacy in finance and business concepts. Strengthening of community incubators and building the capacity of vulnerable groups to develop new, non-farming niches with a sustainable and resilient value chain approach will assist in alleviating these trends and issues. • Agricultural activity is highly sensitive to climate change, as increasing frequency and length of extreme climatic events have adversely impacted agricultural production, which has led to loss of crops and soil erosion.
8.	**Impact of Proposed Activity**	**Outcomes:** • Increased resilient and diversified livelihoods opportunities for the most vulnerable communities which will have a positive impact in their capacity to respond to natural disasters and to cope and adapt to changes in climate in the short, medium, and longer term. • Food security will be improved through crop diversification and improved quality of staple foods. By encouraging the use of new crops through trainings, demonstration gardens, market cooking instruction and equipment, the project will increase the use and sale of a diversified number of agricultural products. • Women and youth will have increased knowledge and skills in the organic production of a specific agricultural product with a sustainable and resilient value chain approach. • Through this increased knowledge, income and skills, women and other vulnerable groups will be empowered to make significant contributions to the village development initiatives in a way that aims to reduce the risks posed by climate change in their livelihoods.

		• They will also be in a stronger position to become change agents within their communities, contributing to increased community resilience.
9.	**Baseline**	• The Post Disaster National Assessment conducted in 2012 highlighted concerns of assistance and interventions not reaching the most vulnerable and marginalized in society. • The PDNA highlights the difficulties faced by individuals with low incomes and those depending on subsistence livelihoods in the post-disaster period due to reduced incomes and food sources, and identifies these as requiring support in the short term to meet minimum needs and to avoid negative coping strategies. • A Samoa case study produced for a AusAID Pacific Social protection series, reviewing poverty, vulnerability and social protection, recognizes that new vulnerabilities in Samoa are emerging from the transition to a cash economy, urbanization and changing societal norms. The case study identified six vulnerable groups – *women, youth, children, older people, people living with disability and households in rural areas.*
10.	**Proposed Specific Sub-activities**	**Planning Phase: Issue identification, intervention identification and planning** • A specialist will be recruited to work with WIBDI to conduct value chain assessments to identify a specific agricultural and handicraft product for the intervention • The value chain assessment will review the current products produced by WIDBI and their value chain,review the farm to table approach in place as well as the demand for valued added products such as coffee, vanilla, virgin coconut oil, etc., have discussions with relevant stakeholders such as Ministry of Agriculture & Tourism, and identify the best products to be considered for support. • The value chain assessment will be conducted concurrently with household surveys in a select number of villages in vulnerable areas. The findings of the surveys will be analysed and provided to WIBDI to assist in the identification of women, youth and vulnerable groups to be trained. • In collaboration with WIBDI and all relevant stakeholders, a plan will be developed for the training of representatives from vulnerable communities in the production of the products and their subsequent sale.
11.	**Activity Outputs**	**Proposed specific outputs of activities:** • Assessment of local crop product diversification and handicrafts as a resilient livelihood option, based on WIBDI's model. • Consultations with stakeholders and key partners to identify the agricultural and handicraft product and specific areas of women and youth participation based on value chain assessment. • Household surveys in identified vulnerable villages. • Assessment of findings from household surveys to identify vulnerable populations.

		• Development of a training plan and schedule for women and youth. • Production of agricultural and handicraft products. • Replication in other identified areas.
12.	**Indicators**	• Completion of value chain assessment on local crops and handicrafts • The selection of one crop and one handicraft product and adapting the production of these products to climate variability • Identification of target vulnerable groups from the assessment of household survey data and through consultations with WIBDI. • Development of training package. • Number of women, youth and vulnerable people trained in development of the agricultural product. • Number of women, youth and vulnerable people trained in development of handicraft product. • Increase in supply of value added agricultural produce. • Increase in supply of handicraft product. • Number of women reporting an increase in income through intervention.
13.	**Links with Other Initiatives**	• The household surveys and subsequent analysis is linked to the work of the Disaster Management Office through the Samoa Red Cross and as part of a toolkit on disaster preparedness in communities. • The project will also identify linkages with the Samoa Youth Employment Project. • The project will link in with current work done by WIBDI with SBEC, Ministry of Agriculture and also the tourism industry through the Farm to Table initiative.
14.	**Implementation**	**A number of mechanisms are already in place, which the implementation of this project will build on:** • Development of ToR with WIBDI for a consultant to do value chain assessment on agricultural and handicraft products. • Development of a ToR with MWCSD, DMO and Samoa Red Cross on the assessment of household survey data. • Appointment of consultants and commencement of work. • Demonstrate how one food and one handicraft product adapts to climate variability. E.g. of adaptation options could include the application of: traditional systems or crop diversity and the use of Biotechnology in the production of pest and disease-resistant plants[18] etc • Identification of a consultant to develop training and capacity

[18] The costs of demonstrating how the products adapt to climate variability are incorporated into the overall project budget.

		building plan based on assessments identified above. • The use of participatory planning with community women groups will facilitate bottom-up planning, funneling community planning processes and priorities via the local government. Implementation of the activities will be through a community-based approach through partnerships between MWCSD, the private sector and the community. • Commencement of training. • Systematic production of produce and subsequent marketing and sales. • **Monitoring and evaluation: ongoing** i) In collaboration with WIBDI and MWCSD assess the impact of interventions in: ▪ Identifying the product and the engagement of vulnerable groups in the development of the product ▪ Building the technical capacity of women and vulnerable groups ▪ Increasing the production and increasing the number of women and vulnerable groups engaged in production. ▪ Using new climate change resistant crops. ▪ Number of trainings conducted and participation rates of women and other vulnerable groups from all villages based on household survey assessment. ▪ Effectiveness of trainings with respect to crop diversification, adoption of new species, etc.
15.	**Outline Terms of Reference**	TOR to be developed for a gender specialist to analyse the completed household surveys, which will identify the following: ▪ Number of people living with disabilities, elderly, youth, single mothers, untitled women living in communities. ▪ Current involvement of vulnerable groups in village development projects. ▪ Types of income generating activities that vulnerable groups are involved in. ▪ Types of community mechanisms that engage with vulnerable groups. ▪ Conditions that vulnerable populations live in. ▪ Opportunities to engage vulnerable groups through organized community mechanisms, if they exist. ToR to be developed for an agricultural specialist to conduct an assessment of local crop product diversification and handicrafts as a resilient livelihood option, based on WIBDI's model.
16.	**Benefits**	**Expected benefits:** • Women and vulnerable groups are more empowered and knowledgeable and have an additional source of income to build their resilience to the impacts of climate change.

		• Women are able to engage strategically within their communities as a result of empowerment and can become agents of change in climate change resilience interventions. • Systematic approach to targeting women and the most vulnerable in climate change, DRR and DRM interventions. • Sustainable and resilient value chain approach will assist in alleviating the trend of the absence of project sustainability identified in the Project Implementation Plan. • Building community members' capacities through exposure to technology while incorporating local knowledge into adaptation actions.
17.	**Beneficiaries**	Given the nationwide scope of this project, the beneficiaries of this project include Samoa's entire population. Specifically, the beneficiaries are as follows: • Women and youth and vulnerable groups will benefit through hands-on training programs that enable them to be involved in the development of livelihoods products. • Women, youth, vulnerable groups will benefit from increased production of the agricultural product and the income derived from the increased sale of market produce. • Youth will benefit by gaining knowledge and skills required for sustainable value chain production, which can be replicated in other areas. • Vulnerable groups will benefit through more visibility in climate change resilience initiatives.
18.	**Gender**	**Links to Gender Equity and Social Inclusion Strategy** • This project directly responds to enhancing climate change resilience in Samoa by focusing specifically on improving the livelihoods of vulnerable and marginalized groups in the community. • The project will provide customized training for women on new farming techniques and the sustainable value chain approach required for the production of high quality food crops needed for livelihoods and household consumption. Market sales is generally the only source of income for women in this area and is essential for paying school fees and supplies, purchasing staple food supplies not grown locally, transport to health centers and markets, etc. Training will also address business establishment skills and other areas of concern to women such as reproductive health, violence against women, leadership skills, business development, etc. • Addressing the risks and vulnerabilities of women who attend to local crops and the need to build their resilience to cope with climatic fluctuations in adapting to increasing climate variability and climate change. • This project will also benefit youth through their active engagement in training programs, CC Youth Clubs and income generation opportunities designed to build local resilience.

19.	**Environment**	• The proposed activity will be completed in consultation with the Ministry of Natural Resources and Environment and Meteorology.
20.	**Risks and Assumptions**	**Risks** ▪ The household survey will gather information based on the current structure of Samoan society and will reflect the presence of sub-households under each household. It does not clearly identify the number of untitled men and women in a village who are usually the ones most disadvantaged as they have limited access to ownership of any assets within society. ▪ These dynamics need to be further unpacked and understood with enumerators trained to gather this level of information and reflect it in the overall assessment and recommendations portion of the forms. ▪ Other risks with the fine mat and handicraft project include inconsistency in delivery by those identified as beneficiaries which can contribute to inconsistent supply to identified markets. ▪ While the reports produced are expected to provide evidence and data to be able to do this, the approach needs to be piloted in a few villages. It also needs to be factored into the monitoring and evaluation and knowledge management components of the project, e.g. # of untitled women, untitled men, young women, and young men engaged in specific livelihoods activities. **Assumptions** • Vulnerable groups, i.e. women, youth, PLWD identified through household surveys will have the capacity to engage in the development of agricultural and handicraft products. • Vulnerable groups will also have sufficient raw material to start the production as will potentially be identified through the value chain assessment.
21.	**Prepared by**	Ana Laqeretabua, Socio-Cultural Gender Specialist

Budget

	Inputs					
		Unit description	**Unit cost**	**No. of Units**	**Total**	**Comment**
	Contractual Services -					
	- Assessment Specialist					
	- Gender Specialist				$30,000	
	Training, Workshops and Conferences				$200,000	
	- Training Material					
	- Meetings					
	- Others					
	Travel					
	- Domestic					
	- Per Diem					
	Miscellaneous Expenses					
	TOTAL				**$230,000**	

4 CONCLUSION

The engagement of socially vulnerable groups in the conceptualization, decision-making and implementation of the LDCF project is necessary to ensure the project achieves its overall objective of enhancing resilience of communities across Samoa to climate change and natural disasters. This assessment has identified a number of specific opportunities building on the work that is currently being conducted through a range of partners working in Samoa. These organizations should be strategically engaged in the establishment of the economy-wide approach to climate change adaptation.

While, a number of these organizations may lack technical skills and understanding of climate change adaptation techniques, it is important to recognize their key links to the communities and in particular to socially vulnerable groups in the community.

To ensure sustainability these organizations should be trained and equipped so they can, in turn, train and equip socially vulnerable groups. This is to include the SVSG community workers to ensure that the marginalized groups in communities/villages are actively engaged in livelihoods initiatives as part of building community resilience. This approach will move beyond working solely through the MWCSD village based networks and will ensure consultations with village representatives working with organizations such as NOLA and SVSG, who reach the most marginalized in communities. This can be considered in the establishment of project management mechanisms and will also contribute to monitoring the impact of interventions amongst vulnerable groups.

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http://www.adaptasiapacific.org

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SAMOA INFRASTRUCTURE VULNERABILITY ASSESSMENT

ECONOMY-WIDE INTEGRATION OF CLIMATE CHANGE ADAPTATION AND DRM/DRR TO REDUCE VULNERABILITY IN SAMOAN COMMUNITIES

PHOTO CREDIT: USAID ADAPT ASIA-APCIFIC / SAMOA

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DISCLAIMER

The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

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EXECUTIVE SUMMARY

Background and goal. Samoan Islands are prone to climatic hazards that will likely increase in coming decades, affecting coastal communities and infrastructure around the islands. As a part of the initiative of USAID/Adapt Asia-Pacific in partnership with UNDP to support the Government of Samoa in addressing a range of climate hazard-related issues, the goal of this report is to identify key infrastructure and their functions and status in order to provide an overall picture of relative vulnerability to climate-related stresses of such infrastructure on the island. This report also aims to identify feasible adaptation measures based on consultations with the Government of Samoa and its implementation plan. A case study for the economic costs and benefits for an early warning system are also summarized. In this report, only water supply, sewerage, land transportation and power supply are considered for vulnerability assessment due to climate-related hazards. A detailed and exhaustive assessment of the climate-related vulnerability of the whole infrastructure system of Samoa will require detailed hazard mapping (e.g. flood hazard mapping, coastal erosion hazard mapping, etc.), the development of an inventory of critical infrastructure and their users, and finally a superimposing of the hazard maps with the inventory of the existing infrastructure. Such an exhaustive exercise is beyond the scope of this report due to the limited time available for this study as well as the lack of readily available data.

Climate models do not predict a reduction of such disaster events in the future in Samoa; indeed, most predict an increase in such events. Future rainfall in Samoa is uncertain as model results have been inconsistent; however, projections generally suggest that the dry season rainfall will decrease but the wet season rainfall will increase, which may lead to seasonal cycles of too much and too little water (ICCAI, 2011). Thus, the dry season will likely be drier and the wet season wetter (World Bank, 2010). The sea level in Samoa has been rising at 4 mm per year since 1983, which is slightly greater than the global average of 2.8-3.6 mm per year (ICCAI, 2011). Rising seas may compound problems either by resulting in a higher base and therefore increasing the height of storm surges, or by acting as a higher seaward barrier that restricts the escape of flood waters caused by excessive runoff (Walsh et al., 2004). Apart from coastal flooding, sea level rise (SLR) may accelerate the erosion of coastal margins, threatening surrounding land, property and infrastructure. Keeping these factors in mind, the following principal hazards induced by coastal processes pertinent to the Samoan Islands are included in this study—storm surge and flooding as well as wind damage that occurs during tropical cyclones.

Methods for Vulnerability Assessment. By reviewing existing reports as well as holding a series of consultation meetings, a list of critical infrastructure was developed and shared with stakeholders for their consideration. An indicator-based vulnerability model (SIVM) was developed in collaboration with stakeholders to assess the vulnerability of selected infrastructure systems on the Samoan Islands. The model aimed to capture the exposure of different infrastructure components of the Samoan Islands to a climatic hazard equivalent to cyclone Evan, which caused devastating damage in the islands in 2012. This was done through extrapolations using the costs of reported damage of given infrastructure in that event. The model also aimed to capture the criticality of such infrastructure and the ability of local authorities to repair it. A set of indicators were proposed and discussed with stakeholders. Using a simple additive weight approach, indicators were aggregated to generate a vulnerability index for each infrastructure component within the study.

Data Collection. Existing reports and consultations were the main sources for development of the inventory of critical infrastructure. Damage costs were extracted from the Evan cyclone recovery needs document. On the other hand, criticality and capacity to repair data were collected from stakeholders. Having stakeholder perspectives on these two issues was important because a) criticality of a given infrastructure could be viewed differently among different stakeholders, and b) stakeholders were the best available source (in this study) to estimate the capacity to repair non-physical damage to such infrastructure.

Results of the Vulnerability Assessment. Analysis of the results suggests the following ranking from most vulnerable to least vulnerable.

1. The **transportation sector** is the most vulnerable among the four sectors considered in the study. High physical exposure and comparatively low capacity to repair some transport infrastructure such as bridges accounts for such high vulnerability.

2. The Samoan **power sector** was ranked as second most vulnerable, again mainly because of the high physical exposure of power generation and distribution systems. Comparatively low capacity to repair damage to such infrastructure was also a critical factor for the vulnerability of this sector.

3. The **water supply sector** ranked third, with some of the water supply infrastructure such as the Alaoa, Tafitoala and Tiavi water treatment plants rated as very critical infrastructure as they play a key role in maintaining a safe water supply that is crucial for maintaining public health. Overall, however, the comparatively low damage costs (i.e. lower exposure to climatic hazards) of this sector reduced its relative vulnerability.

4. The **sewerage system** was ranked as the least vulnerable sector. The sewerage system of Samoa is mainly composed of individual household latrines which are comparatively easy to repair locally, a high adaptive capacity that lowers the overall vulnerability of this sector even though disruption of sewerage system can lead to public health problems.

GEF funded LDCF projects have to follow strict guidelines to address climate change adaptation. That said, the Government of Samoa has its own priorities to be considered under LDCF projects. Keeping both criteria in mind, some of the adaptation interventions that have been identified and proposed under the project by the consultant are listed in the following tables.

POTENTIAL ADAPTATION OPTIONS			
ACTIVITY	OUTPUTS	OUTCOMES	APPROX. BUDGET
"RIDGE-TO-REEF" INTEGRATED WATERSHED MANAGEMENT PLAN FOR GREATER APIA			
Develop IWMP for the Greater Apia area (*)	An integrated water management plan for the 5 catchments in the Apia area focused on vulnerability and adaptation of climate change	The IWMP plan able to address vulnerability assessment and adaptation planning addresses ridge to reef overall systems i.e.: environment, (river systems) infrastructure, (protection systems) natural, (watershed and ecosystem), institutional (policy, legislation and economic (cost/benefit) from the whole catchments.	USD 200,000
Design flood protection measures (feasibility study, climate resilient design, cost-benefit, EIA, SIA, etc.) (*)	A framework of steps needed for the design of flood protection measures, including: i) feasibility study; ii) climate-resilient/"building-back-better" design; iii) environmental and social impact assessments & (iv) Cost-benefit analysis.	(1) Standard guidelines for creating a supportive environment, institutional structure to implement IWMP. (2) Standard factors and criteria for feasibility study, climate resilience design, environment and social impact assessment.	USD 1,000,000

POTENTIAL ADAPTATION OPTIONS			
ACTIVITY	OUTPUTS	OUTCOMES	APPROX. BUDGET
Hard measures for protection of community assets			
Build flood protection infrastructure along Vaisigano River (*)	Construction of 900 m length of embankments on each side of the river between Vaisigano and Leone bridges.	100-year return period flood embankment constructed and used for multiple purposes.	USD 3,500,000
Reconstruct community assets following "building-back-better" approaches (*)	50 houses for Cyclone Evan-affected area; 30 houses to provide models for building back better to relocate households from Sogi to Nuu-Falelauniu with sanitation facilities	Demonstration of building back better approach to enhance community resilience	USD 3,400,000
Improved sanitation coverage to Cyclone Evan affected area	# of sanitation facilities constructed; Community management of sanitation facilities is improved; trained staff to maintain sanitation facilities regularly; Subsidized support to communities without septic tank systems for low income households in reticulated water supply area	# of communities with a WatSan committee established; Community management of sanitation facilities is improved; Improved access to and use of sustainable sanitation; % of people in the target communities using latrines on a daily basis; % of latrines managed by local WatSan committees facilities among targeted communities; # of community WatSan committees with technicians trained to perform basic maintenance sanitation facilities	Per household cost USD1,500 (materials cost only)
Access to safe drinking water, rural water treatment plants, and new pipe networks	(1) # of water treatment plants constructed (slow sand filter); community-based committee established to maintain and improve the water treatment plant. (2) Alaoa Water Treatment Plant - Flood Protection Works- Bundwall 130m long and 11m wide, 75m long 16m wide floodway/channel to control flood flow behind primary treatment area and 174m long 23m wide floodway to control flood flow between primary treatment and secondary treatment areas, 5 cell reinforced concrete box culvert and causeway	(1) # of households having access to safe drinking water; # of communities with WatSan committees established; Community management of water supply facilities improved. (2) WTP secure from 1 in 100-year flood event	(1) Per unit cost USD 600,000. (material cost); (2) USD 1,000,000

POTENTIAL ADAPTATION OPTIONS			
ACTIVITY	OUTPUTS	OUTCOMES	APPROX. BUDGET
Drainage improvements and flood control works in Greater Apia Urban Area	Construct approx 3555 m of drainage/channel improvements in Sopoaga Road to increase flood control.	Improve flood control and the environment for quality of life.	USD1,000,000
Soft measures for protection of community assets			
Implement ecosystem-based approaches to watershed management and flood mitigation (*)	(1) Development of flood forecasting techniques for all 5 river basins in Greater Apia. (2) Generation of medium- and long-range weather/climate predictions; (3) Improved interpretation and communication for sectoral decision making. (4) Development of storm surge model with coastal inundation capacity; Capacity building of the Met office to operationalize the coastal inundation forecasting models.	(1) Advance and accurate operational flood forecasting system is in place to provide warnings to communities. (2) Strategic and planning decisions for disaster risk and climate change adaptation. (3) of communities able to receive coastal inundation warning information well enough in advance to take appropriate actions.	USD1,000,000
Ensure climate smart building codes	(1) Finalization of revised building codes; (2) Training on revised building codes for community application; (3) Equipment to test the structure quality for appropriate assessment; (4) In-house experts to review design (i.e. steel design experts).	All sectors follow building codes. PUMA ensure and train local community/masons on the new design and practice. The revised building codes approved by highest authority.	Finalization of building code $50,000; Training to communities $100,000; Equipment and vehicles $100,000
Establish climate forum	Establish dialogue process between forecast providers and users.	• Ensure that forecasts/warning information products, including their uncertainties and limitations, are communicated to and understood by users. • Encourage the use of forecasts to mitigate risks in climate-sensitive sectors, including, but not limited to agriculture, water resources, disaster management, and health. • Receive user feedback for improving usability of forecast products. • Provide a platform for inter-agency coordination of policies, and sectoral plans and programs for dealing with potential impacts of hydro-	USD 200,000 (workshop @ 100,000; product development @ 100,000)

POTENTIAL ADAPTATION OPTIONS			
ACTIVITY	OUTPUTS	OUTCOMES	APPROX. BUDGET
		meteorological hazards. • Provide a platform for long-term process of understanding risks posed/opportunities brought about by past, current, and future climate.	
TA to assistance on 4 hydropower risk assessments	Assessment of hydropower for future extreme events	all 4 hydropower plants are fully assessed for retrofitting for climate proofing	USD 200,000
Renewable energy, enhanced climate resilience and the potential for building sustainable economic opportunities	Methodically testing and cataloguing the biogas potential of a wide range of possible feedstocks that can be used in biodigesters to produce biogas, also for commercial scale operations	Renewable energy, enhanced climate resilience and the potential for building sustainable economic opportunity	USD 300,000

Based on these above recommendations, during consultation the Government of Samoa identified critical activities for consideration under this project as denoted (*) in the table. The watershed plan and coastal development plan (i.e. CIM) in Samoa once fully harmonized under the WB PPCR project and UNDP Adaptation funds projectswill aim to reduce climate risk using principals of a 'Ridge-to-Reef' approach. The IWMP will focus on 5 water catchments in the Apia area. To address the climate risks, the IWMP will conduct Vulnerability and Adaptation Assessments (V&AA) in finalising the design of project. The V&AA will address gaps from the 5 major sub-systems i.e.: environment, (river systems) infrastructure, (protection systems) natural, (watershed and ecosystem), institutional (policy, legislation and economic (cost/benefit)) from all five catchments. TheGovernment of Samoa has implemented several flood mitigation measures through different projects and programs with the support of SOPAC, EU and AUSAID and noted the lack of technical and personal capacity when combining the various areas for design under integrated flood management, land use zoning flood risk, flood forecasting and the integration of early warning systems. There is also inadequate planning and coordination among the various Government agencies that have the responsibility for flood risk reduction and mitigation, both at the national and village levelThere is a need to consolidate Hydro-meteorological data and budget allocations for mitigation activities through the enhancement of flood forecasting systems.

Structural interventions will remain the primarily focus on the protection of human health and safety, valuable goods and property. Flood forecasting and warning is a prerequisite is and effectivemitigation measure of potential flood damage. Its effectiveness depends on the level of preparedness and response. To enable the Water Resources Division of MNRE to provide timely and reliable flood warning and flood forecasting information for proper community response. The project anticipates providing the required resources to the Water Resources Division with flood forecasting information and capacity training for the Vaisigano River basin.

In December 2012, Tropical Cyclone Evan, a Category 3 cyclone impacted Samoa. Strong winds and flooding caused severe destruction. A Post Disaster Needs Assessment (PDNA) conducted by the World Bank and the United Nations with the participation of the Government to assess the damage and the loss from the Cyclone was completed in January 2013. Its recommendations have provided the basis for a

Recovery Framework that has now received Cabinet approval, and its principles are expected to guide the Government Recovery Programme. It stresses the need for investments in recovery of lost assets to go beyond regaining damaged assets and loss to the economy to 'Build Back Better' (BBB) with improved standards, for increasing disaster resilience and avoiding the creation of new vulnerabilities. United Nations-Habitat with other development partners is working with the Government of Samoa providing assistance to realize these objectives.

1 BACKGROUND

Samoa is comprised of two large volcanic islands (Upolu and Savai'i) and several smaller islands with a total land area of approximately 2,935 km^2. It lies in the southwest Pacific within an exclusive economic zone of 120,000 square km. The population of Samoa is approximately 187,820 (Census, 2011). Approximately 76% of the population lives on Upolu. Apia, with a population of around 36,000, is the capital city and is located on Upolu. Upolu is also serviced by an international airport and a deepwater port. There are 330 villages in Samoa with a population density ranging from 26 people per km^2 in Savaii to 612 people per km^2 in Apia Urban Area (averaging 67 people per km^2). Both islands are mountainous and 70% of the population lives in low-lying coastal areas. There are numerous large and small resorts and accommodation complexes located on the two main islands. Domestic accommodation for most of rural Samoa is the traditional open fale (with no fixed walls).

The National Infrastructure Strategic Plan (NISP) outlines the government's priorities and strategic directions for major initiatives in the economic infrastructure sector over the next 5-10 years. The Plan is country owned and led, and was developed in close consultation with infrastructure managers, the community, the private sector, and development partners. In particular, the NISP is closely linked to the *Strategy for the Development of Samoa 2008–2012* (SDS), and its vision of "… improved quality of life for all". Infrastructure plays a critical role in achieving the goals of the SDS, because there is a clear and positive linkage between infrastructure, social development, community well-being and economic growth. That is why it is critical for Samoa to invest in infrastructure and ensure that its infrastructure is operating as efficiently as possible. After any disaster, "building back better" is often advocated, but unless an appropriate assessment of future extreme events and climate-proof infrastructure is undertaken, the sustainability of that infrastructure remains at greater risk. This report identifies some key water-related infrastructures that need to be considered under the UNDP GEF-funded project "Economy-wide integration of CC Adaptation and DRM/DRR to reduce climate vulnerability of communities in Samoa" based on consultations with different government agencies of Samoa. Based on the recommendations, this report develops a model for assessing the climate-related vulnerability of four public infrastructure sectors of Samoan (i.e., water supply, sewerage, land transport, and power supply), provides an inventory of critical infrastructure for each sector, and ranks those infrastructure systems in terms of their relative vulnerability to climate-related hazards. This report also covers feasible adaptation measures that could be undertaken to promote the resilience of key infrastructure to climate change-induced hazards in Samoa. Finally, the report includes a case study for the economic costs and benefits of an early warning system.

1.1 PROJECT INTRODUCTION

The U.S. Agency for International Development (USAID) supports the USAID/Adapt Asia-Pacific project to assist eligible Asian and Pacific countries in gaining improved access to financing for climate change adaptation. USAID/Adapt Asia-Pacific in partnership with UNDP is supporting the Government of Samoa in addressing a range of climate change-related issues through an economy-wide approach that integrates climate change adaptation and disaster risk management and disaster risk reduction (DRM/DRR) into national development planning and programming, targeting communities as first responders to natural disasters.

The UNDP-GEF Least Developed Countries Fund (LDCF) project "Economy-wide integration of Climate Change (CC) Adaptation and DRM/DRR to reduce climate vulnerability of communities in Samoa" is currently under preparation by the UNDP Country Office in Samoa. The main GEF LDCF project components include: 1) strategic integration of CC adaptation and DRM in national development policy, planning and budgeting through an economy-wide approach; 2) enhanced resilience of communities as first responders of climate change-induced hazards; and 3) improved systems for monitoring and evaluation and knowledge management. A 6-12-month project preparatory phase has

been identified to design the project in consultation with key stakeholders and beneficiaries; potential partners as well as technical feasibility/capacity assessments will be completed to define an operationally viable UNDP-GEF/LDCF-compliant project document.

This work is focused on the vulnerability of infrastructure exposed to coastal hazards. Infrastructure here is commonly defined as the various components of the built environment that make communities safe and which must adapt to extreme climate events due to climate change. The utilities, transportation systems, communication networks, water systems, early warning information products and other elements make up some of the most critical systems protecting Samoan communities against future hazards. Thus even modest disruptions to infrastructure can have significant effects on daily life, and any systematic change in the frequency or intensity of those disruptions could have profound consequences for economic and human well-being. Even though the infrastructure framework involves many aspects, this report focuses only on the water sector; that is, the physical components of water sector infrastructure (e.g. buildings, embankments, bridges, water supplies and sanitation) and the "soft" components (i.e. early warning, community preparedness, etc.). The general concept of vulnerability can be analyzed in three main categories: physical, systemic and organizational/social. The latest severe disaster for Samoa was tropical Cyclone Evan in 2012. This assessment thus mainly focuses on infrastructure recovery requirements from Cyclone Evan, as well as other related hazard aspects.

1.2 SITUATION ANALYSIS

Samoa's islands are highly vulnerable to impacts from climate change, such as sea level rise, increased incidents of extreme events including flooding from storm surges, and tsunami inundation. Climate change is one of the largest challenges Samoa faces, affecting all aspects of life on the island. Samoa's climate is greatly influenced by the El Niño-Southern Oscillation (ENSO). The El Niño phase of ENSO generally brings dry conditions over the island group. In contrast, La Niña tends to bring wetter conditions and is associated with flooding in downtown Apia. Cyclones have occurred more frequently in El Niño years. The average number of cyclones per year varies from 0–5 in one season, where 52 tropical cyclones passed within 400 km of Apia (IUCN2011) during an El Niño year. The influence of global warming on Samoa results in more frequent and extreme rainfall events, longer dry spells, consistent drought events, hotter days, rising sea levels, extreme winds and extremely high air and water temperatures (Climate Risk Profile, 2007).

1.2.1 Infrastructure and Development

According to NISP 2011, there are strong positive links between infrastructure and economic and welfare outcomes. In particular, research results indicate that:

- investment in core economic infrastructure (such as electricity, telecoms, transport, sewerage and water systems) produce the largest gains in productivity. Investments in roads and telecommunications typically deliver the greatest social returns;
- maintenance is not "visible" but is more likely to have a greater positive influence on economic outputs than new projects;
- when access to core infrastructure has been addressed, the best economic results come from improving efficiency and then from reducing service prices; and
- ultimately, infrastructure investment only adds value if it is allocated in the right way.

This means that well-targeted investment in infrastructure can have significant benefits for economic growth and quality of life. But the reverse is also true. Inadequate infrastructure is a bottleneck to economic activity, and also reduces the day-to-day well being of people and their ability to withstand and respond to natural disasters. Sustainability is also compromised because resources are used wastefully. It

is therefore important to understand that inadequate infrastructure does not necessarily mean that thereare not enough infrastructure. It extends to whether or not existing infrastructure is being used and managed effectively. When it is not, service coverage, pricing and quality are all affected, and the benefits of appropriate infrastructure are not realized. As a result, this design report focuses not just on physical infrastructure but also on the way that it is used and managed.

Infrastructure plays a critical role in achieving the goals of the SDS, because there is a clear and positive linkage between infrastructure, social development and economic growth. In general terms, demand for infrastructure capacity and services is linked to population; to the needs of individuals and businesses; and to national development objectives, especially quality of life, economic growth and sustainability, as outlined in the SDS. More specifically, infrastructure contributes to the wellbeing of individuals by providing access to services and social and economic opportunities; and the services delivered by economic infrastructure are an intermediate input into production and affect business efficiency. This means that infrastructure supports the economy and community, and can also be a catalyst for improved quality of life and economic growth. These linkages are shown in Figure 1.1. That is why it is critical for Samoa to invest in infrastructure and ensure that infrastructure is operating as efficiently as possible.

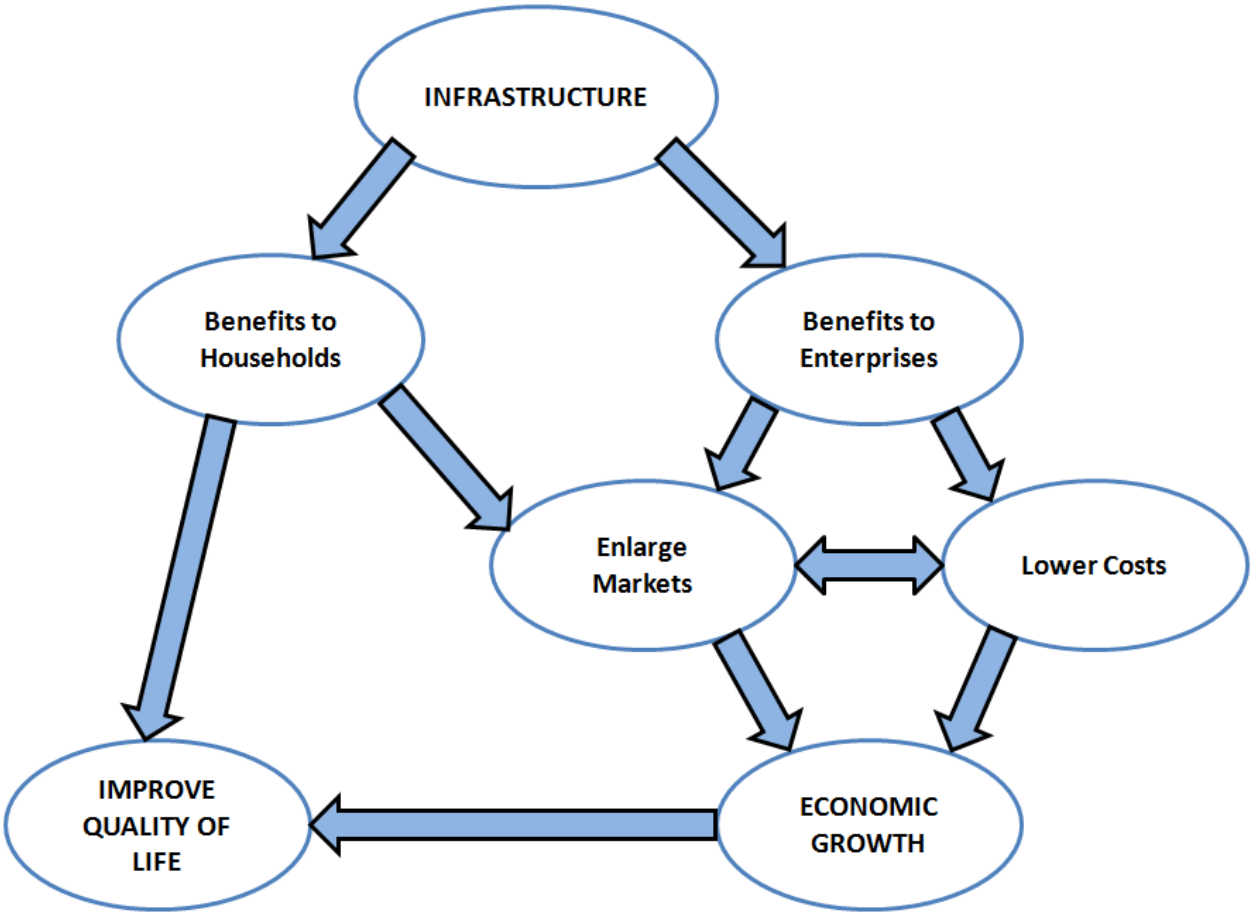

FIGURE 1.1
How infrastructure contributes to development (Source: NISP, 2011)

1.2.2 Climate Change Vulnerability and Impact on Infrastructure in Samoa

Samoa is particularly vulnerable to the adverse effects of climate change. The region is exposed to a number of natural hazards, including tropical cyclones, floods, earthquakes, tsunamis, volcanic eruptions,

and drought. According to the World Bank, Samoa is ranked 30th of countries most exposed to three or more hazards. Samoa ranked 51st out of 179 countries in the Global Climate Risk Index 2012 report on countries that suffers most from extreme weather events (GoS, 2013). At the same time the region is also vulnerable to other extreme climate events, including coral bleaching associated with high ocean surface temperatures and/or extremely low tides. The impacts of climate-related events are felt right across the nation's economic, social and environmental systems, which becomes an issue of great concern.

Infrastructure vulnerability to climate change is increasing around the world and Samoa is particularly vulnerable. Settlement patterns, urbanization, and changes in socioeconomic conditions have all contributed to observed trends in exposure and vulnerability to climate extremes. Settlements concentrate the exposure of humans, their assets, and their activities. The whole island population is highly vulnerable to different hazards, but groups facing the highest risks are the rural poor in informal settlements, internally displaced people, and those living in marginal areas. Samoa is particularly vulnerable to climate extremes, especially where urban infrastructure predominates in coastal locations. Transportation, infrastructure, water, and tourism are sectors sensitive to climate extremes. Transport infrastructure is vulnerable to extremes storm surges, which can lead to damage in road, airports, and ports, and electricity transmission infrastructure is also vulnerable to extreme storm events.

1.2.3 Disaster Risk in Samoa

According to Post Disaster National Assessment (PDNA) (2013), "The total estimated damage and loss on cyclone Evan are equivalent to about 28 percent of the total value of goods and services produced in the country in 2011". Cyclone Evan hit Samoa in December 2012 and caused immense damage and significant losses. The value of durable physical assets across all economic and social sectors destroyed by Evan (referred to as damage) is estimated at SAT 235.7 million, equivalent to US$103.3 million.

Samoa experiences high vulnerability to natural disasters and to external economic and trade developments. These natural disasters include tropical cyclones, prolonged periods of drought, extreme flooding, pests and sudden outbreak of diseases, storm surges and sea level rise which affects the natural resource-dependent economy of Samoa. Samoa has suffered serious economic shocks caused by natural disasters. For example, there were severe cyclones in the successive seasons of 1989-90 (Ofa) and 1990-91 (Val), in addition to the major Cyclone Evan in 2012, which all caused massive damage to infrastructure and other assets (World Bank, 2010). Tropical cyclones are events with multi-faceted hazards, composed of extreme winds, tornadoes, storm surges, wave action and heavy rainfall. The main damage from tropical cyclones results from the severe wind and associated storm surges. According to the National Disaster Management Plan (2011), the highest climate-related hazards we consider in this study are cyclone (includes storm surge causing coastal inundation and high winds) and flood (inland flooding due to heavy rain) (Table 1.1 shows the extreme to moderate hazard risk of Samoa).

TABLE 1.1: HIGHEST RISK HAZARDS FOR SAMOA (NDMP, 2011)

Hazard	Level of Risk
Cyclone[1]	Extreme
Volcanic Eruption	Extreme
Tsunami	Extreme
Urban Fire (Apia)	Extreme
Public health crisis	Extreme
Environmental crisis – invasive species	Extreme
Flood[2]	High
Earthquake	High
Landslide	High
Forest Fires	High
Aircraft emergency (airport)	High
Hazchem incident – marine	High
Lifeline Utility Failure – water	Moderate
Agricultural crisis – animal or plant disease	Moderate
Civil emergency – external	Moderate

Samoa's National Adaptation Programme of Action (NAPA) identified nine sectors highly vulnerable to the adverse impacts of climate change and climate variability, including extreme events. The nine sectors listed from the highest to lowest vulnerability are:

1. water;
2. agriculture and food security;
3. forestry;
4. health;
5. urban settlements;
6. coastal environments;
7. communities;
8. trade and industry; and
9. works transport and infrastructure.

Climate change and climate-induced disasters will cause instability in food production and water availability, affecting income generating activities for communities and the country at large (PPCR Samoa, 2010). As the majority of Samoa's population resides near the coastal area, infrastructure and human lives are more vulnerable to the direct impacts of extreme climatic events. As the climate changes, infrastructure is often unable to cope with the increased capacity required for satisfactory performance and consequently is not able to adequately perform the function it was designed for (Peck et al., 2013). The expected damage to infrastructure for selected climate change phenomena, for example high precipitation, cyclones and sea level rise may result in coastal inundation, flood damage to homes and property, and damage to roads, ports bridges and other infrastructure. When Cyclone Evan made landfall on December 13, 2012, it caused widespread damage across Samoa, with heavy rainfall, flash floods and maximum sustained winds up to 90 knots (166.7 km/h). The cyclone killed at least five people and displaced 4,763 people. Evan destroyed power plants, cutting power and disrupting communication

services; it also ripped trees out of the ground, destroyed buildings and roads, and damaged vast swaths of crops. In addition, water facilities and distribution systems were badly damaged and disrupted nationwide.

1.3 TARGET SECTORS AND BASELINE

One of the outputs (Output 2.1.1) of the LDCF project is "Post-cyclone Evan infrastructure reconstruction activities aligned with "building-back-better" standards and updated management plans, regulations, and codes (including household assets, houses, community buildings, roads, coastal infrastructure, water shed management, etc.), implemented using best available technology and building household-level capacity. Thus this assessment mostly focuses on water-related infrastructure (i.e. water supply, sanitation, drainage, etc.) as well others such as housing, design of climate-proof bridges, building codes, and early warning systems. Interviews were conducted with key stakeholders to identify ongoing initiatives, current gaps in the system, and possible adaptation options that could be carried out under the project.

The vulnerability assessment used the damage caused by the cyclone Evan as a baseline proxy. Cyclone Evan is a relatively recent event (2012) and information on the damage to infrastructure is readily available through a study conducted by GoS (2013a). The proposed interventions were based on the existing and completed assessments, good practice reports, and lessons learned studies conducted by other programs. This assessment also reviewed the WB PPCR project and UNDP Adaptation funds project and their proposed interventions which could enhance and complement these ongoing and planned projects.

1.4 KEY STAKEHOLDERS

The key stakeholders engaged in the discussions on infrastructure risk and capacity assessment are summarized herewith in Table 1.2. The agencies visited and people met during two missions are summarized in Annex 1.

TABLE 1.2: KEY STAKEHOLDERS CONSULTED

AGENCY	KEY RESPONSIBILITIES IN CCA & DRR	RELEVANT POLICIES & LEGISLATION
Ministry of Natural Resources & Environment (MNRE)	MNRE is one of the Samoan government's largest ministries and houses multiple separate divisions dedicated primarily to land, water and environmental planning and management. Hence, it is the largest repository of knowledge and experience on climate and natural resources in the country, with a number of highly trained staff in areas ranging from hydrology to land registry and management to urban planning and beyond. MNRE is also the ministry responsible for producing the key policy documents that guide climate change programming for the country, including the National Policy Statement on Climate Change and the NAPA. It is the designated secretariat for the National Climate Change Country Team (NCCCT), members of which include the CEOs of relevant ministries. The NCCCT has served as the key coordination mechanism for national response to climate change initiatives in the past, but has not remained active.	Integrated Apia Master Plan for Water Supply, Sanitation & Drainage 2011 National Adaptation Program of Action 2005 Coastal Infrastructure Management Strategy and Plans (CIM) (currently under revision) EIA Regulations 2008 Land Surveys and Environment Act 1989
Water Resources	The water resources division under MNRE	Water Resources

TABLE 1.2: KEY STAKEHOLDERS CONSULTED		
AGENCY	KEY RESPONSIBILITIES IN CCA & DRR	RELEVANT POLICIES & LEGISLATION
Management (WRM) under MNRE	established to ensure community access to water of suitable quality and appropriate quantities to meet all reasonable health, environmental and economic development needs (http://www.mnre.gov.ws). It has three major sections, namely policy, hydrology and watersheds.	Management Act 2008 Water Act 1965
Planning and Urban Management Agency (PUMA) under MNRE	The Planning and Urban Management Agency (usually referred to as "the Agency") was formed in 2002, and was the first real effort to address national and urban planning and development issues through strategic and statutory instruments. The Agency operates under the Planning and Urban Management Act ("the Act") and subsequent regulations. The Act created the Agency and Board as a statutory authority responsible for preparing strategic urban planning tools such as planning provisions, plans, and development standards, development consent and compliance of development activity, environmental impact control and compliance, and establishing the Planning Tribunal and enforcement provisions. The Agency sees its mission as "development regulatory and strategic planning for a prosperous Samoa". The Agency regulatory model is based on international planning and resource management law and practice. (http://www.mnre.gov.ws).	Samoa National Urban Policy 2013 Housing guidelines 2005 Planning and Urban Management Act 2004.
Disaster Management Office under MNRE	The DMO is responsible for ensuring the ongoing coordination, development and implementation of Disaster Risk Management programs and activities in Samoa	• Samoa National Action Plan for Disaster Risk Management 2011-2016 (which also serves as the national DRM policy) • Disaster and Emergency Management Act 2007 • National Disaster Management Plan (2011) • National Action Plan for DRM (2011 – 2016) • Fire and Emergency Service Act 2007 • The Red Cross Response Plan • National Policy on Combating Climate Change, 2005 • National Tsunami Plan 2008 • Tropical Cyclone Plan 2007
Land Transport Authority (LTA)	The Land Transport Authority (LTA) is a Public Trading Body established on 1 December 2008	• Construction guidelines • Samoa Asset

TABLE 1.2: KEY STAKEHOLDERS CONSULTED		
AGENCY	KEY RESPONSIBILITIES IN CCA & DRR	RELEVANT POLICIES & LEGISLATION
under MNRE	under MNRE. It brings together the road asset management and road use management functions under the Land Transport Authority Act 2007. The prime objective is to provide a safe and environmentally friendly land transportation network for Samoa (http://www.lta.gov.ws).	Management System (SAMS) • Environmental Management Plan (EMP) • Environmental Impact Assessment (EIA) guidebook
Meteorological Division under MNRE	The Samoan Meteorological Division, formally known as the Apia Observatory, was founded in 1902 under the Samoan Government Ministry of Natural Resources and Environment. The Division consists of six sections including: Administrations; Climate Change; Climate and Research; Disaster Management Office; Geology/Geophysics; and Weather/Forecasting. The Samoan Meteorological Division provides regional and national weather bulletins; tropical cyclone warnings; rainfall outlooks; monthly rainfall data; earthquake reports; and climate outlooks	•
Ministry of Works, Transport & Infrastructure (MWTI)	The Ministry of Works, Transport and Infrastructure (MWTI) is the government entity principally responsible for building. This includes establishing, regulating, promoting and monitoring transport and infrastructure legislation and policy to ensure safe, secure and viable transportation modes and infrastructure assets. It focuses mainly on airport, road and port initiatives, but MWTI is also the national ministry in charge of developing, disseminating and monitoring specifications for the national building code, which has been revamped to accommodate the country's objectives in connection with climate change, disaster risk management and "building back better" philosophy. In this area, MWTI has considerable construction experience of relevance for the development of this GEF project (http://www.mwti.gov.ws).	• Draft Building Regulations 2003 • National Building Code 1992 (under revision) • Ministry of Works Act 2002 • Home Building Manual 1992
Ministry of Agriculture and Forest (MAF)	MAF is the principal organization which provides regulatory and technical advice, training, and support for subsistence farmers, commercial farmers, agri-processors, and exporters to effectively manage and use the potential in agriculture and fisheries for food security, income generating opportunities, commercial development, and sustainable management of resources.	• Agriculture, Forestry & Fisheries Ordinance 1959 • Quarantine (Biosecurity) Bill 2003 • Plants Act 1984 • USP School of Agriculture Act
Electric Power Corporation (EPC)	EPC is responsible for providing reliable and affordable electricity service to the population of Samoa. At present they have 2 diesel engine plants and 5 hydropower stations. 1hydro-power engine was completely damaged in last cyclone Evan.	

TABLE 1.2: KEY STAKEHOLDERS CONSULTED		
AGENCY	KEY RESPONSIBILITIES IN CCA & DRR	RELEVANT POLICIES & LEGISLATION
	Total demand for electricity is around 28 MW during peak times. The hydropower stations provide 11.8 MW during the wet season, and diesel engines have a combined capacity of 23.4 MW.	
Ministry of Women, Community, and Social Development (MWCSD)	As the primary government institution for women's issues as well as village governance, cooperation and development, MWCSD is the entity through which all other government and non-government entities are required to pass for any work involving the local communities. As such, it maintains the closest government ties to the village mayors, village women's leaders and key local development actors.	• Village Sustainable Development Plan

The detail water sector policy and regulatory framework are described in Annex 2.

2 KEY WATER INFRASTRUCTURE IDENTIFIED UNDER CLIMATE THREAT

Annual maximum and minimum temperatures in Samoa have been increasing, which is consistent with the global pattern. The rainfall pattern in Samoa since 1950 is unchanged with very little variation from year to year and season to season. The Global Wet scenario projects an increase of 0.97–0.99°C by 2050, while the Global Dry scenario for 2050 projects an increase of 0.81–0.83°C by 2050 (World Bank, 2010). The sea level in Samoa has been rising at 4 mm per year since 1983, which is slightly greater than the global average of 2.8 to 3.6 mm per year (ICCAI, 2011). By 2030, under a high emissions scenario, the increase in atmospheric temperature is projected to be in the range of 0.4 to 1.0°C. The future rainfall in Samoa is uncertain as the model results are not consistent. However, projections generally suggest that the dry season rainfall will decrease but the wet rainfall will increase that may lead a situation of too much water and too little water (ICCAI 2011). Thus, the dry season will be drier and the wet season will be wetter (World Bank 2010).

Samoa inherits high vulnerability to natural disasters and to external economic and trade developments. According to the World Bank, Samoa is ranked 30th of countries most exposed to three or more hazards. Samoa was ranked 51st out of 179 countries in the Global Climate Risk Index report on who suffers most from extreme weather events (Harmeling, 2011). These natural disasters include tropical cyclones, prolonged periods of drought, extreme flooding, pests and sudden outbreaks of diseases, storm surges and sea level rise which affects the economy of Samoa, a country that is mostly dependent on natural resources. Samoa has suffered serious economic shocks caused by natural disasters like severe cyclones in successive seasons of 1989-90 (Ofa) and 1990-91 (Val), which caused massive damage to infrastructure and other assets (World Bank, 2010) and a major cyclone Evan in 2012.

The water sector's disastrous and difficult situations relating to quality, accessibility and availability of water impact directly on the livelihoods of the communities. Sea level rise may lead to saline water intrusion in underground water sources, affecting the drinking and irrigation water supply systems. This in fact has already been experienced by the people living there. Drought in Samoa is the most obvious and hard-felt impact. There are no physical solutions or a common strategy for adapting to the adverse effects of flooding and drought.

Approximately 70% of Samoa's population and infrastructure are located in the lowland coastal areas. Future climate change and a rising sea level in the country could exacerbate coastal erosion, loss of productive land, property, and dislocation of human population and the infrastructure (GoS, 2005). The coastal zone is vulnerable to sea level rise, and all water infrastructure like dams, water supply systems, hydrological stations, and water treatment plants are subject to damage caused by the high winds, storm surges, and torrential rainfall associated with severe tropical cyclones. It is estimated that two cyclones—Ofa in 1990 and Val in 1991—caused damage to agriculture, infrastructure, and other assets valued at 2.5 to 3 times the country's GDP in 1990 (World Bank, 2010). The coastal infrastructure vital to village communities such as school buildings, church buildings, halls, *malae*, bridges, roads, homes and properties are mainly threatened by extreme events, such as storm surges, tropical cyclones, and severe flooding.

Projected changes in rainfall intensity are likely to increase instances of flooding, leading to inundated water basins and over-tipped dams, culverts and flood-control structures, which in turn may lead to breakages of the country's existing infrastructure system. Samoa lies within the cyclone-belt and is also in close proximity to the Tongan Trench, which is a known earthquake-generation zone (United Nations, 2006).

2.1 STRUCTURAL

2.1.1 Housing and Land Use

The dominant land use in Samoa excluding forestry is agriculture. A common land use pattern in the villages of Samoa consists of a residential area with a village common ground, or *malae*, on a kilometer-wide strip of land along the coastline. The inland zone is a mixed cropping of fruit trees, bananas and coconuts, and further inland is a zone of primary food crops of taro, taamu and yams. The proportion of land covered by forests has increased from 35% in 2000 to 60% in 2005, a reflection of the government's aggressive approach to promote reforestation (GoS, 2010). Around 43% of land is arable and three-quarters of the population still depend on the land for their agriculture activities. However, Samoa is ecologically fragile and vulnerable to environmental degradation and to the impact of cyclones. It is estimated that over 30% of agricultural production is carried out in areas with severe soil limitations, leading to steeper slopes being cleared and increasing the vulnerability to erosion (GoS, 2013). Climate change is expected to have a significant impact on urban settlements, especially in the face of increasing population and continual urban migration. Poor drainage systems, no strategic planning, and an increasing urban population exacerbate the impacts of climate change on urban settlements (GoS, 2005).

An increasing number of village communities are experiencing flooding inundation in new areas of their land. The village of Lano for example suffers mainly from frequent coastal flooding. These problems are worsened by other human activities such as deforestation in the areas located uphill and inland. Tropical cyclones and storm surges contribute to the problem. The land use in and around Apia, the capital city of Samoa, is greatly modified from its natural state, with urban development in the coastal plain and low foothills, and peri-urban development and commercial agriculture in the watersheds (GEF, 2010). Samoa, in particular the urban areas of Apia, suffers greatly from the effects of flooding. The last major flood, in 2001, caused direct losses of SAT 11 million. (ApproximatelyUS$4.8 million). Other reported major floods have occurred in 1939, 1974, 1975, 1982, 1990, 1991, 2003 and 2006 (Lumbroso et al., 2006). In December 2012, Cyclone Evan and the subsequent flooding caused extensive destruction of houses in Samoa. The combined impact of strong winds and very high water levels affected 2,088 houses located across the country, though most of the damage was done in limited areas of Upolu. The flooding of houses also resulted in extensive destruction of household goods. About 7,500 people were temporarily displaced (GoS, 2013).

2.1.2 Land and Water Transport

There are five main public sector transport organizations in Samoa: the Ministry of Works, Transport and Infrastructure (MWTI), the Land Transport Authority (LTA), the Samoa Ports Authority (SPA), the Samoa Shipping Company (SSC) and the Samoa Airport Authority (SAA).

The geographically compact nature of Samoa and its road and shipping network make transport relatively easy, facilitating access to centralized government services (GoS, 2013). Samoa has an extensive network of roads in inhabited areas. The transport sector assessment undertaken by the World Bank in January 2013 found there were 2,340 km of roads, 332km (14 percent) of which were paved (GoS 2013). This network provides good access links to communities in terms of connectivity, and is generally in good condition. Around two-thirds of the total network and all major roads are paved. Currently, a high proportion of Samoa is serviced by tar-sealed road systems, and a well-developed shipping service links both islands (GoS, 2005). On the principal islands of Upolu and Savai'i, there are about 2,340 km of roads, 14% of which are paved, and 52 bridges (44 bridges on Upolu and 8 on Savai'i). Approximately 70% of Samoa's population lives within one kilometer of the coast, and critical infrastructure (i.e., hospitals, schools, places of employment, tourist infrastructure, port facilities, power plants, airports, and roads) is located primarily in the coastal zone where roads are extremely important. However, the Samoan road network faces a range of vulnerability issues: (a) coastal exposure to sea level rise, storm surges, and

wave action during cyclones and tsunamis; (b) inland flooding and landslips during extreme rainfall events; (c) damage from earthquakes; and (d) accelerated pavement deterioration due to extreme weather and rising water tables in some locations (GoS, 2013). The Government is putting a strong emphasis on road maintenance and Samoa is a leader in the Pacific region in outsourcing road maintenance (GoS, 2011). But due to the changing nature of climate extremes, many roads become impassable following floods, cyclones, and tsunamis, cutting off access to villages during periods of severe weather and natural disaster. The transport sector plan (2013-2018) stresses to develop appropriate mechanisms for climate proofing of the entire road network to ensure climate resilience (GoS, 2011).

2.1.3 Water Resources Management

The government of Samoa's approach for water resource management is through the Watershed Management Plans (WMPs). WMPs in critical areas are being prepared; however, the development and subsequent implementation and enforcement of these critical plans have been greatly delayed due largely to limited existing capacity. There are nine watershed management plans existing and in draft forms. The Togitogiga and Vaipouli Watershed Management Plans have been endorsed by the government. The Loimata, Apaula and Gasegase WMPs are also in draft form, while the Faleaseela and Fuluasou WMPs are currently under review and two others, Aufaga and Tafitoala WMPs, have just been drafted (GoS, 2012).

The existing national hydro-metric stations are being upgraded to automatic systems, which measure and produce real-time data. Similar work is also in progress to expand the networks in groundwater. Technical trainings on hydrological monitoring to the national meteorological and hydrological services have been undertaken, and a central database on water resources information called the National Water Resources Information Management System (NWRIMS) is now functioning in Samoa. There are no major irrigation projects in Samoa as most agricultural activities depend on rainfall. Rainwater harvesting is becoming an important issue in Samoa. It has always been part of the overall strategy of water provision. However, it was left largely to individuals and the private sector to undertake projects in communities in response to local needs. Following the 2011 drought, it has become essential that a sectoral approach incorporates the resources available with the need for such projects, the priority placed on each project, and the standards to which the projects are delivered.

2.1.4 Water Supply

Samoa has abundant water resources compared to many other Pacific Islands (GoS, 2012). Samoa's water system services roughly 97% of the population (GoS, 2011), evidence of rapid progress over the last decade as only two-thirds of the population had access to water drawn from surface sources (Taulialo, 1993). Samoa Water Authority (SWA), a Public Trading Body, is the major water services provider in Samoa. Its water service networks cover the urban and rural regions of Upolu, Savaii and Manono Islands. A number of people are receiving water supply exclusively from wells, springs and rainwater reservoirs. Samoans have always regarded water as a gift from god and accordingly, they expect that it should be free. There is concern about the excessively high consumption of water as a result of the inefficient use of existing supplies and supply leakages (GoS, 2013).

Although water is easily available, access to safe and treated water is very low. In part, this is because some villages rely upon private water supplies that are neither treated nor appropriately maintained, therefore, there is a high chance of contamination. With fewer skilled professionals in rural areas, it is frequently difficult to maintain these private water supply systems. Although the cost of maintaining private water schemes is high, many villages prefer the current system because they do not trust the government and wish to be free from government water charges, notwithstanding the health risks of consuming contaminated water. Currently, there are 22 water supply projects in Samoa, among them 18

are in Upolu and 4 in Savai. The Samoa Water Authority (SWA), a government body, has the mandate to distribute water to communities.

Due to climate change, the water resources in Samoa are in a difficult situation. Dry and drought periods result in water shortages while heavy rains bring flooding. During droughts the water evaporates faster resulting in a drier situation (MNRE, 2009). The distribution of water sources in Samoa is influenced by the geology and topography. Catchment areas are small and slope gradients steep, resulting in rapid responses to rainfall events causing flooding with significant sediment loads. Low flows in streams during dry periods have been significant enough to cause problems for the urban areas of Samoa. Furthermore, sea level rise increases the possibilities of seawater intrusion into underground water aquifers which is believed to cause hypertension (Gero et al., 2013). The flood and other extreme flows may directly disrupt the pipe- and canal-based water system systems in Samoa. Extreme events such as cyclones and flash flooding have become frequent events, which have had major effects on the Samoa Water Authority's service. All these events tend to disrupt the service and result in major problems of deteriorating water quality (GoS, 2005). The recovery and reconstruction workplan 2013-2015 by the SWA is summarized in Annex6.

2.1.5 Sanitation

About 89% of the population in Samoa has access to improved sanitation facilities (GoS, 2011). Quality of water is the main driver of sanitation in every settlement. Water quality is affected by poor sanitation, stagnation and sedimentation. Poor sanitation and unsafe water is known to trigger water-borne diseases that affect public health. Water treatment capacity is not adequate for the current demand on the Samoa Water Authority system, and the private water suppliers do not treat water. This contributes to historically high levels of water-borne diseases (GoS, 2011). In Samoa, lack of access to healthy water sources is a common problem in both coastal and inland areas. Community people have experienced health and sanitation problems caused by the extreme climatic conditions, especially with the onset of drought when drinking water is scarce. This triggers outbreaks of communicable and vector-borne diseases like malaria. Cyclone Evan seriously damaged the waste water system. The damage and loss assessment of cyclone Evan is summarized in Table 2.1

TABLE 2.1: CYCLONE EVAN - DAMAGE AND LOSS ASSESSMENT ON WASTE WATER

REF	ITEM	DETAILS	QUANTITY	RATE	AMOUNT (SAT)
1	Damages				
	Wastewater pump stations at Aggie Grey's Hotel totally destroyed	Replacement of two pump stations comprising storages, pumps and controls - including taxes, duties and freight	2	45,000	90,000
	TOTAL DAMAGES				90,000
2	Losses				
2a	Lost revenue - sales not made				
	All wastewater customers - during period when no billings possible	Lost revenue from all wastewater customers from 1st December to 8th January when water billings (and wastewater billings) recommenced. Average	1.27	250,000	317,500

TABLE 2.1: CYCLONE EVAN - DAMAGE AND LOSS ASSESSMENT ON WASTE WATER					
REF	ITEM	DETAILS	QUANTITY	RATE	AMOUNT (SAT)
		monthly wastewater billings are SAT 250,000			
	Loss of future billings from Aggie Grey's Hotel	Hotel has closed and will remain closed for approximately 12 months. Average monthly wastewater bill is SAT15,550	12	15,550	186,600
2b	Higher Operational Costs	None			0
2c	Unexpected Costs	None			0
	TOTAL LOSSES				504,100

Heavy rainfall and inadequate drainage mean that flooding is a frequent problem, compounded by land filling and the blocking of drains. Intense flooding causes sewerage pipes to break, and then the contaminated water spills out to the surface. This poses a public health risk as septage and latrine runoff contaminate water supplies. Flooding is another major cause of health problems, and water-borne diseases such as typhoid and diarrhea spread. Climate-related diseases including food- and water-borne diseases, vector-borne diseases and airborne diseases remain in the top ten causes of morbidity in Samoa. There have been several outbreaks of typhoid fever and dengue fever in recent years.

Surveillance data from the Ministry of Health illustrates that diarrhea continues to be the second-most common disease from 2006 to date. Of all diarrheal cases from 2006-2011, 46% were children under 5 years. The diarrheal cases show a seasonal pattern which increases during the November/December to February/March period which is the wet season in Samoa (GoS, 2012). Health sector vulnerability in Samoa is closely related to water resource issues, particularly the poor water quality and stressed water quantity in the event of floods and drought.

Many vector-borne diseases are weather sensitive and small changes in the weather can dramatically trigger disease transmission. For example, dengue fever and *filariasis* are carried by the domesticated mosquito *Aedes aegypti*. This mosquito thrives in urban environments and breeds in areas that hold water. Cholera is not endemic in Samoa; however, there is some evidence that rising sea surface temperatures may increase the risk of cholera spreading. Typhoid became more problematic with flooding and contamination of surface water in sewage, and it remains a very high risk in Samoa with up to 693 cases reported per year. The last major outbreak of this disease was in the early 1990s. Drought conditions have been linked to increased concentrations of pathogens in surface water and increased morbidity and mortality from a combination of diarrhea and dehydration cases. Droughts and increasing heat waves also cause flu, eye and skin infections (such as skin cancer) and also diseases of the respiratory system.

2.1.6 Electricity

Currently, about 80% of the population have access to electricity (MNRE, 2009). Samoa has been producing 12 MW of electricity, which is only 29.27% of its total capacity (Renewable Factsheet 2013). Hydroelectricity generation accounted for about 50% of electricity production on Upolu. There are five micro-hydro projects, all located in Upolu, at Afulilo, Lalomauga, Samasoni, Faleolefee and Alaoa, the latter three all within the same Vaisagano watershed (GoS, 2012). Before the commissioning of the

Afulilo Hydroelectric scheme in July 1993, hydroelectric power was generated from small "run of the river" plants. Afulilo is a water storage scheme consisting of an impoundment in the upstream plateau of eastern Upolu and a power station at the coast of Fagaloa bay. There is a need to balance the water needs of hydroelectric generation, public water supplies and environmental conservation in Samoa (GoS, 2013). Although Samoa receives high rainfall, water resources usually dry up three to six months of the year as a result of the high permeability of younger rock formations. During this time, only three major rivers run, and these have been fully developed for water catchment.

Cyclone damage and continuing land clearance were the major threats affecting the ability of water catchment areas to hold water as well as the quality of the water from the remaining streams (GoS, 2013). Extreme heavy rainfall causes immediate flooding, which in turns causes extensive erosion. The influx of flood-mobilized sediment into reservoirs and hydropower schemes damages the water supply as it compromises the generation of electricity (MNRE, 2009). Following Cyclone Evan in 2012, the entire island of Upolu and part of Savai'i were without power, though it was restored quickly in Savai'i afterwards. Within one week, power was restored to approximately 10% of the population of Upolu, and within four weeks, about 60% were reconnected. Full reconnection was achieved by mid-February 2013. Cyclone Evan caused significant damage to three hydropower plants (Samasoni, Alaoa, and Fale ole Fee) and minor damage to two additional hydropower plants. The cyclone also damaged Upolu's main Tanugamanono diesel power station. Damage to the transmission and distribution grid included 1,198 power poles damaged (833 leaning, 245 broken, and 120 fallen), 158 power meters destroyed, 6.7km of power line requiring replacement, 25 transformers destroyed, and significant damage to the radio network (GoS, 2013)

2.2 NON-STRUCTURAL

Structural measures alone cannot protect people from natural disasters; some non-structural measures (i.e. early warning, effective communication flow, community preparedness, etc.) are essential. It has long been recognized that if societies could have advanced information on weather, the adverse effects associated with it could be minimized. Prevalence of traditional forecast practices in various parts of the world reflects the demand for long-range forecast schemes to manage the associated uncertainties (Fakhruddin, 2013). Early warning systems alone do not prevent hazards from turning into disasters. Early actions with appropriate infrastructure are essential in order to mitigate potential damage (World Disaster Report, 2009).

The community impacts remain very high due to constraints in information flows, low capacity at local levels and lack of awareness of response options. In any past single event it was observed that early warning systems fail. Examining the root causes, there were three major reasons for warning failures (ICID, 2010):

- Warning not understood: Messages lacked relevance and meaning for the target groups. Some groups were largely excluded from most of the networks, hence they were unable to receive warnings. Alternatively, informal personal networks may have undermined or deflected official communications.
- Warning understood, but ignored: In this case, the warning was understood but it may have been ignored as other priorities interfered with an immediate response to the warning (e.g. looking for household members), seeking confirmation before acting or people made their own decisions based on experience or culture.
- Warning understood, not ignored, but response was not effective: Finally there were cases where the warning was understood and it was not ignored. However, the response failed due to lack of physical facilities, for example a lack of safe shelters or evacuation modes.

Thus combinations of structural and non-structural measures are essential to make communities resilient to extreme climate events.

Through various programs supported by a variety of donors (e.g. EU, World Bank, Australia, New Zealand, Japan, etc.), the national early warning system is quite strong at this point, especially for response. The warning generation system is still weak or totally dependent on external sources. The country's Meteorological Department lacks capacity on hazard detection and modeling capacity for extreme climate events. In addition, the WRM has not fully established a flood early warning system. Other hazard warning systems could also be established, but this project focused only on tropical cyclones and floods. The DMO has a good warning dissemination network for multi-hazards as well as community-level development plans.

The recently completed UNDP-GEF project "Integrating Climate Change Risks in the Agriculture and Health Sectors in Samoa" (ICCRAHS) aimed to increase resilience and the adaptive capacity of Samoa's meteorological, agricultural and health sectors to adverse climate impacts, under both current and possible future climates. The project supported the strengthening of meteorological climate database management, but the in-house localized climate information generation is still missing. A project funded by Finland supports accessing information through cloud monitoring. For daily operational weather forecasting, the Meteorological Department follows WMO's Global Framework for Climate Services (*GFCS*). The responsibility for hydrology falls under a separate agency from meteorology, and the capacity to generate flood warnings is still under development. Flood warnings could be significantly enhanced through strengthening the National Meteorological and Hydrological Services' capacities in Samoa.

An assessment has been made under the EU EDF – SOPAC Project to assess the costs and benefits of improving the flood forecasting and warning system currently in place. It is assumed that no benefits will be realized until the second year, when all components of the system are in place (i.e. rainfall gauges, software, and public awareness campaigns have been conducted). The results from the analysis indicate that, regardless of the discount rate used (see Table 2.2), the benefits of the improved forecasting and warning system outweigh the costs. In the worst-case scenario (using discount rate of 10%), for each tala invested in the system, WST$1.72 is avoided in future flood damages. Since additional benefits such as avoided health-care costs, stress and trauma have not been included in the analysis, it is likely that the benefits from the improved forecasting and warning system have been underestimated, which will result in even higher benefits-to-cost ratios.

TABLE 2.2: BENEFIT-COST ANALYSIS INDICATOR

INDICATOR	DISCOUNT RATE		
	3%	7%	10%
Present value of benefits	1,861,888	1,178,762	895,483
Present value of cost	970,913	653,279	521,035
Net present value	890,975	525,483	374,448
Benefit-cost ration	1.92	1.80	1.72

(Source: EU-SOPAC Project Report 69g, p.49)

The case study for cyclone Evan shows that for every USD 1 invested in EWS, there is a return of USD 4.35 in benefits (Annex-4).

2.3 CAPACITY ASSESSMENT

The government of Samoa's approach for water resource management is through the Watershed Management Plans (WMPs). WMPs in critical areas are being prepared, however, the development and subsequent implementation and enforcement of these critical plans have been greatly delayed due largely to limited existing capacity. There are 8 watershed management plans existing and in draft forms. The Togitogiga and Vaipouli Watershed Management Plans have been endorsed by the government and few watersheds are being rehabilitated. The Loimata, Apaula and Gasegase WMPs are also in draft form while the Faleaseela and Fuluasou WMPs are currently under review, and two others, Aufaga and Tafitoala WMPs, have just been drafted (GoS, 2012). The existing national hydro-metric stations are being upgraded to the automatic systems that measure and produce real time data. Similar work in expanding the networks in ground water is also in progress. Technical trainings on hydrological monitoring to the national meteorological and hydrological services have been undertaken, and a central database on water resources information called the National Water Resources Information Management System (NWRIMS) is now functioning in Samoa. There is no major irrigation project existing in Samoa as most of the agricultural activities depend on the rainfall. Rainwater harvesting is becoming an important issue in Samoa. It has always been part of the overall strategy of water provision. However, it was left largely to individuals and the private sector to undertake projects in communities in response to local needs. Following the 2011 drought, it has become essential that a sectoral approach incorporates the need for such projects, with a greater priority placed on each project and higher standards to which the projects are delivered.

2.4 GAPS IN THE SYSTEM

Any design of infrastructure related to the hydrologic cycle (e.g. levees, embankments, bridge, roads, etc.) is based on an underlying assumption that the probability distribution of extreme weather is statistically stationary. This assumption is called into question by climate change, resulting in uncertainty about the future performance of systems constructed under this paradigm. In the context of climate change the stationary hypothesis represents the biggest challenge for the present and the future of infrastructure design. "Climate smart" or "climate proof" infrastructure has been suggested, which should be designed based on several scenarios of future climate change and vulnerability assessments at the community level. Based on the consultations with the stakeholders, some of the needs that were identified are summarized in Table 2.3.Details about the needs assessment and proposed infrastructure interventions are summarized in the later sections.

TABLE 2.3: INFRASTRUCTURE NEEDS ASSESSMENT BY STAKEHOLDERS

INFRASTRUCTURE	NEEDS ASSESSMENT
Housing and land use	• Flood hazard zoning and construction of new houses in the safe area. • Demonstration of building back better with climate proof housing.
Land transport	• Improvement of storm water drainage system to reduce flooding behind roads • Construction and retrofitting of damaged bridges • Construction of roads
Water	• Development of flood forecasting system for Vaisigano river basin and other river basin as well. • End-to-end early warning mechanism for flood events • Rainwater harvesting at family and community levels • Routing the drainage system far from the water source and supply systems and other essential, sensitive infrastructures. • Sensitization to community people about the efficient use of water

TABLE 2.3: INFRASTRUCTURE NEEDS ASSESSMENT BY STAKEHOLDERS	
INFRASTRUCTURE	NEEDS ASSESSMENT
Sanitation & Water Supply	• Support sanitation service to rural populations • Promotion of drinking water treatment system at household level as the point of use (POU) options • Education and awareness program about the diarrheal and other water borne diseases
Electricity	• The electricity networks can be passed through underground system so that the overtopping of sea water does not affect • Relocation of main supply system from the coastal hazard zones • Detail assessment of the risk of hydro-power stations and rebuild climate proof supply network.

3 VULNERABILITY OF KEY INFRASTRUCTURE

This section outlines the methods implemented to assess the vulnerability of public infrastructure systems and the well being of residents of Samoan to the hazards discussed in the previous section.

3.1 FRAMEWORK

Recently Sydney Environmental Vulnerability Assessment (SEVA) framework was developed and applied to assess vulnerability to assess the sea level rise (SLR) vulnerability of public infrastructure systems of a local council (Shoalhaven City Council) in Sydney. It was developed specifically for assessing vulnerability of infrastructure systems and their users to SLR at a local scale, but can be used for any climate related hazards. It is an indicator based approach where an indicator-based vulnerability model is developed in collaboration with the stakeholders. Involvement of local stakeholders is crucial in order to ensure that the exercise capture the most relevant local contexts. The main objective of this model is to rank a given set of infrastructure sector based on their climate-related vulnerability. Once the model is developed the overall vulnerability index is developed by aggregation of indicator using ted using one of the mathematical procedures discussed in the following sections. The following section describes the indicator-based vulnerability model developed for this study, its development process and mathematical approach used for aggregation of the developed model.

3.2 MODEL DEVELOPMENT PROCESS

A participatory approach is used for the development of the vulnerability model as it is essential to engage with the local stakeholders to ensure that the most relevant local contexts are captured in the model. Two missions were conducted to discuss with the local stakeholders to identify needs and requirements. A detailed step-by-step process of the whole exercise is shown in

3.1.

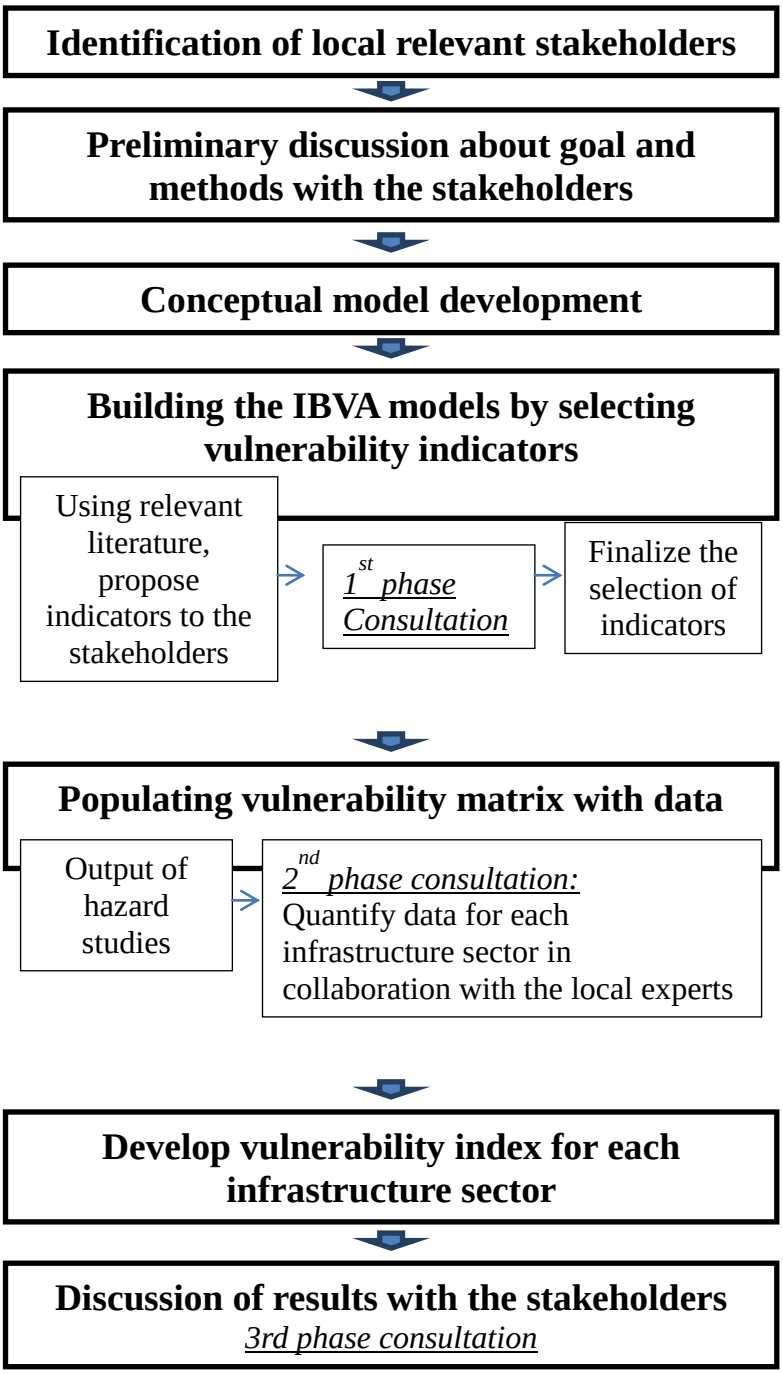

FIGURE 3.1
Step-by-step vulnerability assessment process

3.2.1 Stakeholder consultation and information flow process

The process flow diagram, shown in the figure demonstrates the flow of information in this study. The process started with preliminary discussions with local experts regarding their organizational goal, objectives and existing methods used in the study. After reviewing previously conducted hazard studies of Samoan and other relevant literature, a conceptual model of the vulnerability of Samoa was developed. Following this conceptual model, a list of vulnerability indicators were proposed to the stakeholders for further consultation (1st phase of consultation), who then selected those that are most relevant in the context of Samoa. Starting from the IPCC definition of vulnerability, the Samoan Infrastructure

Vulnerability Model **(SIVM)** was developed with a focus on the vulnerability of the infrastructure systems of Samoa to climate-related hazards by considering the bio-physical, socio-economic and institutional dimension of risk.

In order to select the most relevant set of indicators for Samoa from the proposed set, the following stakeholders were identified and consulted in the first mission and followed by a second mission.

- Planning and Urban Management Agency (PUMA) for water supply and sanitation
- Land Transport Authority (LTA) for transportation and drainage
- Electric Power Corporation (EPC) for power supply authority
- Meteorological Department and Water Resources for early warning system for extreme climate events
- Ministry of Works, Transport and Infrastructure for building back better and building codes

Once the indicators of the model were finalized, the scores for each indicator of each infrastructure system were estimated in order to populate the vulnerability matrix. This was done in collaboration with the engineers and experts from respective departments previously identified (2nd phase of the consultation). A 3rd phase of consultation may be required after development of this vulnerability index in order to discuss the results with the stakeholders and to identify whether it differs from their local perception of their vulnerability. The following sections describe the conceptual model as well as the indicators that were finally selected.

3.2.2 Conceptual Model

One commonly used definition (illustrated in FIGURE 3.) was presented by the International Panel on Climate Change (IPCC) in its Third Assessment Report (IPCC 2001), which was adopted for the Samoan context as well:

> "[Vulnerability is] the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity" (McCarthy et al., 2001).

The three dimensions of vulnerability elicited in this definition (exposure, sensitivity, and adaptive capacity) are seen as the outcome of the interaction of two traditions of vulnerability research in physical and social sciences—a synthesis that provides a better account of the contextual and social dynamics of climate hazards and the multiple linkages that govern their impacts (Adger, 2006; Füssel, 2007).

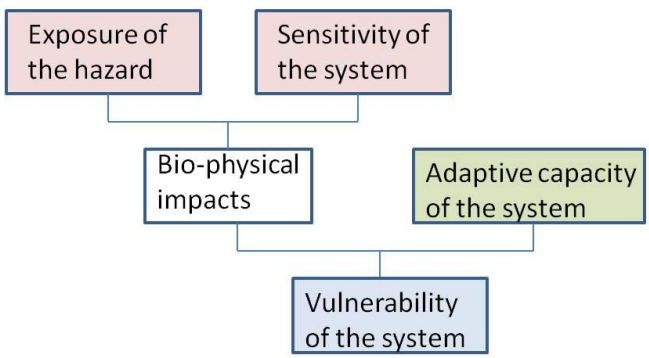

FIGURE 3.2
Components of vulnerability (adopted from IPCC, 2001)

Following this conceptualization, a general conceptual model for vulnerability of an infrastructure sector of the Samoan islands is developed and shown in

FIGURE . Climatic events (e.g., storm surge, flooding and inundation, etc.) pose certain hazards in Samoa (coastal forcing). Their impact depends on the characteristics of the infrastructure (e.g., geographic location, physical integrity, etc.). The social, institutional and financial resources that the community has access to are considered as a reflection of its adaptive capacity.

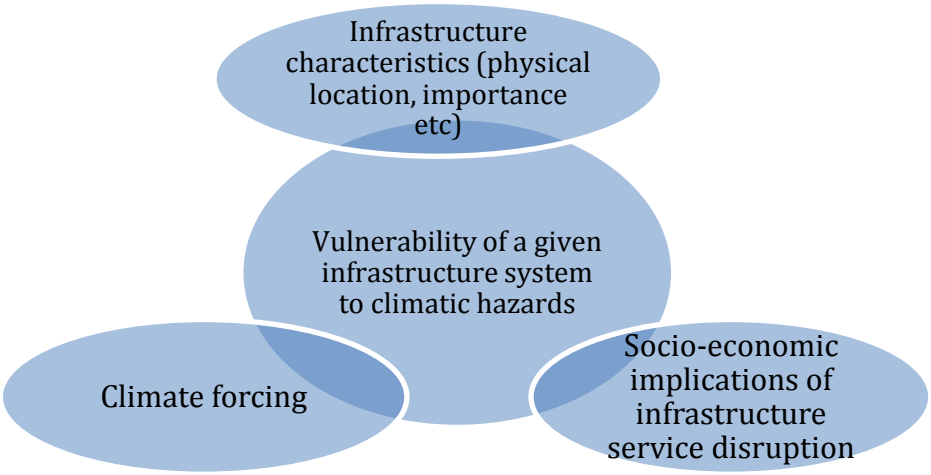

FIGURE 3.3
General conceptual model of vulnerability of infrastructure sector to climatic hazards

The first step in building the most basic vulnerability model, is to define the problem at hand by answering some basic questions (e.g., which socio-ecological system (SES) is the object of the study, the vulnerability to which climate-related stress(es) or hazard(s) is to be assessed, the vulnerability of which valued attribute(s) of this SES(s) is to be assessed, at what point of time is the assessment to be done, which components of the infrastructure are relevant for the study, etc.). In the following section, the answers to these basic questions are discussed in the context of this study.

3.2.3 Problem definitions

As mentioned before one of the main objectives of this study was to rank a given set of infrastructure systems (IS) of Samoa in terms of their relative vulnerability to climate-related stresses. Therefore, a given infrastructure system (e.g., water supply, transportation etc.) is taken as a socio-ecological system which needs to be ranked. A plausible **cyclone** with an intensity equivalent to cyclone Evan is considered as the hazard. The physical integrity of the public infrastructure of a given sector and the well-being of its users were considered as the valued attribute of concern. The vulnerability of the users of a given infrastructure is partly determined by the extent to which the service it provides is critical, and the ability of the service providing authority and/or the users to deploy an alternative to the disrupted service.

In the following sections, the conceptual models underlying SIVM discussed in detail.

3.2.4 Vulnerability of infrastructure system of Samoa and its users (SIVM)

In this model, the cyclones and associated coastal flooding events were taken as the main driving climatic forces impacting the Samoan coast. An ideal vulnerability study would require a physical hazard mapping of such a coastal flooding event at the island. However, given time limitations on this assignment such a

detailed assessment of physical climate risk for Samoa was not possible nor within the scope of this report. Therefore, to provide an indication of vulnerability of infrastructure assets this study adopted the damage caused by the cyclone Evan as a proxy to such information. Cyclone Evan is a relatively recent event (2012) and detailed damage to infrastructure caused by this event is readily available through a study conducted by GoS (2013a). This can be argued that the use of actual damage data instead of model-based risk assessment data can provide an indication of vulnerability of infrastructure assets under consideration.. The approach in determining vulnerability will use climatic hazard indicators *equivalent* to cyclone Evan (i.e.: exposure to risk). Tropical Cyclone Evan passed over Samoa as a Category 2 tropical cyclone on 13-14 Dec 2012. It followed high rainfall over several days approximately one week earlier. Very heavy rainfall over most of the island of Upolu, resulted in high flows of water in catchments, rivers and channels, carrying large debris loads. Much of the debris comprised fully grown tree trunks and branches, which destructively impacted structures along the rivers and flood plains, as well as causing severe flooding of areas and property adjacent to the river channels. Two main water treatment plants were affected and operations were hampered while six main bridges connecting roads on the south and east coasts to Apia Township were also damaged with one completely destroyed.

Identifying the criticality of a given infrastructure from the users' perspective would allow the assessment using the above model to identify how a disruption of a given infrastructure can affect its users (sensitivity of the system). Here, the term criticality suggests the importance of the infrastructure from the user's point of view of how the infrastructure supports and maintains the publics life-lines. As an example, the user might feel that water supply is more critical to him than the sewerage system. On the other, hand the capacity of government institutions (local or central government) to counter and/or mitigate the climatic impacts and the collective is referred to as the adaptive capacity of the SES. The overall infrastructure vulnerability of the IS was determined by the physical impact on its infrastructure and the sensitivity of its users to the impacts, minus the capacity of the authority and individuals to cope with those impacts, a summary of the definitions underlying the model are given in Table 3.1.

TABLE 3.1: SIVM: VULNERABILITY OF A GIVEN INFRASTRUCTURE SYSTEM AND ITS USERS TO CLIMATIC HAZARDS EQUIVALENT TO CYCLONE EVAN

INFORMATION TYPE	DESCRIPTION
Socio-Ecological System (SES)	A given infrastructure system is defined as the infrastructure system owned and maintained by government.
Valued attribute of concern (VA)	All public infrastructures and the well-being of their users
Climatic stress	Climatic hazards such as a design storm with same magnitude of cyclone Evan
Time	Present-day vulnerability to climatic hazards
Exposure of infrastructure system to hazard	Extent to which public infrastructure systems are exposed to climatic hazards (*damage cost from Evan*)
Sensitivity of infrastructure system to the impacts of hazard	1. Extent to which the well-being of the community of users of the public infrastructure is likely to suffer as a result of disruption to service (*Criticality of the service*);
Adaptive capacity of the service providing authority and the users	1. Extent to which, and speed with which, relevant public authorities are able to repair damaged infrastructure components and restore disrupted services to users or offer substitute services

3.3 SELECTION OF INDICATORS

The next phase was to identify the indicators through which SIVM could be made operational, i.e. used as a basis for ranking vulnerabilities of the IS identified in the earlier section. The indicators proposed for the vulnerability model is described in the next sections. The selection was conducted in collaboration with government experts from Samoa.

First, "reported damage of the infrastructure during cyclone Evan" is taken as an indicator of physical exposure of the infrastructure to a climatic hazard (V1). Second, the sensitivity of users of a given infrastructure was captured by expert and stakeholder judgment about the degree to which the disrupted service is critical, i.e. the extent to which it serves a vital function (e.g., from the user's point of view the water supply may be more vital than sanitation) (V2). Finally, adaptive capacity in this case is reflected by the capacity of the local authority to repair the infrastructure after a possible disruption (V3).

TABLE 3.2: VULNERABILITY INDICATORS OF SIVM

DIMENSION	ID	INDICATOR	UNIT	TYPE	D_A	DATA SOURCE
Exposure	V1	Reported damage of the infrastructure during cyclone Evan	$	Quantitative	+	Study conducted by (GoS 2013a)
Sensitivity	V2	Criticality of the service that the infrastructure provides	N/A	Semi-quantitative	+	Stakeholder input through expert estimation
Adaptive Capacity	V3	At current situation, capacity of the service providing authority to repair the infrastructure if damaged	N/A	Semi-quantitative	-	Stakeholder input through expert estimation

D_a = Direction: + (-) indicates that vulnerability increases (decreases) with increasing indicator.
N/A= Not Applicable

The following scales were used for eliciting experts' and stakeholders' judgment for V2 and V3.

TABLE 3.3: SCALES USED FOR ALL V2 FOR ALL INFRASTRUCTURE SYSTEMS

DESCRIPTION	SCALE
Extremely Critical - asset failure is unacceptable. The consequences are so serious that they cannot be tolerated under any circumstances	3
Critical - The consequences of failure may be tolerated provided the risk of failure is as low as reasonably practicable.	2
Non - Critical - Consequences of asset failure are acceptable	1
No infrastructure affected	0

TABLE 3.4: SCALES USED FOR ALL V3 FOR INFRASTRUCTURE SYSTEM

DESCRIPTION	SCALE
Full capacity to repair	3
Partial capacity to repair	2
Cannot repair with existing capacity	1

These scales were developed in consultation with stakeholders.

3.4 INFRASTRUCTURE SYSTEMS OF SAMOAN ISLANDS

Infrastructure systems of Samoa that are considered in this study were primarily divided into two categories; a) hard infrastructure systems and b) soft infrastructure systems. The former are likely to be affected by climatic hazards and were divided into four asset type categories:

1. Water supply;
2. Sewerage (sanitation and sewer transport infrastructure);
3. Land transport infrastructure (i.e., roads and bridges);
4. Power supply infrastructure.

The selection of these asset type categories was guided by the activity schedule developed during consultation with local stakeholders. The above four asset type categories were considered to be of higher order importance compared to other infrastructure asset categories such as telecommunications, building assets, etc.

On the other hand, the soft infrastructure systems is here applied when dealing mainly with capacity and knowledge development issues affecting the public, and other civil and societal institutions. The two soft systems under investigation in this project are as follows:

1. Early warning systems
2. Knowledge development program (about climate hazards)

This study assesses the relative vulnerability of hard infrastructure systems only. For the soft infrastructure, a case study on costs and benefits is presented in this study to indicate value added services to enhance community resilience.

3.5 MODELLING AND AGGREGATION OF INDICATORS

A simple additive weight-based aggregation, a widely used approach, was adopted in this study to aggregate indicators. Aggregation of indicators can bring all of the information used in the model (as a form of indicator) together to portray an overall picture of vulnerability of the infrastructure system. This approach is used widely in the literature for vulnerability studies (Moss, 2001; Ebert and Welsch, 2004; Gbetibouo et al., 2010; Babel et al., 2011; Preston B.L et al., 2008).

$$V_m = \sum_{i=1}^{n} W_i \bar{I}_{mi} \quad (1)$$

Here, V_m is the vulnerability of a given infrastructure system (m), n is the number of indicator of the vulnerability model; w_i is the weight of importance of a given indicator i and $\bar{I}_{mi}$ is the normalized indicator. Normalization is required for bringing different types of indicator data into a common platform where they can be aggregated. There are different techniques of normalization available in the literature. In this study, the following approach was used for normalization.

$$\bar{I}_{mi} = \frac{(I_{mi} - I_{i\,min}) * 100}{I_{i\,max} - I_{i\,min}} \quad (2)$$

Here, I_{mi} is the i the indicator of the mth infrastructure system; $I_{i\,min} = \min(I_{mi})$ and $I_{i\,max} = \max(I_{mi})$

Some limitations from this model has been criticized by many scholars. One of the main reasons of such criticism is that it simplifies a lot of complexities and assumes a linear relationship between indicator and vulnerability.

3.6 DATA COLLECTION

In the first stage of the data collection, a number of existing reports on the Samoan Islands, specifically on its climatic hazards and infrastructure systems were reviewed. A set of critical infrastructure components for each infrastructure system was identified from these reports. Values for the first indicator of the SIVM (V1), which is the reported damage cost of each of these components during the cyclone Evan, was extracted from the existing report (GoS, 2013a). For the other two indicators (V2 and V3), stakeholders were consulted for their expert opinion. Based on the scale shown above (Table 3.3 and Table 3.4) stakeholders provided their opinion on the criticality of each of the listed infrastructure components, and also on the current ability of the infrastructure service providing authorities to repair any low-level damage. Here, low-level damage refers to any damage that does not require complete replacement of the infrastructure.

3.6.1 Identification of critical infrastructure

Review of existing reports resulted in identifying a set of infrastructure components within each infrastructure system which are critical to maintaining the serviceability of the given infrastructure system. Here infrastructure components refer to a specific infrastructure within a system. As an example, Afiamalu water treatment plant is an infrastructure component of the water supply system. The following table shows the critical infrastructure components of Samoa that were considered in this study (Table 3.5).

TABLE 3.5: KEY INFRASTRUCTURE COMPONENTS OF SAMOA THAT ARE CONSIDERED IN THIS STUDY

INFRASTRUCTURE SYSTEM	INFRASTRUCTURE NODE
Water Supply	Afiamalu
	Malololelei
	Vailima
	Alaoa
	Maagiagi
	Vaivase-Uta
	Fagalii- Uta
	Vailele
	Tapatapao
	Fuluasou JR
	Fuluasou EU
	Aleisa
	Lefaga
	Tafitoala and Tiavi
	Togitogiga
	Piu
	Lepa
	Lano
	Aleipata
	Faleapuna
Sewerage	Onsite sanitation facilities

	SWA sewerage system
Power Supply	Power generation
	Samasoni hydro power plant
	Alaoa hydro power plant
	Fale ole Fee hydro power plant
	Lalomauga hydro power plant
	Taelefaga hydro power plant
	Tanugamanono diesel thermal plants
	Savai'i diesel thermal plants
	Transmission and distribution
	Power poles
	Power meters
	Cross-arms
	Power lines
	Transformers
	Radio network
Land Transportation	Roads
	Bridges
	Other infrastructure

3.6.2 Data collection for the vulnerability model

Table 3.6 shows the values of the indicators of the SIVM for each of the infrastructure components that were collected for the sources mentioned in Table 3.2.

TABLE 3.6: VULNERABILITY RAW DATA

		VULNERABILITY INDICATORS		
		V1	V2	V3
		EXTENT OF DAMAGE IN CYCLONE EVAN (USD)	CRITICALITY OF THE SERVICE (BASED ON A PREDEFINED SCALE)	CAPACITY OF THE SERVICE PROVIDING AUTHORITY TO REPAIR DAMAGED INFRASTRUCTURE
WEIGHT OF INDICATOR		1	1	1
INFRASTRUCTURE SYSTEM	INFRASTRUCTURE NODE			
Water Supply	Afiamalu	1,167	2	2
	Malololelei	448,659	2	2
	Vailima	5,852	2	2
	Alaoa	2,331,690	3	2
	Maagiagi	219,956	2	2
	Vaivase-Uta	758	2	2
	Fagalii- Uta	197	2	2

TABLE 3.6: VULNERABILITY RAW DATA				
		VULNERABILITY INDICATORS		
		V1	V2	V3
		EXTENT OF DAMAGE IN CYCLONE EVAN (USD)	CRITICALITY OF THE SERVICE (BASED ON A PREDEFINED SCALE)	CAPACITY OF THE SERVICE PROVIDING AUTHORITY TO REPAIR DAMAGED INFRASTRUCTURE
WEIGHT OF INDICATOR		1	1	1
	Vailele	921	2	2
	Tapatapao	8,604	2	2
	Fuluasou JR	62,982	2	2
	Fuluasou EU	12,800	2	2
	Aleisa	-	2	2
	Lefaga	21,930	2	2
	Tafitoala and Tiavi	578,513	3	2
	Togitogiga	8,772	2	2
	Piu	-	2	2
	Lepa	-	2	2
	Lano	1,316	2	2
	Aleipata	3,026	2	2
	Faleapuna	1,272	2	2
	Total damage/ Avg criticality and capacity	3,708,415	2.1	2.0
Sewerage	5040 Number of damaged onsite sanitation facility	4,290,000	3	1
	SWA sewerage system	39,474	3	1
	Total damage/ Avg criticality and capacity	4,329,474	3	1
Power Supply	Power generation			
	Samasoni hydro power plant	7,894,737	2	1
	Alaoa hydro power plant	910,658	2	1
	Fale ole Fee hydro power plant	5,166,930	1	1
	Lalomauga hydro power plant	287,939	1	1
	Taelefaga hydro power plant	126,228	1	1
	Tanugamanono diesel thermal plants	730,263	1	1
	Savai'i diesel thermal plants	28,509	1	1
	Transmission and distribution	-		
	Power poles (833 leaning, 245 broken, 120 fallen)	377,851	2	2
	Power meters (158 meters destroyed)	42,061	2	2
	Cross-arms (195 broken)	212,149	2	2
	Power lines (6.7km needing replacement)	640,658	2	2
	Transformers (25 destroyed)	191,974	2	2

TABLE 3.6: VULNERABILITY RAW DATA				
		VULNERABILITY INDICATORS		
		V1	V2	V3
		EXTENT OF DAMAGE IN CYCLONE EVAN (USD)	CRITICALITY OF THE SERVICE (BASED ON A PREDEFINED SCALE)	CAPACITY OF THE SERVICE PROVIDING AUTHORITY TO REPAIR DAMAGED INFRASTRUCTURE
WEIGHT OF INDICATOR		1	1	1
	Radio network (destroyed)	183,684	2	2
	Total damage/ Avg criticality and capacity	16,793,640	1.62	1.46
Land Transportation	Partially damaged roads	5,746,360	1	2
	Fully destroyed roads	16,565,614	1	2
	Bridges	3,632,149	2	1
	Other infrastructure	43,860	1	1
	Total damage/ Avg criticality and capacity	25,987,982	1.25	1.50

3.7 VULNERABILITY INDEX

One of the objectives of this study was to assess *relative* vulnerability of the infrastructure systems of Samoa. In order to achieve that, vulnerability indices were developed using the methods stated in the previous section. It should be noted that, vulnerability indices were created for the whole infrastructure system only, NOT for individual infrastructure components. For V1, collected damage data of different infrastructure components of a given infrastructure system were summed to get the total reported damage of the sector. V2 and V3 are ordinal variables, therefore, values of all infrastructure components of a system were averaged to get the representative value of the system (e.g., average of all V2 of the 20 components of water supply system was taken as the V2 of the water supply system, see Table 3.7). These values were then normalized and converted into indices using the equation 1 and 2. In the case of V3 (which is the lower the more vulnerable), 100-$\bar{I}_{mi}$ were used. This was done to ensure that all of the time high index value indicates high vulnerability.

TABLE 3.7: VULNERABILITY MATRIX FOR THE 4 INFRASTRUCTURE SYSTEM CONSIDERED IN THIS STUDY			
	INDICATOR VALUES FOR THE WHOLE SYSTEM		
INFRASTRUCTURE SYSTEM	V1 – AGGREGATED DAMAGE FOR ALL INFRASTRUCTURE COMPONENT OF THE SYSTEM	V2 – AVERAGE CRITICALITY OF THEINFRASTRUCTURE COMPONENT OF THE SYSTEM	V3 – AVERAGE REPAIR CAPACITY OF THEINFRASTRUCTURE COMPONENT OF THE SYSTEM
Water Supply	3,708,415	2.2	2
Sewerage	4,329,474	3.0	1.0
Power Supply	16,793,640	1.62	1.46
Land Transportation	25,987,982	1.25	1.50

TABLE 3.8: VULNERABILITY INDICES					
INFRASTRUCTURE SYSTEM	NORMALIZED INDICATORS			INDEX	RANK
	V1	V2	V3		
Water Supply	-	54.3	65	119.3	3rd
Sewerage	2.8	100	-	102.8	4th
Power Supply	58.7	20.9	100	179.6	2nd
Land Transportation	100	-	97.5	197.5	1st

4 RESULT ANALYSIS

The results suggest that land transportation is the most vulnerable infrastructure sector of Samoa. The high damage cost of this sector is almost double that of the power supply sector and seven times higher than the water supply sector. Although sewerage was considered the most critical of the infrastructure services by stakeholders, its comparatively lower damage cost and the higher capacity of the local authority to fix any damage made it the least vulnerable infrastructure sector. Even after having lower damage cost than the power supply sector, the water supply sector was ranked more vulnerable than power supply. This is mainly because water supply infrastructure is regarded as more critical than power supply by the stakeholders. Further details about the vulnerability of each individual infrastructure sector are discussed bellow.

4.1 WATER SUPPLY SECTOR

Samoa has abundant water resources compared to many other Pacific Islands. Samoa's water system services roughly 97% of the population (GoS, 2012) progressing rapidly from the last decade as there was only two-thirds of the population having access to water drawn from surface sources(Taulialo 1993). Samoa Water Authority (SWA), a Public Trading Body, is the major water service provider in Samoa. Its water service networks cover the urban and rural regions of Upolu, Savaii and Manono Islands. A number of people are receiving their water supply exclusively from wells, springs and rainwater reservoirs. Although water is easily available, access to safe and treated water is very low. In part, this is because some villages rely upon private water supplies that are neither treated nor appropriately maintained; therefore, there is a high chance of contamination. With fewer skilled professionals in rural areas, it is frequently difficult to maintain these private water supply systems. Although the cost of maintaining private water schemes is high, many villages prefer the current system because they do not trust the government and wish to be free from government water charges, notwithstanding the health risks of consuming contaminated water. Currently, there are 22 water supply projects in Samoa, among them 18 are in Upolu and four in Savai. SWA provides piped water service to approximately 80% of the population of Samoa within discrete service areas.GoS (2013b) reported the divisions as follows:

1. Urban treated water supply – Malololelei (2%), Alaoa (10%), Fuluasou (11%);
2. Urban untreated supplies in 7 service areas on the outskirts of Apia (6%);
3. Rural treated and supplementary bore supply – Fuluasou (20%)
4. Remaining rural service areas (16%)
5. Savai'i services areas (15%)

Overall SWA coverage is reported in Table 4.1 below:

TABLE 4.1: SWA SERVICE COVERAGE BY GEOGRAPHIC ZONE AND SERVICE AREA (SOURCE: SAMOA WATER AUTHORITY)

OPERATIONS DIVISION	% IN GEOGRAPHIC ZONE	% IN SWA SERVICE AREA	% OF SUPPLY TREATED AND DISINFECTED
Urban - Apia	95%	95%	80%
Rural	80%	60%	50%
Savai'i	80%	78%	0%

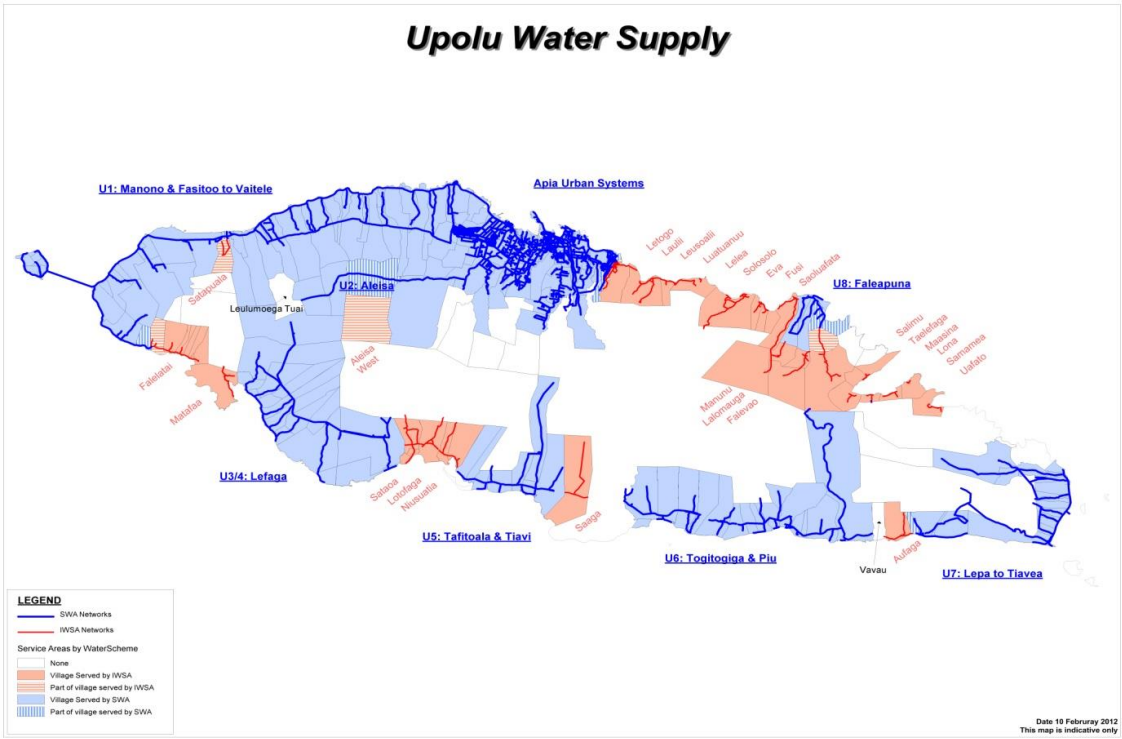

FIGURE 4.1
Upolu Water Supply Systems Source: Samoa Water Authority

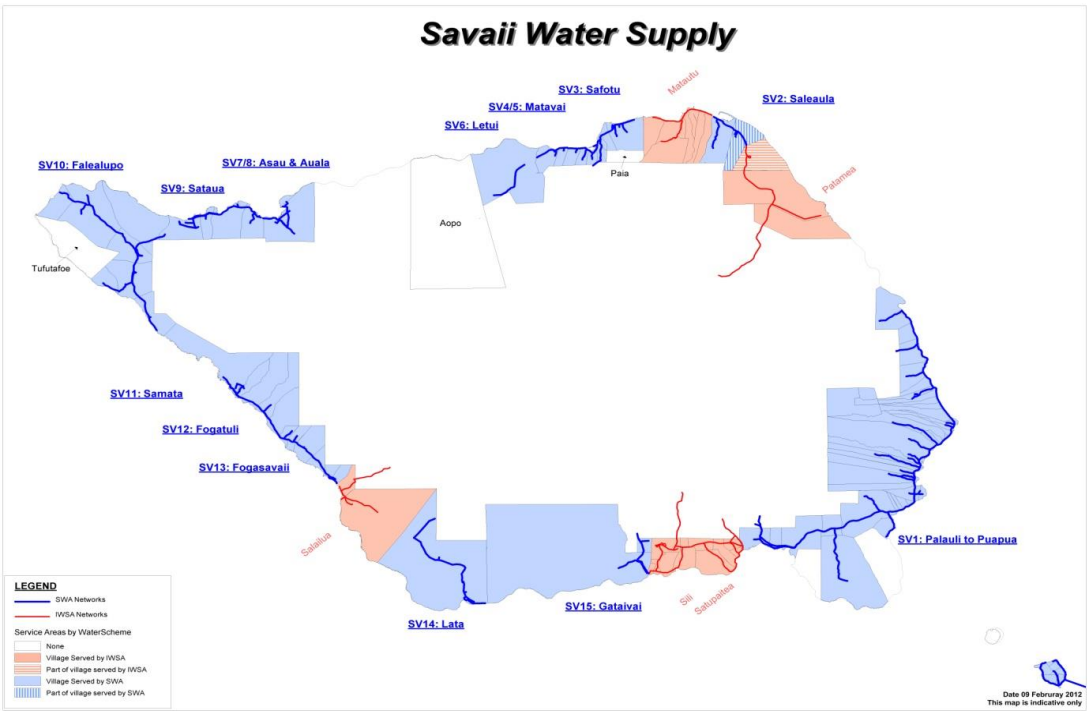

FIGURE 4.2
Savaii Water Supply Systems Source: Samoa Water Authority

4.1.1 Vulnerability

Table 4.2 shows that the Alaoa water treatment plant has the 3rd highest customer base and it is the most exposed of the water supply infrastructure. During cyclone Evan, 2.3 million USD worth of damage was done to it. Stakeholders also suggested it to be very critical asset. Therefore this is one of the most

vulnerable infrastructure components of the water supply system. Other water treatment plants Tafitoala and Tiavi and Malololelei are also exposed, and incurred almost USD 0.5 million damage during Evan. However, the number of people served by those treatments plants is not as high as by Alaoa. On the other hand, Fuluasou EU and Fuluasou JR, water treatment plants have the highest number of users (3900 and 2779 respectively), and are less exposed (damage during Evan was comparatively lower).

TABLE 4.2: DISTRIBUTION OF USERSBY WATER SUPPLY INFRASTRUCTURE

	NETWORK	NUMBER OF CLIENTS
Urban Areas	Afiamalu	50
	Malololelei	760
	Vailima	157
	Alaoa	2530
	Vaivase-Uta	330
	Fagalii- Uta	130
	Vailele	280
	Tapatapao	110
	Fuluasou JR	2779
Rural areas	Fuluasou EU	3900
	Aleisa	193
	Lefaga	460
	Tafitoala and Tiavi	220
	Togitogiga	520
	Piu	
	Lepa	20
	Aleipata	85
	Faleapuna	170
Savaii	Palauli – Puapua	1640
	Saleaula	100
	Safotu	160
	Matavai	170
	Letui	80
	Asau	100
	Auala	50
	Sataua	150
	Falealupo & Neiafu	30
	Samata	140
	Fogatuli	120
	Fogasavaii & Sagone	250
	Lata & Taga	110
	Gataivai	110
	Tapueleele	40

Source: SWA

Most of the IWS were originally constructed by the local villages and consist of above-ground pipe work that has been put together with whatever fittings, tools, and pipes were available at the time of construction. The alignment of pipe work typically follows the river, making the pipes highly vulnerable to natural disasters.

4.2 SEWERAGE SYSTEM

There are no established levels of service for sanitation overall except for those required under the new wastewater treatment plant serving the central business district. Most sanitation facilities are privately owned. A total of 26,100 on-site sanitation systems were recorded in the 2011 National Census Survey: 82 percent are septic tanks (19 percent in urban Apia, 27 percent in northwest Upolu, 17 percent in rural Savai'i, and 19 percent in the rest of Savai'i); 13 percent are pour flush pit latrines (1 percent in urban Apia, 5 percent in northwest Upolu, 4 percent in rural Upolu, and 3 percent in Savai'i); and 4 percent are dry pit latrines (2 percent in northwest Upolu, 1 percent in rural Upolu, and 1 percent in Savai'i) (GoS 2013a). The two solid waste disposal sites are located in Tafaigata, Upolu, and Vaiaata in Savai'i. These are semi-aerobic landfills designed to break down solid waste and treat leachate (from compacted waste) through natural processes. Collection and disposal of solid waste at the designated landfills are outsourced to private contractors.

About 89% of the population in Samoa has access to improved sanitation facilities (GoS, 2011). Quality of water is the main driver of sanitation in every settlement. Water quality is affected by poor sanitation, stagnant and sedimentation. Poor sanitation and unsafe water is known to trigger water-borne diseases that affect public health. Water treatment capacity is not adequate for current demand on the Samoa Water Authority system, and the private water suppliers do not treat water. This contributes to historically high levels of water borne diseases (GoS. 2011). In Samoa, accessibility to healthy water sources is a common problem in both coastal and inland areas. Community people have experienced health and sanitation problems caused by the extreme climatic conditions, especially with the onset of drought where the drinking water is scarce triggering outbreak of communicable and vector borne diseases like malaria.

Heavy rainfall and inadequate drainage mean that flooding is a frequent problem, compounded by land filling and the blocking of drains. Intense flooding causes breaking of the sewerage pipes and the contaminated water spills out to the surface, which poses a public health risk as seepage and latrine runoff contaminate supplies. Flooding is another major cause of health problems, including water-borne diseases such as typhoid and diarrhea. Climate-related diseases including food and water borne diseases, vector borne diseases and airborne diseases remain in the top ten causes of morbidity in Samoa. There have been several outbreaks of typhoid fever and dengue fever in recent years. Key health concerns for Samoa include vector-borne diseases, diarrhea and other water-borne diseases, acute respiratory infections, malnutrition and loss of life to extreme climatic events such as tropical cyclones, floods and drought.

Surveillance data from the ministry of health illustrates that diarrhea continues to be the second most common disease from 2006 to date. Of all diarrheal cases from 2006-2011, 46% were children under 5 years. The diarrheal cases show a seasonal pattern which increases during the November/December to February/March period which is the wet season in Samoa (GoS, 2012). Health sector vulnerability in Samoa is a product of the water resources, particularly the poor water quality and stressed water quantity in the event of floods and drought. Many vector-borne diseases are weather sensitive and small changes in the weather can dramatically trigger disease transmission. For example, as summarized in the NAPA document (GoS, 2005) dengue fever and *filariasis* are carried by the domesticated mosquito *Aedes aegypti*. This mosquito thrives in urban environments and breed in areas that hold water. Cholera is not endemic in Samoa; however, there is some evidence that rising sea surface temperatures may increase the risk of cholera spreading. Typhoid become more problematic with flooding and contamination of surface water in sewage and it remains very high in Samoa with up to 693 cases reported per year. The last major outbreak of this disease was in the early 1990's. Drought conditions have been linked to increased concentrations of pathogens in surface water and increased morbidity and mortality from a combination of diarrhea and dehydration cases. Droughts and increasing heat waves also cause flu, eye and skin infections (such as skin cancer) and also diseases of the respiratory system (GoS, 2005).

Vulnerability

Sewerage system was ranked as the least vulnerable infrastructure system among the four considered in this study. Table 4.3 shows the geographical distribution of the sanitation system of Samoa. Sanitation systems located at urban Apia seems most exposed to the climatic hazards as maximum number of damage occurred in this area during Evan. On the other hand, although North West Upolu has the maximum number of properties with sanitation system, this area had comparatively less damage during Evan.

Vulnerability of the off-site sanitation seem to be robust as there were no damages reported from the SWA-managed WTP in Sogi, though two wastewater pump stations at Aggie Grey's Hotel were reported to be completely destroyed (GoS, 2013a). Only minimal damages were reported at the sludge treatment facility at Tafaigata and the two public toilet facilities in Sogi and Eleele-fou, though both facilities were closed down following the cyclone due to lack of water supply. Electricity supply to both waste disposal facilities was cut off when trees fell on power lines. Loss of electricity severely damaged water pumps and the aerator, affecting crucial components of the leachate treatment process of the solid waste management facility.

TABLE 4.3: GEOGRAPHICAL DISTRIBUTION OF THE SANITATION SYSTEM

	COMPONENT	NUMBER OF PROPERTY	ESTIMATED NUMBER OF PROPERTY DAMAGE
Urban Apia	Septic Tanks	5,048	1,500
	Pour Flush Pit Latrine	245	120
	Dry Pit Latrine	75	20
North West Upolu	Septic Tanks	7,022	500
	Pour Flush Pit Latrine	1,205	250
	Dry Pit Latrine	462	200
Rural Upolu	Septic Tanks	4,499	1,000
	Pour Flush Pit Latrine	1,155	500
	Dry Pit Latrine	256	200
Savaii	Septic Tanks	4,981	300
	Pour Flush Pit Latrine	835	200
	Dry Pit Latrine	317	250
Total		26,136	5,040

One thing that should be noted is that stakeholders identified the sanitation and sewerage system as the most critical infrastructure. However, the repair capacity of the local authority of such infrastructure is very high. Comparatively lower damage cost and higher repair capacity resulted in comparatively lower vulnerability of the sanitation and sewerage system than the other three sectors of Samoa.

4.3 POWER SUPPLY SECTOR

About 80% of the Samoan population has access to electricity (GoS, 2013a). The country has been producing 12 MW of electricity through renewable resources, which is only 29.27% of its total capacity (WorldBank 2010). Electricity generation on Upolu is a mix of diesel and hydropower generation. The main diesel power station on Upolu is located at Tanugamanono. The remaining hydropower capacity

comes from four run-of-river schemes (combined installed capacity 4.5MW) and one scheme with a reservoir. During the 12-month period from November 1, 2011, to November 1, 2012, EPC generated 102.5GWh of energy in Upolu, of which 40.0GWh (39.1 percent) was generated by hydropower schemes. Peak load for Upolu prior to Cyclone Evan was 17.5MW. Losses (both technical and nontechnical) are estimated at 17.8 percent (12-month rolling average). Over the same period, EPC had total sales revenue of approximately SAT 73.2 million (GoS 2013a). In general, cyclone damages and continuing land clearance were the major threats affecting the ability of water catchment areas to hold water as well as the power generation in Samoa. These are exaggerated by the extreme heavy rainfall and subsequent flooding, which in turns causes extensive erosion. The influx of flood-mobilized sediments into reservoirs and hydropower schemes damages the water supply and it compromises the generation of electricity (UNFCCC 2009).

Vulnerability

Overall, the power sector of Samoa was ranked as the 2nd highest vulnerable sector. High exposure of the distribution and transmission system, and moderate criticality and repair capacity of the local authority were attributed to such high vulnerability. Following Cyclone Evan in 2012, the entire island of Upolu and part of Savai'i were without power, though power in Savai'i was restored quickly afterwards. Within one week, power was restored to approximately 10 percent of the population of Upolu, and within four weeks, about 60 percent were reconnected. Full reconnection was achieved by mid-February 2013. This suggests that the repair capacity of power sector is relatively higher than the other sectors and it was also reflected in the stakeholders' response through the V3 of the vulnerability model of this study. On the other hand, power transmission infrastructures are stated to have partial repair capacity which made them more vulnerable under a climatic hazard than the power generation infrastructures. Cyclone Evan caused significant damage to three hydropower plants (Samasoni, Alaoa, and Fale ole Fee) and minor damage to two additional hydropower plants. The cyclone also damaged Upolu's main Tanugamanono Diesel Power Station. Damage to the transmission and distribution grid included 1,198 power poles damaged (833 leaning, 245 broken, 120 fallen), 158 power meters destroyed, 6.7km of power line requiring replacement, 25 transformers destroyed, and significant damage to the radio network (GoS, 2013a). Future climate projection suggests increase of frequency and intensity of such catastrophic cyclones in Samoa. Therefore, high current exposure of power supply infrastructures will play a crucial role in determining the vulnerability under future climate change scenario.

4.4 LAND TRANSPORT

Samoa's transport sector includes all modes of transport via air, sea, and land. In this study only land transport was considered. The two main islands are well served by tar-sealed ring- and cross-island roads. Samoa's geographically compact nature and its road and shipping network make transport between and within islands relatively easy, thus facilitating access to centralized government services.

There are five main public sector transport organizations in Samoa: the Ministry of Works, Transport and Infrastructure (MWTI), the Land Transport Authority (LTA), the Samoa Ports Authority (SPA), the Samoa Shipping Company (SSC) and the Samoa Airport Authority (SAA)(GoS 2013a). The transport sector assessment undertaken by the World Bank in January 2013 found there were 2,340 km of roads, 332km (14 percent) of which were paved. Around two-thirds of the total network and all major roads are paved. Currently, a high proportion of Samoa is serviced by tar-sealed road systems; a well-developed shipping service linking both islands (NAPA 2005). On the principal islands of Upolu and Savai'i, there are about 2,340 km of roads, 14% of which are paved, and 52 bridges (44 bridges on Upolu and 8 on Savai'i). With approximately 70% of Samoa's population living within one kilometer of the coast, and critical infrastructure (hospitals, schools, places of employment, tourist infrastructure, port facilities, power plants, airports, and roads) are located primarily in the coastal zone where roads are extremely important.

Vulnerability

- Samoa road network faces a range of vulnerability issues (GoS, 2013a):
- coastal exposure to sea-level rise, storm surge, and wave action during cyclones and tsunamis;
- inland flooding and landslips during extreme rainfall events;
- damage from earthquakes; and
- accelerated pavement deterioration due to extreme weather and rising water tables in some locations.

The government is giving a strong emphasis on road maintenance and Samoa is a leader in the Pacific region in outsourcing road maintenance. But due to the changing nature of climate extremes, many roads are vulnerable to natural hazards like flooding, cyclone, tsunami damage and become impassable, cutting off access to villages during periods of severe weather and natural disaster (GoS, 2011). The transport sector plan (2013-2018) stresses developing appropriate mechanisms for climate proofing of the entire road network to ensure climate resilience.

In general land transport sector was ranked as the most vulnerable of the infrastructure sectors studied in this report. High exposure of roads and bridges and their associated damage cost are the prime reason behind such high vulnerability ranking. Cyclone Evan has caused about 22 million USD worth of damage to roads and 3.6 million USD to bridges. Criticality of the bridges is high and their repair is also not very straight forward (Table 3.6).

Bowman and Cartan (2013) conducted a damage assessment of the roads, bridges, and culverts from the cyclone Evan and made the following conclusions, which portrays some of the major existing vulnerability of the land transport sector of Samoan.

> "*All bridges on Upolu and Savaii were inspected during the mission, as well as many culverts and ford crossings. Many common problems were found, including abutments and wing-walls undermined by scouring, structure damage caused by debris, and issues related to lack of maintenance such as corrosion of steel and reinforced concrete elements, excessive deflection, inadequate deck elevation, pot-holing of decks, and poor drainage on and adjacent to the structures. A number of structures were also found to have insufficient waterway area. Approximately half of all structures were found to have either scouring or siltation problems. Urgent repair work is required on eleven of the forty five Upolu bridges, and important repair work is required on another twenty seven.*
>
> *Much of the damage caused to bridges and culverts by flooding was caused either directly or indirectly by floating timber and debris. Some of the more obvious floating timber was removed shortly after the cyclone, but much remains against and directly upstream of structures, in streams, and on river banks. With more high rainfall much of this material can be expected to be swept into rivers and again cause scouring or other damage to structures. As cyclones and heavy rainfall occur on a regular basis it is suggested that steps be taken to reduce the amounts of floating timber and debris, by inspecting rivers and catchments, by attempting to find a use for the timber, and by attempting to remove at least a proportion of it prior to storm events. Note that scouring of wing walls and abutments, the most common problem found, occurs as a result of very high stream flows, particularly when the flow is deflected, either by debris or river bed material, towards abutments, piers or wing-walls. Removal or reduction in the amount of timber and other debris would therefore play a large part in reducing scouring problems.*
>
> *The inspections on both Upolu and Savaii indicated that regular maintenance of structures does not occur. As a result many of the lesser problems, such as blocked scuppers, loose material on decks, damaged guardrails and handrails, missing nuts and bolts, and faulty expansion joints receive no attention. Some of these situations then*

cause other problems such as concentrations of loose soil and debris around beams, corrosion of steel and concrete sections, and pitted decks, in many cases necessitating difficult and expensive remedial works. Regular maintenance works would minimise secondary effects in many cases.

Apart from two new bridges to the east of Upolu, most bridge and culvert work carried out during the past years has been in the Apia city area, and related to street improvement works. As well as remedial or replacement works for Leone and Vaisigano bridges, future priorities are likely to be replacement of the single lane structures at Nu'usuatia and Tafitoala due to their small size and low levels, and any other urban area bridges where road works dictate improvements. It is expected that data obtained during the mission will assist in the decision-making processes for remedial work or replacement of other structures, as necessitated by physical conditions of the structure or its surrounds. As noted in the data bases, further detailed inspection of some structures is recommended where full information could not be obtained due to either visibility or access difficulties. The additional information obtained, combined with relevant costing data, would enable estimates to be made for required remedial work, and allow comparisons between viable options."

4.5 LIMITATION OF THIS STUDY

The following limitations of this study should be considered before using its results.

- The study was designed and implemented using information collected from existing reports, therefore the quality of results of this study is highly dependent on the quality of the reports.
- Damage to infrastructure was modeled using the reported damage data of cyclone Evan. An ideal vulnerability study would require a physical hazard mapping of such a coastal flooding event of areas under investigation.. However, such a detailed assessment of physical climate risk for Samoa was neither readily available nor within the scope of this report. Therefore, this study adopted the damage caused by the cyclone Evan as a proxy to such investigative work. . Cyclone Evan is a relatively recent event (2012) and detailed damaged to infrastructure caused by this event is available through a study conducted by GoS (2013a). This can be argued that the use of actual damage data instead of a model based risk assessment data can provide a more realistic approach to the problem. However, such an approach might have increased the uncertainty of the study results.
- Model development and data collection was conducted to some extent in collaboration of the stakeholders. However, it was limited by the short span of time available for this study and therefore, there is a possibility that it might have missed consultation with some other key stakeholders.
- An indicator based model was used for vulnerability assessment. Indicators were selected in collaboration with stakeholders in order to make sure that they are relevant for the local context. However, there is a possibility that the study might have missed some of the other relevant key processes that defines vulnerability of Samoan infrastructure system.
- The results suggest only the relative vulnerability of the four infrastructure system of Samoa, NOT the vulnerability of each individual infrastructure components.

5 INDICATIVE ADAPTATION OPTIONS

This section described the indicative adaptation options proposed under this study based on stakeholder consultations and requirements as well as GEF/LDCF-funded project requirements.

5.1 PROPOSED ADAPTATION OPTIONS/INTERVENTIONS

As described in the vulnerability assessment section, land transportation became the most vulnerable infrastructure sector of Samoa. High damage cost of this sector, which is almost double that of the power supply sector and seven times higher than the water supply sector. Although sewerage was considered most critical of the infrastructure services by stakeholders, because of its comparative lower damage cost and higher capacity of the local authority to fix it made it the least vulnerable infrastructure sector. Even after having lower damage cost than the power supply sector, the water supply sector was ranked more vulnerable than power supply. This is mainly because water supply infrastructure was regarded as more critical than the power supply by the stakeholders. Among other vulnerabilities water induced vulnerabilities are major threats for the population of Samoa. In many studies (i.e. NDMP- 2006-2009. FMAP 2007-2013, etc.) Indicated that "floods" as a result of heavy rain were ranked as a 'high risk' event for the country. The economic cost of flood 2001 was estimated over 11 million tala (FMAP 2007-2012) and similarly storm surge flood inundation of cyclone EVAN 2012, value of durable physical assets across all economic and social sectors destroyed estimated at SAT 235.7 million, equivalent to US$103.3 million. Future events may raise the cost of flood much higher. The Mid-Term Report of the Samoa National IWRM has mentioned... *'the importance of Vaisagano Catchment as it provides water for 3 of the 5 hydropower plants in the country and any mismanagement of water resources will results in these catchments reaching low flow levels within several weeks. Conversely the lack of storage also results in rapid flooding events, with times to peak estimated at less than 3 hours for cyclone and tropical storm associated rainfall events'*.

Considering above problems, we emphasis the need to strengthen the Integrated Water Management Plan (IWMP) for the 5 catchments in the Apia area. Adaptation should not be understood as simply implementing the correct technology or practice. It should be part of a coherent, inter-sectoral strategy to reduce climate risk and maintain sustainable water resources. IWMP is a strategy being recommended here provides an overall decision-making framework for climate change adaptation in water resources through mainstreaming climate adaptation into its plans. To address the issue of climate risks, the IWMP would need to include a vulnerability and adaptation assessment (on which MNRE has received some capacity building). For the effective adaptation to climate change LDCF project need to address the gap in the IWMP.. Otherwise all plans (i.e. CIM plan, watershed plan) would only be integrating Standard River and coastal assessments. These are also gaps in the CIM2 plans that PPCR and Adaptation Fund projects are redesigning for implementation. IWMP will enable the Government of Samoa to strengthen the overall water management plan by considering future climate risk and 'Ridge-to-Reef' approaches being suggested by regional projects to be implemented in the design of water management plans. The proposed interventions are based on reviewing all ongoing initiatives, considering stakeholders' demands during consultations, the vulnerability assessment of infrastructure in this study and the requirements of accessing GEF funding. In addition, the government has its own priorities and it is sometimes difficult to balance government and donor priorities. Considering all of these aspects, we propose the followings interventions to be considered for implementation under this project as a summarized below in Table 5.1. Details of these proposed interventions, outputs, outcomes, budget, baseline, indicators and issues relating to project sustainability of activities are summarized in Annex 3. More recently the government has proposed infrastructure activities under LDCF projects. The relevance of these activities under LDCF is also summarized in Annex 5.

TABLE 5.1: PROPOSED INTERVENTIONS FOR SAMOA INFRASTRUCTURE SYSTEM			
ACTIVITY	OUTPUTS	OUTCOMES	APPROX. BUDGET
"RIDGE-TO-REEF" INTEGRATED WATERSHED MANAGEMENT PLAN FOR GREATER APIA.			
Develop IWMP for the Greater Apia area	An integrated water management plan for the 5 catchments in the Apia area focused on vulnerability and adaptation of climate change	The IWMP plan able to address vulnerability assessments and adaptation planning using the "ridge to reef" overall systems approach i.e.: environment, (river systems) infrastructure, (protection systems) natural, (watershed and ecosystem), institutional (policy, legislation and economic (cost/benefit) from the whole catchments.	USD 200,000
Design flood protection measures (feasibility study, climate resilient design, cost-benefit, EIA, SIA, etc.)	A framework of steps needed for the design of flood protection measures, including: i) feasibility study; ii) climate-resilient/"building-back-better" designs; iii) environmental and social impact assessments & (iv) Cost-benefit analysis.	(1) Standard guidelines for creating a supportive environment, institutional structure to implement IWMP. (2) Standard factors and criteria for feasibility study, climate resilience design, environment and social impact assessment.	USD 1,000,000
Hard measures for protection of community assets			
Build flood protection infrastructure along Vaisigano River	Construction of 900 m length of embankments on each side of the river between Vaisigano and Leone bridges.	100-year return period flood embankment constructed and used for multiple purposes both in accessing the river and protection of properties.	USD 3,500,000
Reconstruct community assets following "building-back-better" approaches	50 houses for Cyclone Evan-affected area; 30 houses to provide models for building back better to relocate households from Sogi to Nuu-Falelauniu with sanitation facilities.	Demonstration of building back better approach to enhance community resilience	USD 3,400,000
Improved sanitation coverage of Cyclone Evan affected area.	# of sanitation facilities constructed; Community management of sanitation facilities is improved; trained staff to maintain sanitation facilities regularly; Subsidized support to communities without septic tank systems for low income households in reticulated water supply area.	# of communities with a WatSan committee established; Community management of sanitation facilities is improved; Improved access to and use of sustainable sanitation; % of people in the target communities using latrines on a daily basis; % of latrines managed by local WatSan committees facilities among targeted communities; # of community WatSan committees with technicians trained to perform basic maintenance sanitation facilities.	Per household cost USD1500 (materials cost only)

TABLE 5.1: PROPOSED INTERVENTIONS FOR SAMOA INFRASTRUCTURE SYSTEM			
ACTIVITY	OUTPUTS	OUTCOMES	APPROX. BUDGET
Access to safe drinking water, rural water treatment plants, and new pipe networks.	(1) # of water treatment plants constructed (slow sand filter); community-based committee established to maintain and improve the water treatment plant. (2) Alaoa Water Treatment Plant - Flood Protection Works- Bundwall 130m long and 11m wide, 75m long 16m wide floodway/channel to control flood flow behind primary treatment area and 174m long 23m wide floodway to control flood flow between primary treatment and secondary treatment areas, 5 cell reinforced concrete box culvert and causeway	(1) # of households having access to safe drinking water; # of communities with WatSan committees established; Community management of water supply facilities improved. (2) WTP secure from 1 in 100-year flood event	(1) Per unit cost USD 6000 (material cost); (2) USD 1.5 M
Drainage improvements and flood control works in Greater Apia Urban Area.	Construct approx 3,555 m of drainage/channel improvements in Sopoaga Road to increase flood control.	Improve flood control and the environment for quality of life.	USD1,000,000
Soft measures for protection of community assets			
Implement ecosystem-based approaches to watershed management and flood mitigation.	(1) Development of flood forecasting techniques for all 5 river basins in Greater Apia. (2) Generation of medium- and long-range weather/climate predictions; (3) Improved interpretation and communication for sectoral decision making. (4) Development of storm surge model with coastal inundation capacity; Capacity building of the Met office to operationalize the coastal inundation forecasting models.	(1) Advance and accurate operational flood forecasting system is in place to provide warnings to communities. (2) Strategic and planning decisions for disaster risk and climate change adaptation.(3) of communities able to receive coastal inundation warning information well enough in advance to take appropriate actions.	USD1,000,000
Ensure climate smart building codes	(1) Finalization of revised building codes; (2) Training on revised building codes for community application; (3) Equipment to test the structure quality for appropriate assessment; (4) In-house experts to review design (i.e. steel design experts).	All sectors follow building codes. PUMA ensure and train local community/masons on the new design and practice. The revised building codes approved by highest authority.	Finalization of building code $50,000; Training to communities $100,000; Equipment and vehicles $100,000
Establish climate forum	Establish dialogue process between forecast providers and users.	• Ensure that forecasts/warning information products, including their uncertainties and	USD 200,000 (workshop @ 100,000; product

TABLE 5.1: PROPOSED INTERVENTIONS FOR SAMOA INFRASTRUCTURE SYSTEM			
ACTIVITY	OUTPUTS	OUTCOMES	APPROX. BUDGET
		limitations, are communicated to and understood by users. • Encourage the use of forecasts to mitigate risks in climate-sensitive sectors, including, but not limited to agriculture, water resources, disaster management, and health. • Receive user feedback for improving usability of forecast products. • Provide a platform for inter-agency coordination of policies, and sectoral plans and programs for dealing with potential impacts of hydro-meteorological hazards. • Provide a platform for long-term process of understanding risks posed/opportunities brought about by past, current, and future climate.	development @ 100,000)
TA to assistance on 4 hydropower risk. assessments	Assessment of hydropower for future extreme events.	all 4 hydropower plants are fully assessed for retrofitting for climate proofing.	USD 200,000
Renewable energy, enhanced climate resilience and the potential for building sustainable economic opportunities.	Methodically testing and cataloguing the biogas potential of a wide range of possible feedstocks that can be used in biodigesters to produce biogas, also for commercial scale operations.	Renewable energy, enhanced climate resilience and the potential for building sustainable economic opportunity.	USD 300,000

5.2 MOST PROMISING/ACCEPTED ADAPTATION OPTIONS/INTERVENTIONS

As mentioned earlier, this assessment has been made to supplement the ***component 2: Community resilience to climate hazards Protection of assets & livelihoods*** under the GEF/LCDF funded project *"Economy-wide Integration of Climate Change Adaptation and DRR/DRM to Reduce Climate Vulnerability of Communities in Samoa"*. Based on the consultation with the Government the most promising adaptation options that has been selected for the project implementation are:

TABLE 5.2: MOST PROMISING ACCEPTED ADAPTATION OPTIONS		
OUTPUT A. "RIDGE-TO-REEF" INTEGRATED WATERSHED MANAGEMENT PLAN FOR GREATER APIA.		
ACTIVITIES	BUDGET (USD)	RESPONSIBLE ORGANIZATION
A1. Develop IWMP for the Greater Apia area	200,000	MNRE: WRD, PUMA, DMO, Forestry
A2. Design flood protection measures (feasibility study, climate resilient design, cost-benefit, EIA, SIA, etc.)	1,000,000	LTA; MNRE: PUMA, DMO; MWCSD
OUTPUT B. HARD AND SOFT MEASURES FOR PROTECTION OF COMMUNITY ASSETS		
B1. Build flood protection infrastructure along Vaisigano River	3,500,000	LTA; MNRE: PUMA, DMO
B2. Implement ecosystem-based approaches to watershed management and flood mitigation	1,000,000	MNRE: WRD, Forestry
B3. Reconstruct community assets following "building-back-better" approaches	3,400,000	MNRE; MWCSD

As described in the previous section, Samoa is exposed to a number of natural hazards and vulnerable to other extreme climate events. The impacts of climate-related events are felt right across the nation's economic, social and environmental systems, which becomes an issue of great concern. At the same time there is still lack of coordination and integrated planning to address DRR, CCA and infrastructure planning within the institutions. The flood and other hazards warning system is still not in an advance state to ensure quick dissemination and response by its communities at risk. With these present situations, an Integrated Water Management Plan (IWMP) for greater Apia (five river basins) is highly important. The details lists of steps need to take to develop the IWMP and other proposed adaptations measures are summarized in the section 6.

5.3 KEY INDICATOR, RISK AND ASSUMPTIONS

Infrastructures assets along the coastal zones are exposed to different hazards are interdependent on different sectors: economics, agricultural, transportation, energy, etc. Different infrastructure assets are impacted has different induced damage (D) in these sectors, with different probabilities of occurrence (P). Table 5.2 shows the relation between different types of infrastructure and different sectors.

TABLE 5.2: IMPACTS OF INTERDEPENDENCY SECTORS

INFRASTRUCTURE	INFRASTRUCTURE IMPACT SEVERITY	IMPACT ON INTERDEPENDENCY SECTORS																	
		ECONOMIC			AGRICULTURE			COMMUNITY			TOURISM			TRANSPORTATION			COMMUNICATION		
		D	P	U	D	P	U	D	P	U	D	P	U	D	P	U	D	P	U
Building	Catastrophic	H	H	L	L	L	H	M	M	M	H	H	L	M	M	M	M	M	M
	Medium	M	M	M	L	L	L	L	L	L	M	M	L	L	L	L	L	L	L
Drainage	Catastrophic	H	H	M	H	H	L	H	H	L	H	H	L	H	M	M	H	M	H
	Medium	M	M	M	L	L	L	M	H	L	M	M	M	H	H	M	L	L	L
Bridge	Catastrophic	H	H	M	L	L	L	H	H	L	H	H	H	H	H	H	H	H	M
	Medium	M	M	L	L	L	U	M	H	U	M	M	U	M	M	M	L	L	U
Sewerage	Catastrophic	L	M	L	L	L	L	H	H	H	H	H	L	L	L	L	U	U	U
	Medium	L	L	L	L	L	L	H	H	H	H	H	L	L	L	L	U	U	U
Water Supply	Catastrophic	H	H	M	H	H	L	H	H	L	H	H	L	H	M	M	H	M	H
	Medium	M	M	U	H	M	M	H	H	U	M	M	L	L	L	L	L	L	L
Power Supply	Catastrophic	H	H	H	M	M	U	H	H	H	H	H	H	M	M	U	H	H	H
	Medium	M	M	M	M	M	U	H	H	H	M	M	U	U	U	U	M	M	U
Early Warning	Advance Lead Time	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H
	No Lead Time	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	M	M	M

Cross sectoral interdependency matrix between infrastructure and different sectors.
D=damage, P=probability, and U=unknown. H=high, M=medium, and L=low impact.

6 DESIGN OF MOST PROMISING ADAPTATION OPTIONS

This section summarizes the key elements for implementation of the proposed adaptation options being considered under this project.. A detailed list of steps to consider for each of these activities is mentioned here. The technical team to design components of the selected adaptation options scopes of work is summarized in Annex 7.

6.1 DEVELOP IWMP FOR THE GREATER APIA AREA

The watershed plan and coastal development plan (i.e. CIM) for Samoa could have been more harmonized for a range of stakeholders in order to complement other government plans more fully. Additionally, climate risk and 'Ridge-to-Reef' approach has not been prioritised in these documents. An IWMP could bridge this gap. Furthermore, future climate change would be addressed in the IWMP with periodic updates based on climate scenarios.

The IWMP would focus on 5 catchments in the Apia area and to address climate risks, the IWMP could include Vulnerability and Adaptation Assessments (V&AA). The V&AA will address gaps from the 5 major sub-systems i.e.: environment, (river systems) infrastructure, (protection systems) natural, (watershed and ecosystem), institutional (policy, legislation and economic (cost/benefit)) from all five catchments. At the same time, the IWMP will provide management guidance on the use of Samoa's water resources in order to improve people's quality of life through the access of safe and reliable water.

The IWMP will be living documents which needs periodic *updates*. A five-year planning review cycle is envisaged to update the documents and create guidelines for more detailed planning. A five-year cycle would also bring the IWMP in pace with Samoa's national plan. A 5-year cycle would also allow new initiatives on DRR/DRM and CCA to be involved in the IWMP.

To develop an IWMP focusing on the above issues in the context of Samoa would require the development of structured planning procedures so that alternative water management strategies are included. It is recommended that the following measures are included in the development of the IWMP:

1. *Problem assessment* based on: (i) demand projections and future climate change scenarios for the pacific; and (ii) the state of the water resources system
2. *Identification of the policy objectives* for water management (Samoa Flood Management Action Plan, Watershed Management Plan, Water Policy, sectoral plans), coastal management (CIM Plan) and their translation into planning objectives
3. *Identification and feasibility assessment of structural and non-structural measures in the context of future climate change*. This includes different kinds of physical structures with different scenarios, but also such measures as pricing, extraction quota, and zoning.
4. *Impact analysis of alternative strategies*. Strategies could be analyzed under different climate and hazard scenarios e.g., excess water or shortage of water, community resiliencies, demographic and economic developments.
5. *Public consultations* to discuss problems, objectives and possible strategies for enhancing the resilience of communities to climate change and natural disasters.
6. *Development of a database and models*. This would be driven by policy priorities, problems and measures to reduce the different types of floods and coastal inundation.
7. *Evaluation of alternative strategies*. This could be supported by a multi-criteria analysis (MCA) against the assessment framework defined at the beginning of the study.

Implementation of what has been referred to above: *structured planning procedures,* requires *structured preparation*. The preparation required for the above suggested activities would likely be:

- The establishment of an *operational network of government agencies*, which would be involved in the planning process.
- The further development of *participatory approaches*, based on the experiences of ongoing initiatives, lessons learned and close coordination with other line agencies (MWCSD, MoF and Communities in the catchment areas)
- The development of a *framework of analysis for* the formulation, analysis and evaluation of alternative management strategies.

During the development of the IWMP, it is recommended that equal importance is given to each national goal of Samoa in order to convince decision makers. Programs could be categorized in clusters or sub-groups with short, medium and long term goals. Program could then be analyzed for the impacts of future climate change scenarios. Ideally, priority would be given to institutional development, enabling environment, land transportation, water supply and sanitation, early warning and community capacity building.

The government process and demography of Samoa is highly dynamic; local government, preparation of land-use and physical planning strategies will keep changing. Thus, it is recommended that risks are identified at both program and plan levels.

To ensure the success of the IWMP, equitable and sustainable development with women and men as decision makers is recommended. Presently, women in Samoa are largely involved in agriculture and household preparation. The IWMP could adopt an appropriate methodology to identify the roles and responsibilities of the various members of the household and their access and control over resources. For example, women could be given access to early warning information for their decision making processes (i.e. agriculture, housing) or they could be given access to resources to practice stress (drought, flood or saline) tolerant crops.

Finally, a Management Information System is recommended to ensure well managed and reliable information during the implementation of the IWMP.

Enabling environment, institutional structure to implement the IWMP

Samoa has a unique institutional structure to strengthen and establish a comprehensive IWMP. MNRE is an umbrella institution overseeing all water, disaster and climate change matters affecting the country. The overlapping roles and functions of current water-related institutions (i.e. Met office, Water Resources) within the context of IWMM could impede the development and implementation of an affective IWMP. The Ministry of Finance , the Ministry of Women and Community Development the Ministry of Agriculture & Fisheries, PUMA, Environment and Conservation, Disaster Management and other relevant stakeholders will need investment in technical, institutional and legal capacities to ensure the IWMP is well-grounded and accepted.

6.2 DESIGNING FLOOD PROTECTION MEASURES

Flood is a recurrent and severe risk in major parts of Apia. The floodplains of Apia spread across the lowland areas and is drained by the Mulivai and Vaisigano Rivers towards the sea. There are five major catchments in Samoa which do not have early warning systems that provide adequate warning times for residents during heavy rains. Flooding from steep and narrow catchments causes sudden mass flows of water to the extent that very little warning is given to those in the path of is flows causing damage and disaster of communities and property. The Government of Samoa has implemented several flood mitigation measures through different projects and programs with the support of SOPAC, EU and AusAID, however there is evidence that flood forecasting and early warning systems still lag behind. There is inadequate coordination and integrated planning among agencies that have responsibilities for flood risk reduction. Hydro-meteorological data is still sparse with a high degree of uncertainty and there are constraints in budget allocation for mitigation activities or enhancing operational flood forecasting systems.

Figure 6.1: Different return period floods in Apia area (source: FMAP 2007)

Furthermore, climate change is affecting the primary source of floods in Samoa. For mitigation of flood risks under climate change, it is crucial to understand and quantify the changes in sources and use them to establish the change in local flood risk. A comprehensive flood mitigation framework needs to be established under this project for the design of flood protection measures, including: i) feasibility study; ii) climate-resilient/"building-back-better" design; iii) environmental and social impact assessments & (iv) Cost-benefit analysis. Flood strategy should cover the entire river basin area and promote the co-ordinated development and management of actions regarding water, coast, land and related resources.

Feasibility Study

In the case of flood protection measures, a feasibility study will need to assess several approaches. For Samoa, an approach such as the following could be used based on international current practices:

- Using structural interventions to reduce the hazard (e.g. dams, polders, canal diversions).
- Altering receiving infrastructures (e.g. elevation, strengthening).
- Changing the land use (e.g. subdivision regulation).
- Insuring receiving infrastructures (e.g. local flood insurance).
- Providing early warning and emergency management (e.g. an evacuation system).

Quantifying the flood risk to infrastructure will aid in the assessment and scaling of adaptation options. Using hazard thresholds to determine the level of risk, detailed GIS maps should be prepared on important infrastructures. The severity of flooding at various sites will determine the types of infrastructure needed at those sites. Structural elements, services and materials must be appropriate for the flood conditions. Based on the literature reviews (i.e. David, 2010) and physical assessment, Apia seems prone to mainly-

- Hydrostatic forces: buoyancy and pressure differentials from rivers

- Hydrodynamic force: high flow conditions due to a critical storm duration of 2-3 hrs
- Impact from debris
- Land and road erosion
- Changes in the properties of construction materials and other affects.

Depending on the nature of the flood and physical and structural design of infrastructure, these characteristics can be resisted without structural damage. SAMOA Flood Management Action Plan (2007-2012) by SOPAC has identified the level of flood hazard severity mentioned in table 6.1. These data may need to be updated and redefined based on future climate change scenarios. The overall flood management needs to be improved based on the current situation under the IWMP.

TABLE 6.1: ASSESSING FLOOD HAZARD FOR APIA

FLOOD WATER DEPTH (M) X WATER VELOCITY (M/S) (M^2/S)	DEGREE OF HAZARD	DESCRIPTION
> 0.75	Low	Caution
0.75 to 1.25	Moderate	Dangerous for some (children)
1.25 to 2.5	Significant	Dangerous for most people
> 2.5	Extreme	Dangerous for all

For all flood protection measures there is an upper limit above which the protection will fail called the "design flood elevation". Any flood mitigation designs will need to be based on rigorous data from surveyors and hydrologists, taking into close consideration the future effects of climate change.

As mentioned in PDNA (2012), the total cost of damage and losses from Cyclone Evan in 2012 were estimated at US$203 million, or about 28% of Samoa's 2011 gross domestic product. Due to rapid/un-planned development and expanding urbanization, a single disaster event such as cyclone Evan has the potential to erode many years of economic development gains by damaging critical infrastructure and by diverting resources away from development spending, such as health and education services, towards disaster response and reconstruction efforts. Rising sea levels and increased frequency of storm surges are expected to intensify urban drainage run off, impacting present infrastructure. MNRE, SWA, MWTI, LTA have primary responsibilities of decisions regarding the planning and sitting of future urban infrastructure development in Apia. In order to provide flood protection measures in Apia, there is an urgent need to review the existing urban drainage infrastructure systems and design of urban drainage by considering future climate change threats and impacts to future urban development in Apia.

An example from the ADB Technical Report (Project no TA 7890-BAN) of urban drainage modelling is shown in Figure 6.2 below. Firstly, the rainfall data from available rain gauges is analysed. This involves differentiating storm events, evaluating the return periods durational rainfall, checking consistency of data and so on. In this case, sub-catchments are delineated using topological survey data or digital elevation models. The sub-catchments have been defined as areas of land where direct surface runoff is directed to a single discharge point. Sub-catchments were further divided into pervious and impervious subareas with the land use maps. Drainage networks are determined using spatial analysis of DEM, which needs to be trained using existing drainage network maps. The x-sectional survey of drainage structures and canals will provide the properties of existing drainage networks and canals. Input parameters of soil properties, infiltration rate, depression storage, etc. will be obtained from field visits and secondary literature. The

model will need to be calibrated in order to assess the performance of the model for capturing rainfall-runoff in the study area. Storm data of this season will be collected from outfalls and major canals for the calibration of the model. Calibration goals included the shape and timing, the total flow volume and the peak discharge of the hydrograph. During the calibration process, the model's rating curve is compared and re-established with the rating curve obtained from field measurements. This helps in the elimination of inconsistency in the measurements. The hydrographs from one or two storms will be used for model calibration. Hydrographs of a separate storm event will be used to verify the model and assess the match of the shape, duration, and peak flow of the hydrographs.

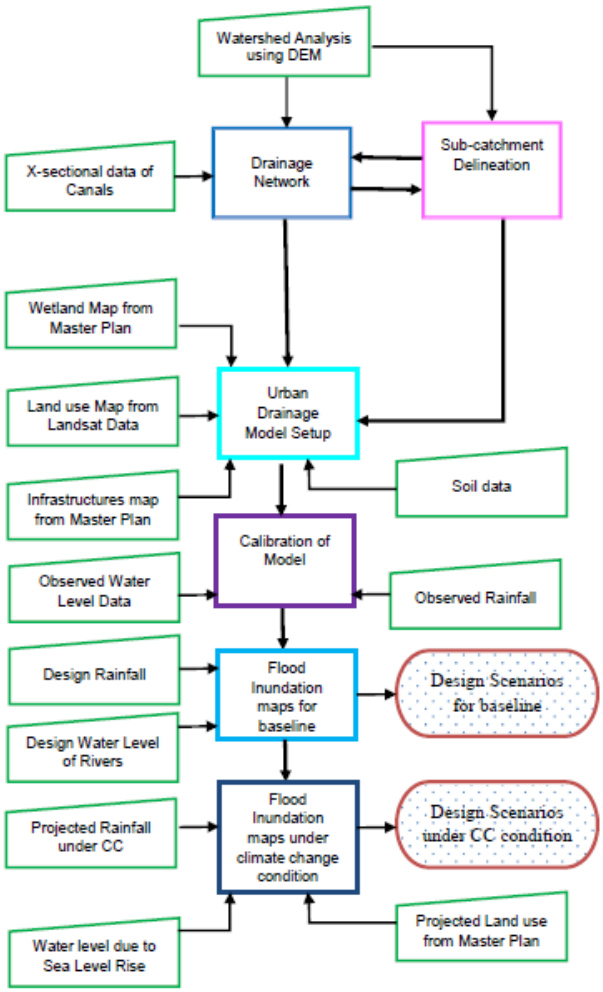

Figure 6.2: Steps of setup, calibration and simulation for design of urban drainage model (Source: ADB, 2013)

Future hazard scenarios and flood depth for Apia can be generated from the hydrodynamic models based on drainage model outputs. There are existing flood hazard maps for 1:20 and 1:100 years developed under the FMAP 2007-2012. Based on climate change predictions, these maps will need to be replaced with different scenarios. A flood hazard map for 1:100 years in the lower Vaisigano River is shown in Figure 6.3. This was produced based on a 1D hydraulic model, however 1D model is not suitable for operational use. A two dimensional model is essential to generate a flood risk map for Apia. The Consultant can provide recommendations for hydraulic design calculations which will take into account risks of climate change and natural hazards based on climate change modeling outputs and risk analysis as explained above. From the point of view of hydrology the most likely parameter to be adjusted will be

rainfall intensity, total daily and monthly and yearly rainfall. The design flood frequency would be increased which, for example, would result in a reduced return period for road design after considering climate change risks. The design rainfall frequency for calculation of design flood frequency would also be raised. If the influence of climate change can be quantified, geographically indexed and integrated into the vulnerability mapping procedure, design factors such as runoff coefficients could be re-assessed as risk parameters. The effect of rising maximum temperatures will also need to be taken into account in pavement design.

Practical applications of climate change modelling and risk analysis have already been found. For instance, when calibrating drainage infrastructure, water managers in Copenhagen now use run-off figures that are 70 percent larger than current levels. This increase will deal with both population growth and the effects of climate change, which is predicted to cause an increase in heavy precipitation over Denmark. This 70 percent increase has not been precisely calibrated, because such a calibration is made impossible by the uncertainty of climate change. However, this increase is considered large enough to cope with possible climate change effects this century, given the information from climate models. The move is further justified by the fact that it is inexpensive to implement a drainage system for higher precipitation during the design phase whereas and modification of the system after it has been built is both expensive and difficult. It is wise, therefore, to be pessimistic during the design phase.

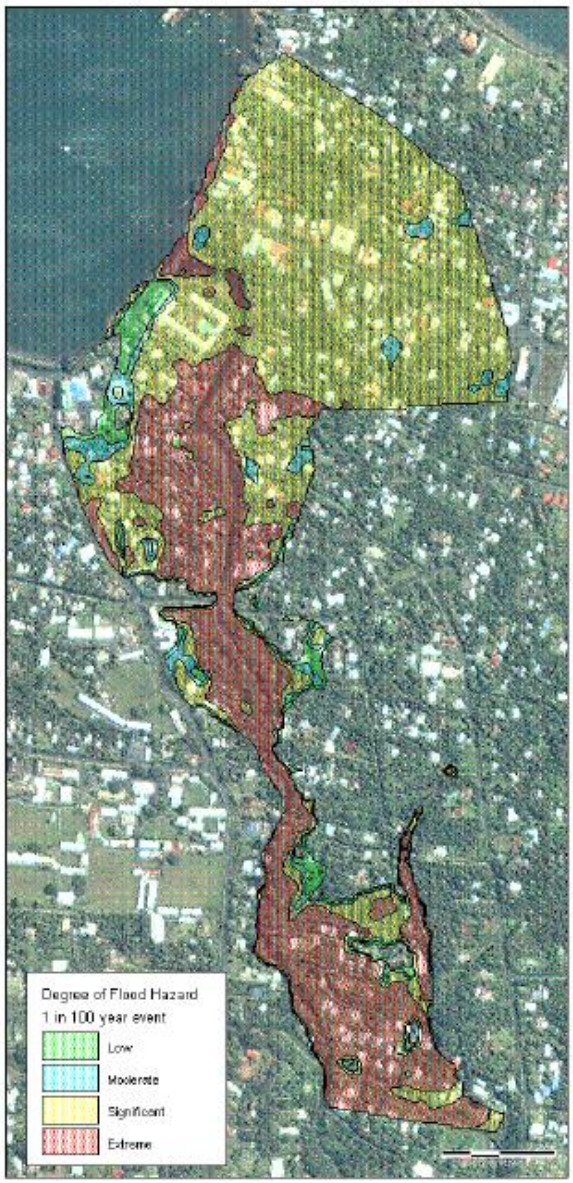

Figure 6.3: 1 in 100 year flood hazard map for the lower Vaisigano River (Source: GoS, 2007a)

Environmental and social impact assessments

The exact effects of the changing climate on infrastructure are still not known in detail. In this complex situation environmental and social impact assessment (EIA/SIA) is essential. The EIA/SIA approach need to work in a logical sequence through the project's primary and secondary physical impacts to the consequential environmental, social and economic impacts. For example:

- Assessment of hydro-morphological changes due to the fresh water flows established by the physical interventions.
- Assessment of impacts of the hydro-morphological changes on the biophysical environment.
- Assessment of the primary benefits and direct effects (in the context of environmental and social considerations) resulting from the physical and biophysical changes.
- Assessment of the consequential benefits and indirect effects, stemming from the primary benefits and effects.

On each of these "levels", indicators are required to defined to make changes measurable and comparable. The environmental and social impact assessment (EIA/SIA) guidelines for climate risk resilient coastal infrastructure and flood protection measures in Samoa should be formulated through a participatory approach and recommend amendments to the existing Alienation of Customary Land Act 1965; Building Alignment Ordinance Act 1932; Disaster and Emergency Management Act 2007; National Building Code of Samoa; Land for Foreign Purposes Act 1992 - 1993; Lands, Surveys and Environment Act 1989; Planning & Urban Management Act 2004; Waste Management Act 2010; Water Resources Management Act 2008; National Policy on Combating Climate Change 2007 and National Environment Management Strategies (NEMS) 1993 to better address climate change adaptation and provide pragmatic evidence-based advocacy for high level political endorsement of coastal infrastructure and flood protection.

It is recommended that the review guidelines assess past and current development practices and coastal protection measures that have had negative impacts such as the reduced natural resilience and increased vulnerability due to climate change risks. The EIA/SIA will review the existing coastal development planning process, engineering designs and construction implementation and monitoring processes and practices for high, medium and low impact coastal developments from a climate risk planning perspective. These include land reclamation, erosion prevention and other coastal protection measures. Considering these, the updated EIA/SIA will formulate objectively verifiable, quantitative standards for coastal land use with respect to coastal development including safe setbacks, land reclamation, infrastructure etc. For example, a minimum elevation could be set with respect to the high wave energy zone in Apia. The guidelines will also provide an objective quantitative performance monitoring and evaluation framework for monitoring delivery of the proposed standards.

Climate-resilient/"building-back-better"

The Government of Samoa is promoting reconstruction of climate proof housing under the title "Building Back Better". The cyclone shelter reconstruction project provides climate proof housing designs which is currently in the process of being approved by the Government of Samoa for consideration in future standard designs.. To demonstrate the building back better approach to enhance community resilience, the following recommended steps (see Figure 6.3) will assist MWTI and the National Building Code to address current climate change issues when integrating climate change into building codes and standards.

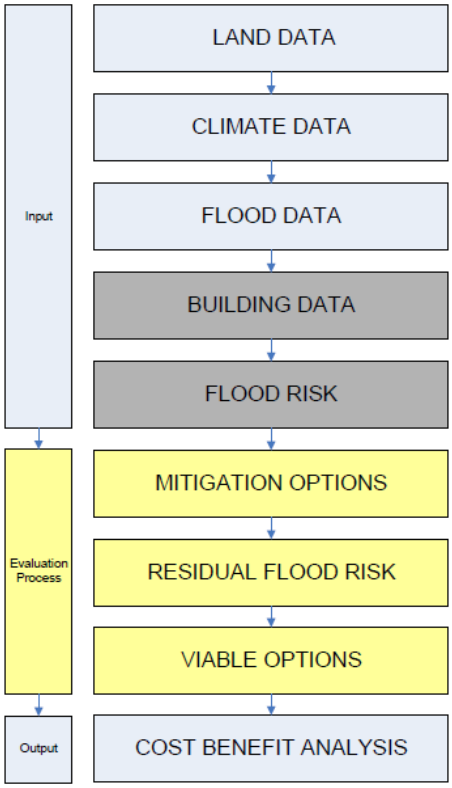

Figure 6.3: Recommended steps when accommodating climate change flooding of buildings (Source: USACE, NIWA)

Risk Analysis

Most of the current measures undertaken to cope with climate change issues regarding infrastructure design standards relate to "safety-margin strategies" (e.g. EU Strategy on adaptation to climate change, 2013). These are strategies that reduce vulnerability at negative, null or negligible risks. Risk analysis typically involves the choice of several variables to be varied simultaneously, as project returns are generally subject to more than one source of risk. Because of the mathematical complexity involved in such calculations, the analysis of risk in this form may need to be undertaken by some kind of computer software such as @RISK.

Climate Change Cost Implications

It is clear that addressing the climate change impacts on infrastructure and their mitigation requires investments to enable a radical transformation to strong and resistant infrastructure. Any new interventions ("climate-proofed" community houses, schools, buildings) or retrofits need to be analysed through an economic angle to ensure their sustainability. A number of design options could be formulated. For example, based on design options (building, rising of the road, construction of new culverts/ bridges, construction of storm water retention basins etc.) interventions could be evaluated in a ranking matrix includinga number of social and environmental criteria as shown in table 6.2.

TABLE 6.2: EVALUATED IN A RANKING MATRIX			
CRITERIA	LOW	MIDDLE	HIGH
COSTS			
Restoration of access to services, sea walls, embankments, bridges, schools, markets			
Acquisition of land			
Reduction of travel time			
Reduction of travel costs			
Environmental impact			
Social impact, health, migration issues, etc..			

For any cost-benefit analysis, parameters like material and labour cost, information of trade and market literature, analysis tools and economists need to engage with technical experts.

6.3 BUILDING FLOOD PROTECTION INFRASTRUCTURE ALONG VAISIGANO RIVER

As stated in the Samoa Flood Management Action Plan 2007-2012 With Specific Reference to Vaisigano River (GoS, 2007a):

> *The area drained by the Vaisigano River is approximately 34 km² and is one of the main sources for water supply in Apia. The main river is approximately 12.5 km long and at its widest, the catchment is 5 km. The river is tidal for a maximum of 500 m upstream from the river mouth due to the gradient of its lower reach. The tidal range at the river's mouth typically varies from 0.6 m to 1.0 m above mean sea level to 0.25 m to 1.5 m above mean sea level. The Vaisigano River run two hydropower stations, supplying the majority of Apia's electricity.*
>
> *Full historical data for the frequency and extent of past flood events is unfortunately limited. In 2006, flooding was caused by surface water ponding and poor drainage instead of the Vaisigano River. In 2001, severe flooding , resulting in an estimated 1,300 damaged buildings and a cost of over 11 million Samoan Tala. There has been speculation that tidal levels are having significant effects in the lower Vaisigano River on peak flood levels. In the last 15 years, the highest recorded tide in the harbour was about 1.67 m above sea level. Tidal water levels have no impact on upstream flood levels for a 1:2 year flood event due to the peak flow size at the downstream end of the river.*

There are numerous elements at risk in the lower Vaisigano floodplain. Table 6.3 shows the total affected number of people and buildings, using flood extent maps produced as part of FMAP 2007-2012.

TABLE 6.3: NUMBER OF PEOPLE AND BUILDINGS AT RISK IN THE LOWER VAISIGANO FLOODPLAIN		
RETURN PERIOD (YEARS)	NUMBER OF PEOPLE AT RISK	NUMBER OF BUILDINGS AT RISK
1 in 2	1139	244
1 in 5	1382	296
1 in 20	1536	329
1 in 50	1596	342
1 in 100	1634	350

The hydraulic modelling of the lower reach of the Vaisigano River has indicated that during rare flood events it is possible that Lelata, Leone and the Vaisigano Bridge may be overflowed causing them damage. The amount of damage that these structures would incur is difficult to quantify as the Vaisigano river is a complex system and floods occur frequently. It carries a lot of fine sediments (non cohesive silty sand). Thus, river bed movement, sediment budger and shoreline evaluation of the river will be crucial for informing possible revetment work, channel improvement and bank stabilization etc. The model case for the Mississippi river could be followed in this case.

If hydraulic modelling is to be involved in the design of water retention structures, embankments or combined schemes HEC RAS will be applied, alongside other hydraulic planning tools. Appropriate training sessions for LTA. MWTI and WR staffs are proposed in the training program. While drainage design is essentially preparing for the maximum probable discharge over a 2, 5 or 10 year period, water management is concerned with allocating a vital resource to the users. This allocation process requires a deeper understanding of the processes taking place in the watershed, for example, periods of low flow, water losses through evapotranspiration, water losses in sinks within the catchment area and of course the efficient use of water for irrigation and other purposes. Water management thus requires more complex models and calculations of the stores and fluxes within a catchment, and it also requires a stronger effort concerning measurements, maintenance and operational organization.

Though WR of MNRE has an HEC-RAS model, this model is a 1D model which is not adequate to provide the diversified analytical tools for river morphological computations that are essential to devise RTW and crossing structures for integration of sustainable river engineering solutions. A 2D model (i.e. MIKE-21 C; Delf-3D) is required for a fully hydraulic study together with morphological changes. The existing HEC-RAS modelling can continue to be applied for one dimensional averaged hydraulic parameters of water way crossing structures like bridges, culvert hydraulics, but would require a detailed study to define strategy and type of protection works required. The SIA would need to conduct this after the hydraulic study. As one of the objectives of the rock wall would be a scenic view and recreation, advection / dispersion and/or water quality need to be considered while doing the hydraulic modelling.

6.4 IMPLEMENTING ECOSYSTEM-BASED APPROACHES TO WATERSHED MANAGEMENT AND FLOOD MITIGATION

Structural measures will remain important elements and should primarily focus on the protection of human health and safety, and valuable goods and property. Flood forecasting and warning is a prerequisite for successful mitigation of flood damage. Its effectiveness depends on the level of preparedness and correct response. Therefore the Water Resources Division of MNRE would need to provide timely and reliable flood warning and flood forecasting information for proper community response. A fully distributed flood forecasting model is required for the Vaisigano River basin.

Flood Forecasting Model

At present, there is only a HEC-HMS model developed by WRD of MNRE. Due to small catchments and very steep slopes there is not enough lead time for a gauge to gauge correlation method or using celerity function. For Vaisigano River, a combined catchment and routing model or probabilistic model using numerical weather prediction could be applied with a fully distributed model. The catchment models simulate the catchment response to produce runoff at certain points based on the type of model, scale used and hydrological response unit (HRU). In the soil-moisture accounting and routing (SMAR) conceptual model, the Nash equal-reservoir cascade is used in parallel with a single linear reservoir, the

former to route the quick response surface runoff and the latter to route the slow response groundwater runoff. In the classic Sugawara tank model, the outputs from the four storage tanks were taken as surface runoff, intermediate runoff, sub-base runoff and base flow respectively, becoming the components of the total discharge at the catchment outlet. Figure 6.4 presents the overall structure of the combined catchment and routing model.

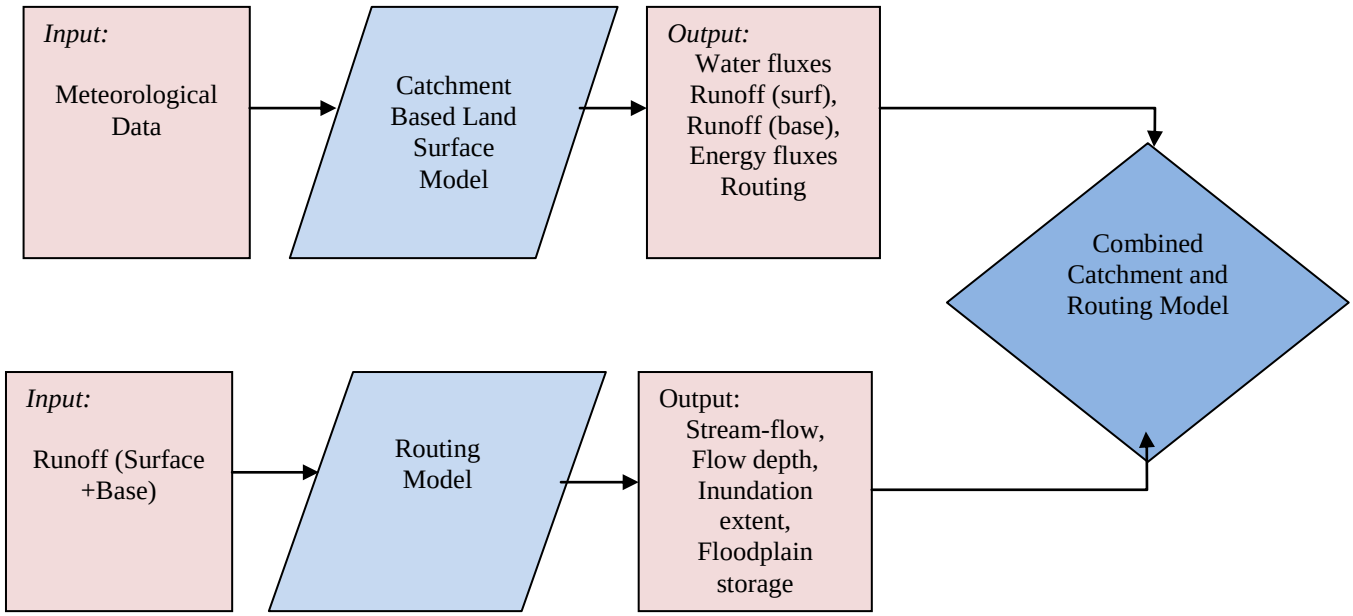

Figure 6.4: Structure of combined catchment and routing model (adopted based on Goteti et al., 2007).

Probabilistic forecasting is a technique that relies on different methods to establish an event occurrence/magnitude probability (http://www.nssl.noaa.gov). Hydrologists usually use distributed hydrological models to perform real-time stream-flow forecasting for flood warning purposes. These models require large data sets of a catchment's physical characteristics and precipitation series that are not always available. Moreover, the results from these models can be rather uncertain due to large errors in precipitation input, initial catchment moisture conditions and/or modelling parameters or processes. An alternative approach is to use nonparametric models based on stream-flow series only to overcome the requirement for data on catchment physical characteristics and precipitation series. However, it is not known whether nonparametric models for meso-scale catchments can provide reliable stream-flow forecasting for flood warning, or whether they can perform as reliably as, or even outperform, distributed hydrological models. It is therefore different from a deterministic forecast, which is just one prediction of what might happen. Both probabilistic and deterministic techniques try to predict events but only probabilistic forecasts provide consistent information about the uncertainty by providing a range of possible forecast flood water levels (or rainfall depths). These are often referred to as an ensemble. Figure 6.5 shows an example of a probabilistic forecast (H. L. Cloke & F. Pappenberger, 2009). The plot shows the discharge predicted for each ensemble forecast (solid line), the observed discharge (dashed black line) and four flood discharge warning levels (horizontal dashed lines).

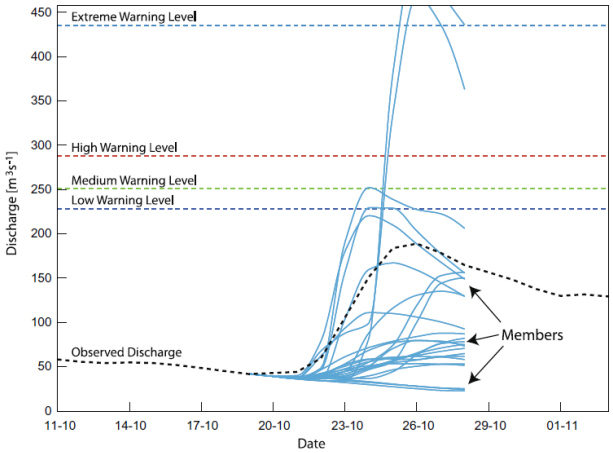

Figure 6.5: An example of an ensemble 'spaghetti' hydrograph for a hind casted flood event (H. L. Cloke & F. Pappenberger, 2009)

A possible flood forecasting cascade of components of the ensemble prediction system proposed by (H. L. Cloke & F. Pappenberger, 2009) is shown in Figure 6.6. It should be noted that not every flood modeling system driven by EPS will have exactly these components. Many countries include the Ensemble Pre-Processor (EPP) for the generation of ensembles of future precipitation and temperature from single-value quantitative precipitation and temperature forecasts.

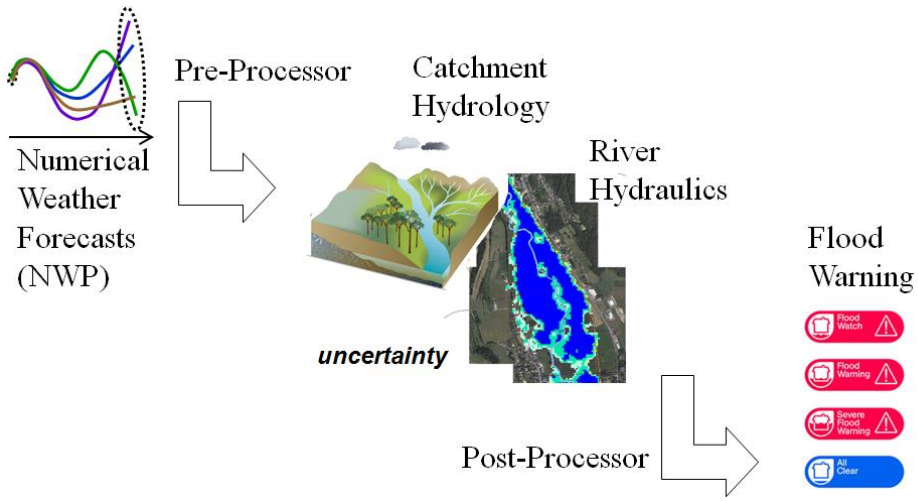

Figure 6.5: Cascade of components in EPS based Flood modelling (Source: Modified from H. L. Cloke & F. Pappenberger, 2009)

Coastal Inundation Model

Samoa is highly prone to tropical cyclones and tsunamis. After the impact of tropical cyclones along the coast, the primary cause of infrastructure damage is inundation due to storm surges and wind-induced wave action. The Meteorology division does not have any infrastructure to produce coastal inundation forecast information to communities. At present they only provide cyclone track and landfall information. It is highly recommended to enhance the system by development of a coastal inundation forecasting system for Upolu to enhance cyclone and storm surge warning systems and community preparedness.

Recognizing the extreme vulnerability of coastal areas to inundation/flooding, and with a view to improve safety-related services for the community, as a fundamental priority of the WMO, the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM) and the WMO Commission for Hydrology (CHy) have initiated the coastal inundation forecasting demonstration project. Its purpose is to address the challenges faced by coastal communities to enhance their safety and to support sustainable development, through the improvement of coastal inundation forecasting and warning systems at the national and regional scale. The similar program could enhance Samoa to save people's lives and property (JCOMM Technical Report No.64, 2013).

The goal of the Coastal Inundation Forecasting Demonstration Project (CIFDP) is to show how coastal inundation forecasting products can be improved and effectively coordinated with warning services provided by the National Meteorological and Hydrological Services (NMHSs). This process is facilitated primarily by the WMO Technical Commissions, in cooperation with a consortium of experts and related institutions of excellence in the field of storm surge, wave and hydrological flooding in order to deal with the coastal inundation matter from the viewpoint of the Total Water Level Envelope (TWLE)1. The CIFDP contribute to the improvement of the interaction of the national operational forecasting agencies e.g. National Meteorological and Hydrological Services (NMHSs) with Disaster Management Agencies (DMAs), through an integrated coastal management strategy, including the development of preparedness, response and management strategies of storm surges and waves associated with coastal inundation. These strategies are built on the basis of hazard and vulnerability maps and related information by developing scenarios, for the use of DNAs. The scenarios are a basis for disaster preparedness, and could provide valuable assistance to national partners involved in recovery and reconstruction activities.

At present, the number of national agencies globally that run storm surge, wave and hydrological models, and coupled coastal forecasting systems is fairly limited and almost non-existent in developing countries. Hence, the CIFDP will work with responsible national agencies to support them in utilizing forecast products operationally and linking them to coastal flood management programs and related activities. This requires substantial training in the use of these products and robustness of technical capacity such as infrastructure, data storage, back-up, data delivery, etc., under different hydro-meteorological and risk situations.

[1] The 1st JCOMM Symposium on Storm Surges (2-6 October 2007, Seoul) taking into account the emerging awareness of the need to promote the storm surge activity strongly recommended improving prediction for total water levels that is the real source of risk in coastal areas comprising tide, wave, surge and other factors.

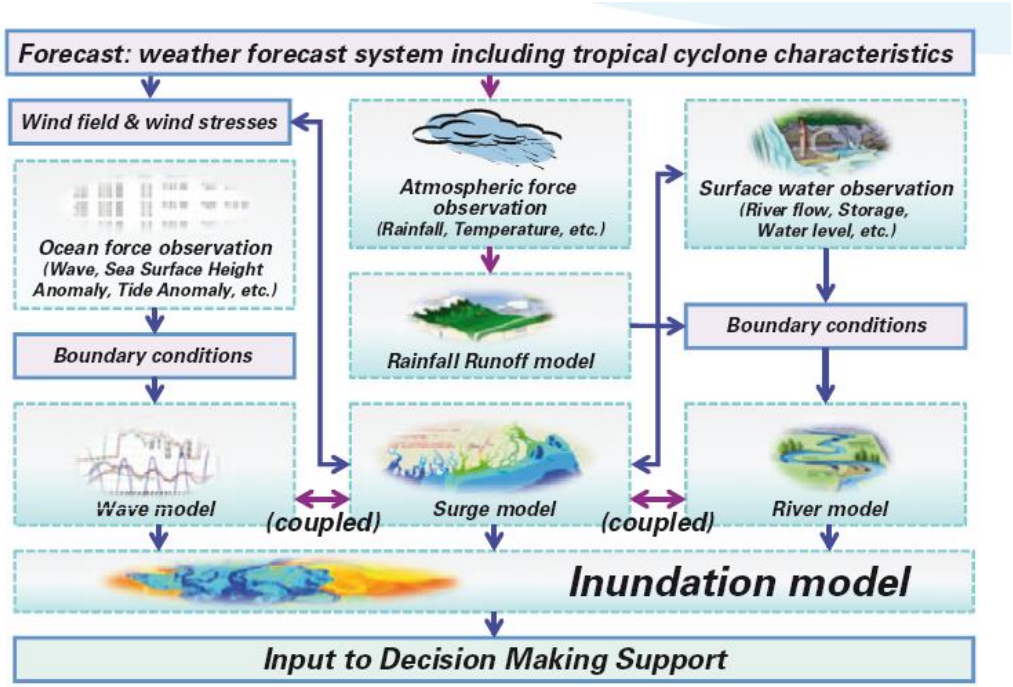

Figure6.6: Input to Decision Making Support for coastal inundations (JCOMM, 2013)

The Storm Surge and Flood modeling system is founded on a numerical model of coastal water systems that is based on coastal hydraulics, processes of river/estuaries and Sea shore. The Coastal Hydraulics based model consists of a suite of modules, each of which is used to simulate particular coastal processes.

Strengthening Climate Services in Samoa

Implementation of the GEF- funded project, 'Integrating climate change risk in the Agriculture and Health Sectors in Samoa' (ICCRAHS), managed by the Samoan Ministry of Natural Resources and Environment (MNRE), ended in 2013. Under ICCRAHSS, the project infrastructure for climate data management has been completed. The report entitled "STRENGTHENING CLIMATE SERVICES IN SAMOA, Recommendations for the next development phase of integrating climate change mitigation and adaptation services into the agriculture and health sectors in Samoa [2013─2018]" stated that the focus of the recommendations and technical objectives set out in ICCRAHS are consistent with the objectives of Samoa's National Adaptation Programme of Action, and build on the work already achieved under the ICCRAHS project. This report's recommendations are also consistent with Global Framework for Climate Services Implementation Strategy of the World Meteorological Organisation (WMO), the Pacific Islands Meteorological Strategy 2012-20191(PIMS), which sets out a strategic framework for the development and support of national and regional meteorological services in the Pacific.

The aforesaid report claims that significant progress has been achieved during the implementation of ICCRAHS to enhance the capacity of the Samoa Meteorological Division (SMD) to observe, capture and manage weather and climate data. Several joint workshops of SMD climate staff, agriculture and health professionals, and other agency and community leaders, have been held to help to clarify basic climate information, services and early warning advisories as briefed below that could regularly and routinely assist these agencies with climate risk management.

1. Climate briefings

- Conduct a monthly climate briefing to MAF staff (selected from administration and field officers) covering:

    - Climate developments over the past few weeks including severe events if any and their impacts on agricultural production and food security
    - Climate outlook for the next three months
    - Actions needed to improve climate information for the agricultural sector.
- Conduct a monthly climate briefing to MOH and NHS staff and health workers covering:
    - Climate developments over the past few weeks and any significant impacts on health
    - Climate outlook for the next three months
    - Actions needed to improve climate information for the health sector.
- Use the information from the above briefings to improve sector focus and quality of climate information provided by Samoa Met Division to these sectors.
- Provide regular climate bulletins to established communication networks, such as Samoa Farmers Association and Women in Business, and meet with them to provide training and improve understanding of what information would best suit the needs of these networks.

2. Access to Data and Products

- Provide fit-for-purpose and affordable inter-departmental, sector-specific and public access to climate data, products and information produced at Samoa Met Division (while respecting institutional responsibilities and their different needs and requirements).
- Develop and improve institutional and technical arrangements within Samoa to enable all observed climate data, and climate related data, to be used in the production and delivery of climate services in Samoa.
- Improve data systems and data exchange collaborations to enable Samoa to gain increased access to global and regional climate resources and services (e.g. global telecommunications system (GTS) data, web tools, seasonal forecasts, satellite data).

3. Capacity building

- Continue to build and (critically) maintain a robust climate observation network across all climatic zones of Samoa to underpin data needs for sector decision-making.
- Ensure high quality climate data records and management are sustained through continued professional development of staff capabilities and responsibilities.
- Through technical support and staff training as needed, maintain and extend the development and use of open source tools (including CLIDE, R, QGIS, and selected web based services) for the regular production of climate products designed to inform decision-making.
- Improve in-house capabilities for analyzing and interpreting climate patterns and trends to inform risk planning on all time scales

Climate forecast applications

With the achievements of ICCRAHS in institutionalizing the climate forecast processes, the following application on the ground could be undertaken to derive the benefit in the field. Similar approach has been taken under USAID OFDA funded CFAB project in Bangladesh and was successful (Fakhruddin, 2014).

- Long-term (1-6 month) forecast schemes. Historical data can be used to initialize the long-range flood forecasting scheme. With Samoa's weather pattern in a symbiotic relation with the ENSO oscillation, it would be easier to have the kind of long term forecast projection.

- Development of medium-term forecast scheme. A Stochastic approach built on a Neural network concept supported by statistical analysis for the prediction of rainfall (and river discharge) can be developed, providing potential application for disaster management, particularly for the management of floods and drought.

- Establishment of short-term (1-6 day) flood forecasts. Short term forecasts would be based on more detailed hydrology and hydrological numerical modeling system comprising of river and flood plains models coupled to the sea models of appropriate portion of Pacific Ocean in the vicinity; the sea model would require extensive analysis of land fall data of tropical cyclones to cover the trajectories and wind fields. The lead time needs to be decided so as to allow for emergency planning and selective planting or harvesting to reduce potential crop losses at the beginning or end of the cropping cycle and disaster management.

- Forecast application. A method to bridge the gap between producers and users of probabilistic forecasts has to be developed through the generation of a user friendly data set that provides an aggregated risk analysis to aid a user community in making absolute decisions (for example, evaluate the risk in harvesting early to ensure 80% of the potential yield, or wait for two weeks to obtain 100% yield but with the possibility of losing the entire harvest).

    - Develop a localized forecast product to provide climate information for the prediction of flash floods, as well as the lengths of dry and wet spells

    - Transfer technology for the various forecasting schemes (short-, medium- and long-term forecasts)

    - Develop a training program for scientists to run the forecasting and application system

    - Demonstrate through pilot projects the end-to-end application of climate information where the climate forecast generated is translated into a flood forecast, interpreted into an impact outlook, and communicated to end users to enable them to make informed responses.

    - Institutional mechanisms at the national and local levels will be set-up for program implementation.

- Vulnerability analysis: Using a participatory approach (focus group discussions, interviews, etc.), the sector vulnerable to floods and drought will be identified. This involves the assessment of: the climate-related problem – who takes climate risk-related decisions?; what are they and what are their options?; how climate-dependent are they?; what major policies and institutions are involved?; who are the major stakeholders, what are their expected interests and roles? The vulnerability analysis will be carried out by the local level working group.

- Assessment of user needs: Each pilot site will be evaluated for the most suitable ways to inject climate information into local decision-making processes. The local level working group will facilitate a dialogue between end users and the providers of climate information on the nature of uncertainty and risk of probabilistic climate information with reference to local infrastructure, resource management and decision cycles; establish an understanding of historical impacts of floods and drought and the adaptive strategies taken by the community; assess the sensitivity of decision cycles to floods and drought, and the potential for and benefits that may be gained from using climate information; evaluate the nature of climate information required and its location

within the production decision cycle (e.g. onset of wet/ dry spell and lead time required for the information to guide farmers' decisions on the choice of crop, planting and agricultural inputs required); and determine the level of demand for this information. Linking climate information to sectoral decision models, such as the farmers' decision calendar, will allow users in local communities to plan for the next cycle of activities.

- Development of localized forecast products: With an enhanced forecasting capability, SMD will be able to develop localized forecast products to provide climate information within Samoa for the prediction of flash floods and lengths of dry and wet spells within the wet season. Information required for the development of forecast for a specific site (e.g. historical rainfall and discharge data) will be obtained and analyzed for hydro-meteorological predictability and, based on this information, the downscaled or localized climate information will be generated taking into consideration the nature of information that the users need.

- Preparation and communication of the flood/ drought impact outlook: The flood forecast will then be interpreted into an impact outlook, which indicates the likely impacts of the flood forecast on resources, including response options. The user friendly data developed earlier offers a simple way to incorporate information on impacts with probabilistic forecasts to provide an easily interpretable graphic for risk analysis to enable users to make reasoned decisions. It incorporates:

    - Information from the forecast schemes on the probability of the occurrence of a particular event with specific intensity and duration.

    - User community assessments of the impacts of the occurrence of a particular event. A user community is best equipped to calculate the loss associated with the occurrence of a particular natural hazard.

    - The two pieces of information (probability forecast plus user information) are combined to produce an optimal strategy. Such a strategy, appearing in quantitative form, might suggest that the optimal strategy for maximum yield might be to harvest crops early rather than take the chance of heavy rainfall.

- Application of information in demonstration sites: The application of climate information will be demonstrated in the pilot sites selected. The concept of climate variability, terminologies used in climate forecasting, and the probability concept in climate/ seasonal forecasts will be introduced to end users. These users will also be guided to set up a strategy under a given climate forecast, and measure climatic data in the field and use these to assess crop water requirements in agriculture (as an example). Response options in anticipation of the next season's climate will be delivered to farmers/ end users to help them make appropriate decisions. Users' response will then be monitored to determine the applicability of the climate information at the local level, as well as measured to determine enhanced performance with the use of the forecast products. Responses will then be fed back to the climate information providers for any system adjustment that may be required.

Integrated Coastal Area and River Basin Management

Lately it has been widely recognized that river basins and coastal sectors are linked through their physical and ecological structure and related physical and biological processes. Coastal areas and river basins provide space and resources, while they host valuable ecosystems and human activities which often use resources intensively. Economic activities in downstream areas benefit from upland resources, such as water; coastal resources are often threatened due to the pollution generated in upstream areas, while they provide space for settlement, industrial activity and tourist developments that have a positive benefit for

the broader river basin area. Within this context a new approach, called Integrated Coastal Area and River Basin Management (ICARM), provides the key to the integrated development of natural and socio-economic environments within river basins and coastal areas.

The initial and long-term cost should not exceed the benefits to be derived. Permanent countermeasures should be used for location where the results of failure would be intolerable. Designs should be based on studies of channel trends and processes and on experience with comparable situations. The environmental effects of the countermeasures on the natural channel both up-and downstream should be considered. The possibility of using model studies as a design aid should receive consideration at an early stage. Countermeasures must be inspected periodically after floods to check performance and modify the design, if necessary. The first design may require modification. Continuity in treatment, as opposed to sporadic attention, is advisable. In most cases, the countermeasure does not "cure" the instability or scour problem, and planning (funding) for continued maintenance of the countermeasure will be required. (FHWA HEC 23)

6.5 RECONSTRUCTING COMMUNITY ASSETS FOLLOWING "BUILDING-BACK-BETTER" APPROACHES

In December 2012, Tropical Cyclone Evan, a Category 3 cyclone passed over Samoa. Strong winds and flooding caused severe destruction. A Post Disaster Needs Assessment (PDNA) conducted by the World Bank and the United Nations with the participation of the Government to assess the damage and the loss from the Cyclone was completed in January 2013. Its recommendations have provided the basis for a Recovery Framework that has now received Cabinet approval, and its principles are expected to guide the Government Recovery Programme. It stresses the need for investments in recovery of lost assets to go beyond regaining damaged assets and loss to the economy to 'Build Back Better' (BBB) with improved standards, for increasing disaster resilience and avoiding the creation of new vulnerabilities. United Nations-Habitat with other development partners is working with the Government of Samoa providing assistance to realize these objectives.

Responding to a request from the Government for assistance in the recovery efforts of housing, UNDP is assisting government to enhance community based post – cyclone shelter recovery for climate resilience in Samoa by construction of new replacement houses through a well-planned reconstruction effort, based on an owner-driven approach; promoting the BBB concept within the village; education on construction and development in with a focus on climate change and Disaster Risk Reduction (DDR) and constructing one climate-resilient model house in Samoa (Figure 6.7).

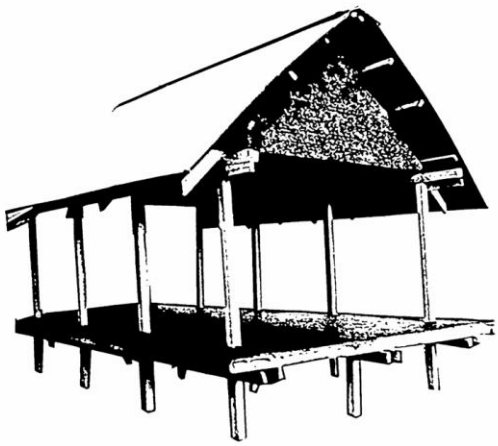

Figure 6.7: climate-resilient model house (Source- UNDP, Samoa)

Under this project capacity building could be conducted on climate proof infrastructure. The method needs to focus on risk analysis – with risk assessment, risk management in cost-benefit analysis and level of acceptable risk, and on risk management options. Specific attention could be given to both new infrastructure design and improvement/maintenance/operation of existing infrastructures. The table below shows a summary of the steps and sub-steps involved in the risk analysis method:

TABLE 6.4: STEPS AND SUB-STEPS FOR RISK ANALYISIS FOR CLIMATE PROOF INFRASTRUCTURE	
KEY STEPS	SUB-STEPS
1. Context analysis	1.1 Establish general context 1.2 Establish specific context for particular scale of analysis 1.3 Establish risk criteria and indicators adapted for each particular scale of analysis
2. Risk identification	2.1 Identify risk sources 2.2 Identify vulnerabilities 2.3 Identify possible consequences
3. Risk analysis	3.1 Establish risk chronology and scenarios 3.2 Determine impact of risk 3.3 Evaluate occurrences 3.4 Provide a risk overview
4. Risk evaluation	4.1 Evaluate quantitative aspects with appropriate analysis (CBA or others) 4.2 Compare climate risk to other kinds of risk 4.3 Determine which risks are acceptable
5. Risk mitigation	5.1 Identify options 5.2 Appraise options 5.3 Negotiation with funding agencies 5.4 Elaborate action plan
6. Implementation of action plans	6.1 Develop action plan at each level of responsibility 6.2 implement adaptation action plans
7. Monitor, re-plan and capitalize	7.1 Regular monitoring and review 7.2 Re-plan in case of new data or delay in implementation 7.3 Capitalization of return of experience on both climatic events and progress of implementation
Communication and gathering of information	

Based on a risk analysis, a GIS model for the vulnerability of all sensitive components of an infrastructure (i.e. roads, bridge, etc.) could be developed. On the basis of a socio-economic analysis, structuring and establishing priorities for investments will be made. It could be run using different climate scenarios to

assist in dealing with exceptional events to make the most relevant emergency decisions and implement corresponding measures in collaboration with all involved partners, including emergency services. An expertise has emerged progressively from these analyses for assessing the vulnerability of a route and then a complete network.

7 MONITORING AND EVALUATION

The task of monitoring is a continuous process that the management of any intervention should pay attention to in order to achieve the objectives of the intervention. The project management literature spells out many types of monitoring, and an easy classification of monitoring is presented below. These are the Results Monitoring and Implementation Monitoring which are diagrammatically presented in figure 7.1.

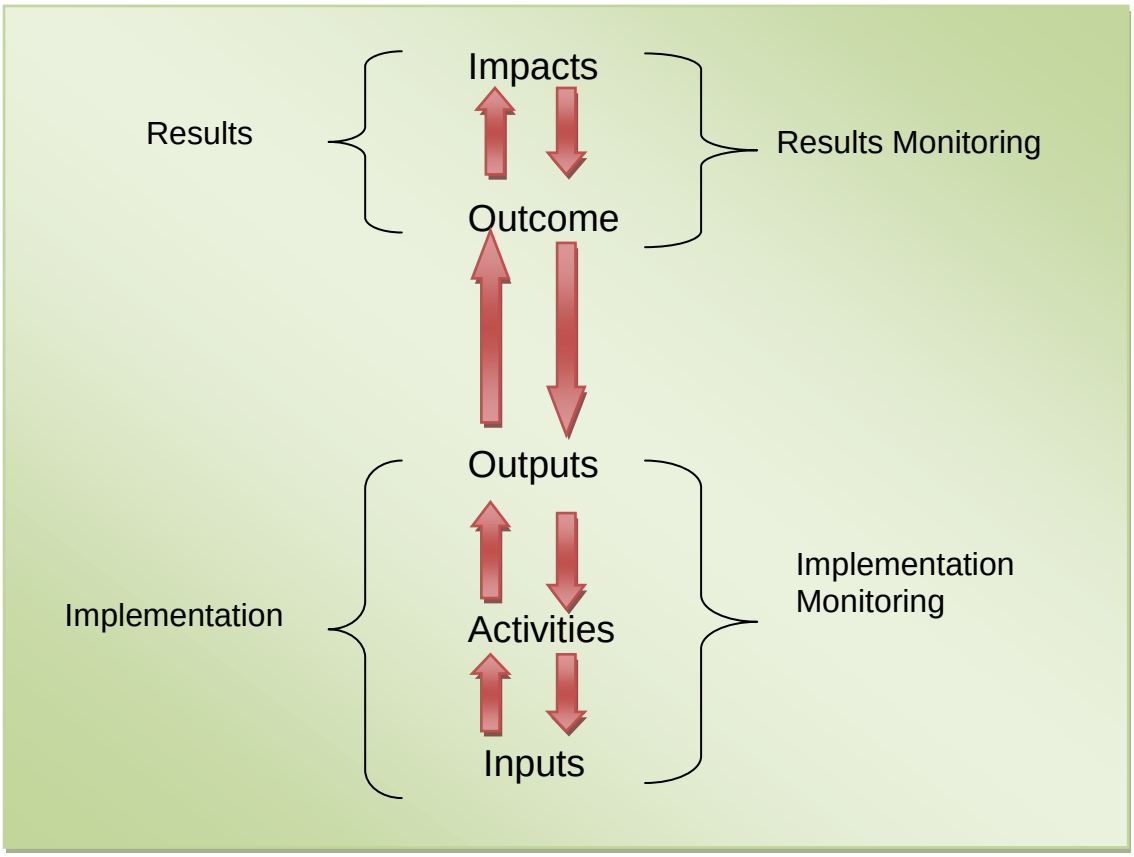

Figure 7.1Key Types of Monitoring

This classification is for the easy understanding of the process. There is no distinct separation between the two. In fact monitoring is entirely a continuous process that should bring information to the management on the actual operation of the planned activities for infrastructure project implementation with earmarked inputs i.e. what is happening at all stages of this process. That is the need to know whether the activities are producing the expected outputs so that the anticipated outcomes and objectives are achievable. Any deviations to that planned trajectory too should be reported, enabling the management to take corrective measures to put the process back in the correct path.

In return, what should be done in response to deviations from the original plan, how to address the constraints and impediments if any should go back to the implementing personnel in order to achieve the purpose and the objectives of the intervention. The M&E Framework therefore should be developed in

such a manner that there should be an effective two-way flow of information and decisions as reflected in the arrows of the above diagram.

On the other GEF has very well established M&E guidelines climate change adaptation projects. The infrastructures activities need to evaluate with project outcomes against climate change scenarios; performance review of project interventions against climate impacts; comparison of performance between the project area and a similar comparison area in an experimental procedure; assessment of outcomes against known best practices, global targets or recommended standards and comparison of vulnerability and adaptive capacity indicators via vulnerability assessments at project inception and project completion. A sound M&E Framework for climate smart infrastructure therefore should be able to address these needs.

7.1 RESULTS BASED MONITORING AND EVALUATION (RBM&E)

As discussed above monitoring is a continuous process of collecting and analyzing information to compare how well an intervention is being implemented against expected results. Monitoring links activities and their resources to objectives. The most important role of monitoring is its regular reporting that alerts managers to problems. The GEF defines evaluation as the "systematic and impartial assessment of an activity, project, program, strategy, policy, sector, focal area…" whereas monitoring is a "continuous or periodic function using systematic collection of qualitative and quantitative data to keep activities on track and thereby help identify implementation issues that warrant decisions at different levels of management." The GEF Evaluation Policy follows internationally recognized guidelines for evaluation and outlines five major criteria to be systematically reviewed in GEF evaluations (GEF EO, 2006) those are relevance, effectiveness, efficiency, results and sustainability.

The monitoring and evaluation differ yet are closely related. The monitoring is focused on tracking evidence of movement towards the achievement of specific and pre-determined target. Evaluation takes broader view of an intervention considering not only progress towards stated goals, but also logic of initiatives and its consequences.

A sound M&E Framework makes life easier for all stakeholders as the monitoring function brings essential data and information for the evaluation. A good monitoring system brings in complementary and also supplementary inputs to evaluations. In a situation where the M&E Framework is effective the additional information that an evaluation requires may depend on the extent of details on the sustainability and impact that the partners are keen to find out. Annex 3 summarizes the key indicators that need to consider for the proposed infrastructures interventions.

8 INSTITUTIONAL ARRANGEMENT

This section describes more on institutional collaboration required to enhance the proposed infrastructure interventions under this project.

8.1 COASTAL INFRASTRUCTURE MANAGEMENT

LTA plays a key role in coastal infrastructure specially sea walls, road network, bridges, etc. LTA needs to work closely with the MWTI and WRM division to integrate their planning into coastal infrastructure The coastal infrastructure design. There was lessons learned that after tsunami the sea wall built to protect against tsunami waves creates local-level flooding. This was due to the fact that water could not drain out properly due to water blockage by the sea wall. Integration and inter-agency cooperation is essential.

8.2 CLIMATE PROOF HOUSING

MWTI needs to ensure that the new building codes follow the standard of climate proof housing standard and that have been successfully apply at the community level. Thus the building codes need to be finalize and approved by the cabinet as legislation so that community can apply the building codes. All sectors and NGOs need training on the design standards so they will be followed regularly.

8.3 COASTAL INUNDATION FORECASTING

Samoa is highly prone to tropical cyclone and tsunami. After the impact of tropical cyclone along the coast, the primary cause of infrastructure damage is the inundation due to storm surge and wind-induced wave action. The Meteorology division does not have any infrastructure to produce coastal inundation forecasts information to its community. At present they only provide the cyclone track and landfall information. It is highly recommended to enhance the system by development of coastal inundation forecasting system for Upolu to enhance cyclone and storm surge warning system and community preparedness. Recognizing extreme vulnerability of coastal areas to inundation/flooding, and with a view to improve safety-related services for the community, as a fundamental priority of the WMO, the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM) and the WMO Commission for Hydrology (CHy) have initiated the coastal inundation forecasting demonstration project. Its purpose is to address the challenges faced by coastal communities to enhance their safety and to support sustainable development, through the improvement of coastal inundation forecasting and warning systems at the national and regional scale. The similar program could enhance Samoa to save peoples life and property damage.

The goal of the Coastal Inundation Forecasting Demonstration Project (CIFDP) is to show how coastal inundation forecasting products can be improved and effectively coordinated with warning services provided by the National Meteorological and Hydrological Services (NMHSs). This process facilitates primarily by the WMO Technical Commissions, in cooperation with a consortium of experts and related institutions of excellence in the field of storm surge, wave and hydrological flooding in order to deal with the coastal inundation matter from the viewpoint of the Total Water Level Envelope (TWLE)2. The CIFDP contribute to the improvement of the interaction of the national operational forecasting agencies e.g. National Meteorological and Hydrological Services (NMHSs) with Disaster Management Agencies (DMAs), through an integrated coastal management strategy, including the development of preparedness, response and management strategies of storm surges and waves associated with coastal inundation. These strategies are built on the basis of hazard and vulnerability maps and related information by developing

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scenarios, for the use of DNAs. These scenarios are basis for disaster preparedness, and could provide valuable assistance to national partners involved in recovery and reconstruction activities.

In the present, the number of national agencies globally that run storm surge, wave and hydrological models, and coupled coastal forecasting systems is fairly limited and almost non-existent in developing countries. Hence, the CIFDP will work with responsible national agencies to support them in utilizing forecast products operationally and linking them to coastal flood management programs and related activities. This requires substantive training in the use of these products and robustness of technical capacity such as infrastructure, data storage, back-up, data delivery, etc., under different hydro-meteorological and risk situations.

8.4 FLOOD FORECASTING

WRM division needs to work closely with the Meteorology Department to enhance and set up flood forecasting systems. The flood forecasting model could be set up on a catchment basis based on the assessment report of Vaisigano river basin supported by Australian Government. A fully distributed flood model needs to be established for a country like Samoa to generate flood early warning system with full automated telemetric system of observations.

9 CONCLUSION

This report studied the existing available data and reports to assess climate-related relative vulnerability of four major infrastructure sectors of the Samoan Islands. An indicator-based vulnerability model, SIVM, was developed for this purpose. A range of stakeholders were consulted both at the model development and data collection stages. The study identified some of the critical infrastructure components of each sector and collected data of the vulnerability indicators for each of the sectors. The resulting vulnerability index suggests that the transportation sector is the most vulnerable among the four sectors considered in this study. High physical exposure and comparatively lower capacity to repair some of the transport infrastructure such as bridges accounted for such high vulnerability. The power sector of Samoa was ranked as the second-most vulnerable sector, again, mainly because of the high physical exposure of power generation and distribution system. Comparatively lower capacity to repair the damage to these infrastructures was also a critical factor for the vulnerability of this sector. The water supply sector was ranked third. Some of the water supply infrastructures, such as the Alaoa, Tafitoala and Tiavi water treatment plants, were rated as very critical infrastructure; they play a key role in maintaining a safe water supply, which is crucial for public health. However, comparatively overall lower damage cost (exposure to climatic hazards) of this sector reduced its relative vulnerability. The sewerage system was ranked as the least vulnerable sector. The sewerage system of Samoa is mainly composed of individual household latrines which are comparatively easier to repair locally. This higher adaptive capacity lowered the overall vulnerability of this sector even though disruption of sewerage system can be crucial to public health.

As stated earlier, the watershed plan and coastal development plan (i.e. CIM) in Samoa were not harmonized properly to complement each other and there is a lack of climate risk and 'Ridge-to-Reef' approach. Considering the current gaps and vulnerabilities and project limited scopes, a "RIDGE-TO-REEF" integrated watershed management plan for greater Apia has been proposed to develop an integrated water management plan (IWMP) and development a framework of steps needed for the design of flood protection measures, including: i) feasibility study; ii) climate-resilient/"building-back-better" design; iii) environmental and social impact assessments & (iv) Cost-benefit analysis has been proposed. For the hard measures, building flood protection infrastructure along Vaisigano River, reconstruct community assets following "building-back-better" approaches, improved sanitation coverage to Cyclone Evan affected area and others have been proposed. For the soft measures, implement ecosystem-based approaches to watershed management and flood mitigation under which flood forecasting techniques for all 5 river basins in Greater Apia, generation of medium- and long-range weather/climate predictions; improved interpretation and communication for sectoral decision making and development of storm surge model with coastal inundation capacity; Capacity building of the Met office to operationalize the coastal inundation forecasting models has been proposed. Also to ensure climate smart building codes has been reemphasized.

The IWMP for Samoa need to be focused on 5 catchments in the Apia area. To address the climate risks, the IWMP would need to include a Vulnerability and Adaptation Assessment (V&AA). The V&AA needs to address all gaps from the 5 major sub-systems i.e.: environment, (river systems) infrastructure, (protection systems) natural, (watershed and ecosystem), institutional (policy, legislation and economic (cost/benefit)) from all five catchments. At the same time, IWMP need to provide rational management and wise use of Samoa's water resources, improve people's quality of life by equitable, safe and reliable access to water for production, disaster, health and hygiene and enhance an efficient integration and management of adaptation and DRR/DRM into national development planning and programming.

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ANNEX 1: AGENCIES VISITED AND PEOPLE MET

FIRST MISSION: 30 SEPTEMBER TO 6 OCTOBER 2013						
DATE	TIME	PPG TEAM MEMBERS	ORGANIZATION	PURPOSE	PARTICIPANTS	
					NAME	DESIGNATION
Mon 30th Sep	10.30 am	Dirk/Claudia/Bapon/Marta/Sara/Nadia		PPG team logistics		
	3pm	Dirk/Claudia/Bapon/Marta/Sara/Anne/Nadia/Muliufi	MNRE	Introductory meeting	Taulealeausumai L. Malua	CEO
	4pm	Dirk/Claudia/Bapon/Marta/Sara/Anne/Nadia/Muliufi	MOF	Introductory meeting	Tupaimatuna I Lavea Noumea Simi Litara Taulealo	CEO ACEO Aid & Debt Management PPCR Coordinator
Tues 1st Oct	8.30am	Dirk/Claudia/Marta/Sara/Nadia		PPG team logistics		
	9am – 12 pm	Dirk/Claudia/Marta/Sara/Bapon	MNRE	Site Visit	Malaki Iakopo	Principal WRD Officer
	2pm – 4pm	Dirk/Claudia/Bapon/Marta/Sara/Nadia/Muliufi	MNRE, MOF, MWCSD	Introductory Meeting with key implementing agencies	Filomena Nelson Lita Lui Sulu Amataga Fiasosoitamalii Siaosi Josephine Stowers-Fiu Andrew Riplinger Rosa Toese-Siaosi Lameko Osana Mulipola A Titimaea Malaki Iakopo	ACEO DMO Principal Aid Officer ACEO WRD WRD ACEO Legal Fulbright Sector Coordinator WRD ACEO Meteorology WRD - PRO
Wed 2nd Oct	8.30am	Dirk/Claudia/Bapon/Eduardo/Ana/Nanette/Marta/Sara/Nadia/Muliufi (All)	PPG Team	Internal Meeting		
	10 am	All	MNRE (PUMA, WRD,	Focus group meeting on Land Use and	Suluimalo Amataga Penaia	ACEO WRD Principal WRD Officer

FIRST MISSION: 30 SEPTEMBER TO 6 OCTOBER 2013						
DATE	TIME	PPG TEAM MEMBERS	ORGANIZATION	PURPOSE	PARTICIPANTS	
					NAME	DESIGNATION
			Land Management, Land Technical Services)	Management	Malaki Iakopo Pau Ioane	Principal LTS Officer
	11.30 am	All	MWTI LTA MNRE (PUMA)	Focus group meeting on Infrastructure	Leasi Galuvao Seimaleula Sinapati Ulberg Ferila Brown	LTA CEO LTA ACEO Procurement & Planning PUMA Acting ACEO
	1.30 pm	Claudia/Marta/Anne/Nadia	MOF	Focus group meeting on Climate Finance	Noumea Simi Lita Lui Litara Taulealo	ACEO Aid & Debt Principal Aid Officer PPCR Coordinator
	3pm		MAF MWCSD MCIL STA	Focus group meeting on Livelihoods and Communities	Rosa Toese Mene Salote Meredith Amiafolau Afamasaga	MWCSD Community Sector Coordinator MCIL Trade Sector Coordinator STA Climate Change Coordinator
Thurs 3rd Oct	9am – 3pm	All	PPG Team, RTA, CO only	Workshop Preparations		
			PPG Team, RTA, CO only	ProDoc sections and responsibilities, Environmental and Social Safeguards, Impact assessments pilot & M&E and Reporting,		

FIRST MISSION: 30 SEPTEMBER TO 6 OCTOBER 2013						
DATE	TIME	PPG TEAM MEMBERS	ORGANIZATION	PURPOSE	PARTICIPANTS	
					NAME	DESIGNATION
				Capacity assessments, Summary and Next Steps		
Fri 4th Oct	9am – 4pm		Inception Workshop		(See separate attachment)	

Government of Samoa

MINISTRY OF NATURAL RESOURCES AND ENVIRONMENT

Matāgaluega o Puna'oa Faalenatura ma Siosiomaga

GEF/LDCF Project: "Economy wide integration of Climate Change Adaptation and DRM/DRR to reduce climate vulnerability of Communities in Samoa"

Inception Workshop, MNRE Conference Room Level 3, TATTE Building
Friday 4 October 2013

No	Name	Designation	Organisation	Email
1	Ms. Claudia Ortiz	UNDP-APRC ⟷ Regional Tech Specialist		claudia.ortiz@undp.org
2	S.H.M. Fakhzuddin	~~UNDP~~ Infrastructure	UNDP	smfuctar@gmail.com
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5	Dirk Snyman	Team Leader	UNDP	dirk.snyman@c4es.co.za
6	Ana Lagere Tabua	UNDP Consultant		ana.lageretabua@gmail.com
7	Nanette Svenson	UNDP consultant	UNDP	nanette.svenson@gmail.com
8	MARTA MOREO	UNDP MCO SAMOA	UNDP	marta.moreo@undp.org
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10	LEE BAKER	USAID ADAPT Coy	USAID	lbaker@adapt-asia.com
11	FIONA SAPATU	Urban Planner	IPA	fiona@ipa.com.ws
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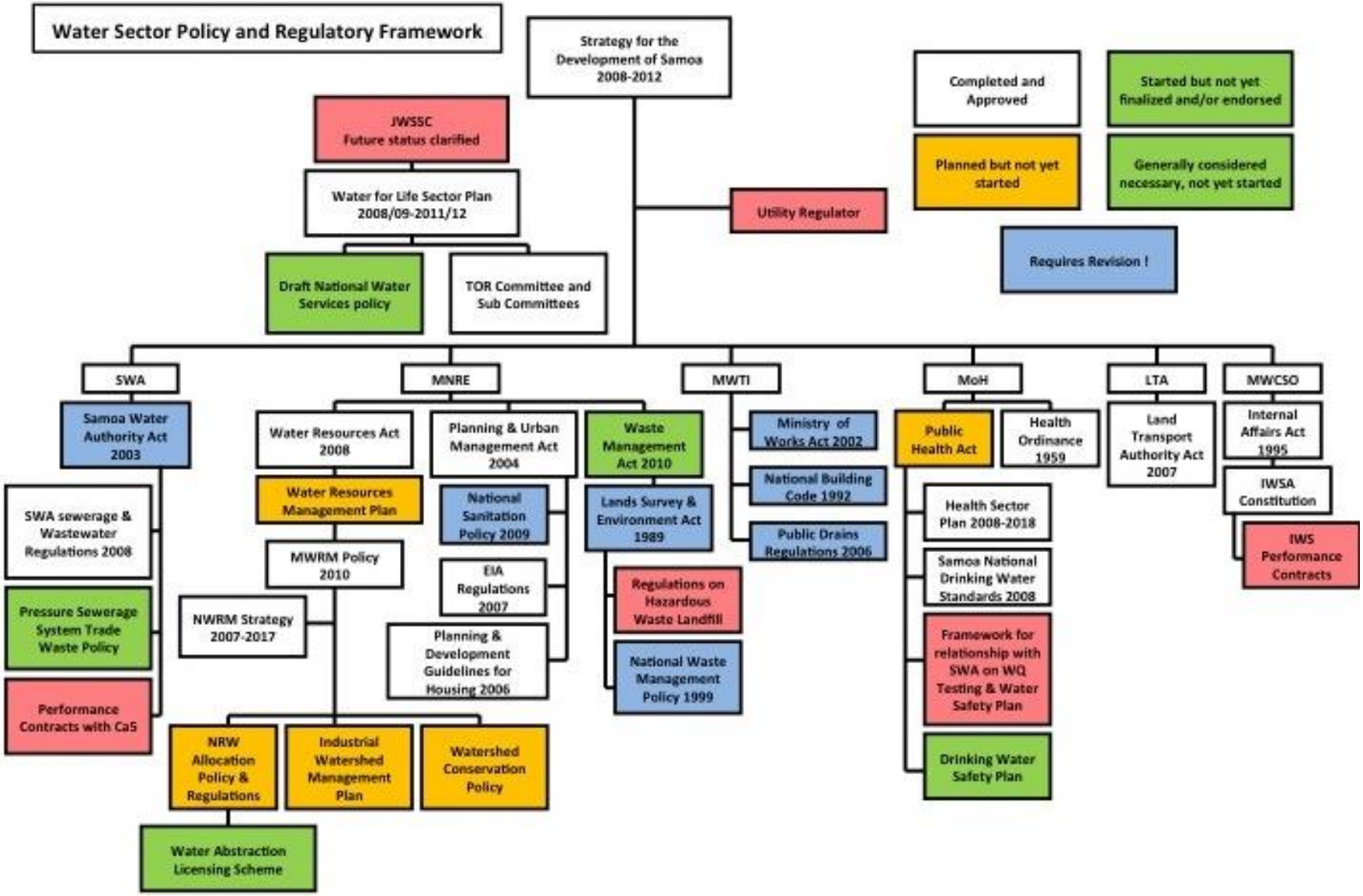
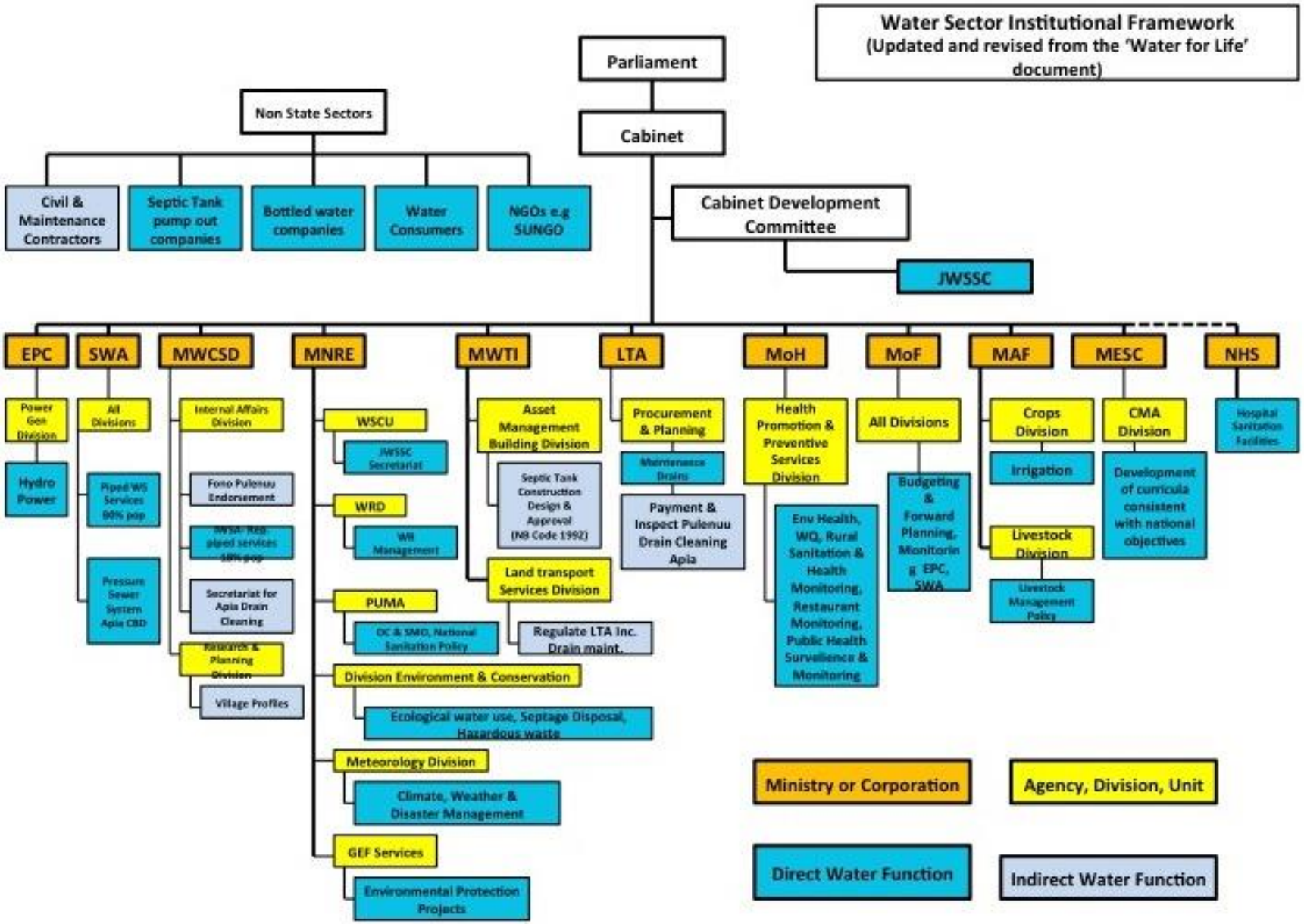
16	Taulealuga Tuulgata	UNDP	UNDP	taulealu29@gmail.com
17				
18	Viosua. Dosua	MWCSD ICT Officer	MWCSD	viosua@mwcsd.gov.ws

SECOND MISSION: 26 NOVEMBER 5 DECEMBER 2013	
26-Nov-2013	Traveled to Samoa & project documents review
27-Nov-2013	Team meeting on the second mission objectives & consultation with MNRE
28-Nov-2013	Meeting with Ministry of Agriculture and Fisheries, SPREP/WMO to discuss on climate EWS
29-Nov-2013	Meeting with Meteorological Department to share to project concept and benefits for communities
30-Nov-2013	Team meeting on economic cost benefit analysis of infrastructure projects
1-Dec-2013	Team meeting with gender and livelihood linkage with infrastructure projects
2-Dec-2013	Meeting with WRM and Water Sector on WatSan projects and possible collaboration on LDCF
3-Dec-2013	Meeting with UNDP country residence to debrief and meeting with UN Habitat on housing projects, Red Cross on community activities
4-Dec-2013	Meeting with Ministry of Works on building codes update and possible incorporation in LDCF projects
5-Dec-2013	Meeting with LTE on drainage and bridge construction enhancement for climate smart design under LDCF

ANNEX 2: WATER SECTOR POLICY AND REGULATORY FRAMEWORK




Water Sector Institutional Framework
(Updated and revised from the 'Water for Life' document)
Parliament
Cabinet
Non State Sectors
Civil & Maintenance Contractors
Septic Tank pump out companies
Bottled water companies
Water Consumers
NGOs e.g SUNGO
Cabinet Development Committee
JWSSC
EPC
SWA
MWCSD
MNRE
MWTI
LTA
MoH
MoF
MAF
MESC
NHS
Power Gen Division
Hydro Power
All Divisions
Piped WS Services 90% pop
Pressure Sewer System Apia CBD
Internal Affairs Division
Fono Pulenuu Endorsement
Secretariat for Apia Drain Cleaning
Village Profiles
WSCU
JWSSC Secretariat
WRD
WR Management
PUMA
OC & SMO, National Sanitation Policy
Division Environment & Conservation
Ecological water use, Septage Disposal, Hazardous waste
Meteorology Division
Climate, Weather & Disaster Management
GEF Services
Environmental Protection Projects
Asset Management Building Division
Septic Tank Construction Design & Approval (NB Code 1992)
Land transport Services Division
Regulate LTA Inc. Drain maint.
Procurement & Planning
Maintenance Drains
Payment & Inspect Pulenuu Drain Cleaning Apia
Health Promotion & Preventive Services Division
Env Health, WQ, Rural Sanitation & Health Monitoring, Restaurant Monitoring, Public Health Surveillance & Monitoring
All Divisions
Budgeting & Forward Planning, Monitoring EPC, SWA
Crops Division
Irrigation
Livestock Division
Livestock Management Policy
CMA Division
Development of curricula consistent with national objectives
Hospital Sanitation Facilities
Ministry or Corporation
Agency, Division, Unit
Direct Water Function
Indirect Water Function

ANNEX 3: PROPOSED INNOVATIONS, OUTPUTS, AND OUTCOMES

See attached spreadsheet

ANNEX 4: ECONOMICS ASSESSMENT OF INFRASTRUCTURE RISK IN SAMOA

1 NON-STRUCTURAL

1.1 Methodology for Quantification of Benefits of EWS

There are several studies on quantifying benefits of early warning systems, especially for flood damage reduction, such as the studies by Day (1970), US Army Corps of Engineers' Institute of Water Resource (IWR) (1991), Chatterton and Farrell (1977), as well as other studies on economic value of hurricane forecasting, meteorological forecasting and warning services, and benefits of ensemble-based forecasting. Here we try to identify, the benefits of adopting early warning systems against the investment required for establishing and operating a suitable early warning system. The following generic methodology, drawing basic principles from these references to estimate cost-benefits of early warning systems:

If loss due to a disaster without early warning is 'A', and if the decreased loss that may be incurred after appropriate measures following early warning is 'B', then the potential reduction in damages due to early warning is A - B. However, there may be a cost or investment required for providing the early warning services 'C'. Therefore, the actual benefit due to early warning is A-B-C.

The benefits due to the early warning may be estimated by summing the monetary benefits accrued as in Box 1 below:

BOX 1: BENEFITS OF ADOPTING EARLY WARNING SYSTEMS

1. Direct tangible benefits in the form of damages avoided by households and various sectors due to appropriate response by utilizing the lead time provided by the early warning
2. Indirect tangible benefits such as avoidance of production losses, relief and rehabilitation costs, and costs involved in providing such services

In some papers utilizes the concept of opportunity costs, or economic opportunity loss incurred by either inaction or by inappropriate action to early warning; for example, the cost of leaving land fallow in response to El Niño forecasts, or planting inappropriate crops where an appropriate action would have been to shift to short-term crops such as water melon, maize, etc.

In a developing country context, no accepted tools are available to quantify the value of life, and emotional and psychological trauma. Hence, the paper does not account for the economic benefits of lives saved or direct and indirect intangible benefits such as risk of injuries, trauma, or suffering avoided due to appropriate actions.

COST OF AN EARLY WARNING SYSTEM

The cost of EWS is calculated under three broad components:

- *Scientific component costs:* input costs for technical institutions required to generate forecast information

- *Institutional component costs:* refers to costs of training and other capacity development required for institutions to be able to use forecast information, especially to facilitate its use at lower levels
- *Community component:* refers to the input costs at community level to enable them to adopt forecast information and respond appropriately

TABLE 1: DAMAGE REDUCTION DUE TO EARLY WARNING OF DIFFERENT LEAD TIMES			
HOUSEHOLD ITEMS	24 hrs	20	Removal of some household items
	48 hrs	80	Removal of additional possessions
	Up to 7 days	90	Removal of all possible possessions including stored crops
LIVESTOCK	24 hrs	10	Poultry moved to safety
	48 hrs	40	Poultry, farm animals moved to safety
	Up to 7 days	45	Poultry, farm animals, forages, straw moved to safety
AGRICULTURE	24 hrs	10	Agricultural implements and equipment removed
	48 hrs	30	Nurseries, seed beds saved, 50% of crop harvested, agricultural implements and equipment removed
	Up to 7 days	70	Nurseries, seed beds saved, fruit trees harvested, 100% of crop harvested, agricultural implements and equipment removed
FISHERIES	24 hrs	30	Some fish, shrimps, prawns harvested
	48 hrs	40	Some fish, shrimps, prawns harvested, nets erected
	Up to 7 days	70	All fish, shrimps, prawns harvested, nets erected, equipment removed
OPEN SEA FISHING	24 hrs	10	Fishing net, boat damage avoided
	48 hrs	15	Fishing nets removed, boat damage avoided
SCHOOL OR OFFICE	24 hrs	5	Money, some office equipment saved
	48 hrs	10	Money, most office equipment saved
	Up to 7 days	15	Money, all office equipment, including furniture protected

The case study of Cyclone Evan, December 2012, in Samoa demonstrates the ideal level of detail in cost-benefit calculations possible due to data availability. Cyclone Evan hit Samoa in December 2012 and caused immense damage and significant losses. The value of durable physical assets across all economic and social sectors destroyed by Evan (referred to as damage) is estimated at SAT 235.7 million, equivalent to US$103.3 million. In addition, production losses and higher production costs arising from the disaster across all sectors (referred to as losses) are estimated at SAT 229.4 million, or US$100.6 million. Thus the total effects of the disaster amount to SAT 465 million, or US$203.9 million (PDNA, 2012)

CASE STUDIES ON COST-BENEFITS OF EWS- CYCLONE EVAN, DECEMBER, 2012

Case studies are drawn, based on the methodology described, to illustrate the benefits of EWS considering investments with respect to economy of scale, enhancing basic services, enhancing efficiency of EWS through institutional and community involvement, and incorporating emerging technologies, as outlined below.

- *Economy of Scale:* What is the economy of scale, i.e., the threshold at which an early warning system can be justified as economical, with benefits outweighing the initial establishment and subsequent operational costs? Further, how much would such threshold be lowered by integrating more common, but low-impact events within such an early warning system?
- *Benefits of enhancing basic meteorological services:* Samoa meteorological services (SMS) have the infrastructure and technical and human resources to provide basic or first order services to stakeholders. These services are appreciated by stakeholders and, hence, supported by national budgets. Some additional marginal investments could enable SMS to provide special (or value-added) services, such as long-lead climate forecasts, location-specific forecasts, or inputs for detailed potential impact assessments, resulting in greater benefits. Would the benefits be sufficient to convince national governments to provide these additional budgets to SMS?
- *Institutional and community involvement:* While scientific and technical investment is vital, marginal investment on ensuring institutional and community involvement in early warning will go a long way in ensuring further saving of lives and property, and thus in economic benefits. While there is no doubt that this societal investment has direct economic benefits, the linkages can be detailed and the tangible benefits elaborated further.
- *Emerging and new technologies:* Even in relatively advanced systems, incorporation of emerging technologies, with minimal investment that enables systems to use the latest advances in science, can result in maximizing benefits manifold. What are the new technologies and what are the benefits that can accrue to society due to them?

On 13 December 2012, Cyclone Evan struck Samoa with sustained winds up to 185 kilometers per hour, with gust up to 230 kilometers per hour causing widespread damage in the capital, Apia and was considered to be the worst tropical cyclone to affect Samoa, since Cyclone Val in 1991 and Cyclone Ofa in 1990. The storm made landfall as a Category 1 storm before intensifying to Category 3. The cyclone passed over Samoa for two days before moving on accompanied by surges of up to 4.5 meters in some areas, flooding low-lying areas and causing extensive physical destruction. High winds and floods also caused damage to housing, roads and other infrastructure. Electricity and communication were knocked down; roads became impassable due to flood water and fallen trees. The worst affected areas were those on the coasts and near river banks.

Cyclone Evan hit Samoa and caused immense damage and significant losses. Though the impacts of Cyclone Evan were felt widely across the country, they were most severe in districts situated in the path of the cyclone, affecting livelihoods, access to civic amenities and social services. Upolu Island sustained the major impact of Cyclone Evan with the districts of Vaimauga West, Lefaga, Safata and Siumu/Falealili being severely hit. At least six people were dead and more than 7500 people were temporarily displaced. The value of durable physical assets across all economic and social sectors destroyed by Evan (referred to as damage) is estimated at SAT 235.7 million, equivalent to US$103.3 million. In addition, production losses and higher production costs arising from the disaster across all

sectors (referred to as losses) are estimated at SAT 229.4 million, or US$100.6 million. Thus, the total effects of the disaster amount to SAT 465 million, or US$203.9 million (Table 2).

TABLE 2: SUMMARY OF DAMAGE AND LOSS CAUSED BY CYCLONE EVAN IN SAMOA (THOUSAND SAT) (SOURCES: PDNA, 2012)

	Disaster effects			Ownership by sector	
	Damage	Losses	Total	Public	Private
Productive sectors	**56,979.0**	**106,748.6**	**163,727.6**	**367.5**	**163,360.1**
Agriculture	4,905.0	58,060.5	62,965.5	275.0	62,690.5
Livestock	3,450.0	800.0	4,250.0	66.0	4,184.0
Fishery	2,069.0	5,493.0	7,562.0	25.0	7,537.0
Manufacturing	17,250.0	4,595.7	21,845.7	0.0	21,845.7
Commerce	1,605.0	15,589.9	17,194.9	0.0	17,194.9
Tourism	27,700.0	22,209.5	49,909.5	1.5	49,908.0
Social sectors	**49,182.3**	**7,587.5**	**56,769.7**	**13,462.5**	**43,307.2**
Education	7,222.1	628.0	7,850.1	6,733.9	1,116.2
Health	3,608.9	1,956.2	5,565.1	5,125.7	439.4
Housing	38,351.3	5,003.3	43,354.5	1,602.9	41,751.6
Infrastructure	**113,313.2**	**58,687.4**	**172,000.6**	**168,987.6**	**3,013.0**
Electricity	39,089.3	31,884.4	70,973.7	70,973.7	0.0
Water and sanitation	8,836.3	3,845.0	12,681.3	12,681.3	0.0
Transport	65,387.6	22,958.0	88,345.6	85,332.6	3,013.0
Cross-sectoral	**16,251.0**	**56,398.0**	**72,649.0**	**72,649.0**	**0.0**
Environment	16,251.0	56,398.0	72,649.0	72,649.0	0.0
Total	**235,725.5**	**229,421.4**	**465,146.9**	**255,466.6**	**209,680.3**

Source: Estimations by assessment team on the basis of official information.

Possible early warning

An advanced numerical weather prediction (NWP) technique, such as Weather Research Forecasting (WRF), in conjunction with a high performance computing system and trained human resource, would be in a position to provide enhanced lead times of both landfall point and cyclone track beyond 5 days. Also, associated hazard parameters, such heavy rainfall and strong wind over specific locations at a very high resolution (up to 3 km or even 1 km grid), may be quantified.

Cost-benefit analysis

The cost-benefit model was developed using excellent and readily available data from the study entitled 'SAMOA Post-disaster Needs Assessment Cyclone Evan 2012' based on field experiences.

Table 3 lists the EWS costs calculated under one-off (fixed) costs, and variable costs that occur on a regular basis.

Table 4 lists the qualitative impacts, i.e., the current scenario without this additional EWS when compared to the scenario with the additional EWS, to describe all changes that would take place as a result of the EWS. Impacts were analyzed under natural, physical, economic, human, and social categories.

Table 55 lists the benefits assessed for quantifiable areas and, for each quantifiable benefit, the calculated change in impact.

TABLE 3: EWS COSTS FOR SAMOA EVAN CYCLONE

ITEM	FIXED COSTS (MILLION USD)	YEARLY VARIABLE COSTS (MILLION USD)	OTHER COSTS (MILLION USD)
Scientific component[3]			
EWS technology development costs	1.0	-	-
High performance computing system	1.0	0.10	-
Additional training for human resources to generate forecast information	0.1	0.01	-
Institutional component[4]			
Capacity building of national and sub-national (district) institutions for translation, interpretation and communication of probabilistic forecast information	-	0.20	-
Community component[5]			
Training of Trainers at local levels to work with ground level users – farmers, fishermen, small businesses, households	-	0.10	-
Total (million USD)	2.1	0.41	-

[3] Scientific component costs refer to input costs for technical institutions to generate forecast information

[4] Institutional component costs refer to costs for training and other capacity development for institutions to be able to use forecast information and facilitate use at lower levels

[5] Community component refers to the input costs at community level to enable communities to adopt forecast information, and respond appropriately

EWS costs for 10 years

Fixed costs remain @ USD 2.1 million:	USD 2.1 million
Variable costs @ 0.41 million per year for 10 years:	USD 4.1 million
Total costs for 10 years	USD 6.2 million
Total costs for 10 years (cyclone only) (C):	USD 3.1 million

(This investment has multiple uses. In addition to cyclone forecast improvement, it can also be used for heavy rainfall, thunderstorm and flash flood forecasting. Hence a proportion (50%) of the total costs is considered.)

TABLE 4: IDENTIFYING EWS BENEFITSFOR SAMOA CYCLONE EVAN

TYPE OF IMPACT	WITHOUT EWS	WITH EWS	INCLUDED IN ANALYSIS
Natural	Damage to coastal forests, ecosystems	Damage to coastal forests, ecosystems	No
Physical & Economic	Housing damaged; household possessions lost	Housing damage avoided in some cases (damage due to fallen trees reduced in 10% of partially damaged houses by maintenance of trees), and many or most household possessions saved depending on lead time	Yes. Household possessions taken as 5% of housing damages is considered as avoidable
	Agriculture: crops damaged; implements and equipment damaged or lost	Agriculture: damage to crops avoided, where applicable, by early harvesting; agricultural implements and equipment saved	Yes
	Fishery: Fish, fisheries Division infrastructure; nets and other fishing equipment damaged	Fishery: Fish harvested; nets erected; equipment removed (70% reduction in damages)	Yes
	Livestock: most poultry, farm animals, forages, and straw damaged or lost	Livestock: all poultry, farm animals, forages, and straw moved to safety (45% reduction in damage)	Yes
	Offices and schools: cash lost; equipment and furniture damaged	Offices and schools: cash saved; equipment and furniture protected (15% reduction in damages)	Yes
Human	Several lives lost	Many lives lost	No
	Several injuries sustained	Many injuries avoided	No

	Several affected people exposed to various illnesses as a result of inadequate or no preparedness	Many illnesses avoided as a result of increased preparedness measures	No
Social	Trauma, suffering among affected and their relatives	Reduced trauma and suffering among affected and their relatives due to anticipation and preparedness	No

TABLE 5: QUANTIFYING EWS BENEFITS FOR SAMOA CYCLONE EVAN

IMPACT	MAGNITUDE WITHOUT EWS	MAGNITUDE WITH EWS	VALUE	TOTAL YEARLY BENEFIT (AVOIDED COST)
Agriculture	Fruit trees (banana, breadfruit, mango, rambutan, citrus, and avocado) damaged Total damage of SAT 390,000	Damage of at least 10%, avoided by early harvesting	10% of SAT 390,000= SAT 39000	SAT 0.04 million
	Buildings, machinery, and equipment used for agricultural production were damaged. Total damage was SAT 4.05 million	At least 70% machinery and equipment could be saved preventing exposure.	70% of SAT 4.05 million= SAT 2.835 million	SAT 2.84 million
	Agricultural inputs, such as fertilizers, seeds, and agricultural chemicals, have been lost (cost estimated at SAT 0.2 million).	Damage of at least 80% avoided by shifting safer place or preventing exposure.	80% of SAT 0.2 million= SAT 0.16 million	SAT 0.16 million
Livestock	Death of livestock such as cattle, pigs, and poultry (cost estimated at SAT 0.69 million)	50% damages could have been avoided.	50% of SAT 0.69 million= SAT 0..345 million	SAT 0.35 million
	Damages to	At least 40% of the	40% of SAT	SAT 1.10 million

IMPACT	MAGNITUDE WITHOUT EWS	MAGNITUDE WITH EWS	VALUE	TOTAL YEARLY BENEFIT (AVOIDED COST)
	infrastructure and equipment (cost estimated at SAT 2.76 million)	damage could be avoided.	2.76 million= SAT 1.10 million	
Manufacturing	Damages to premises, equipment and machinery, stock of raw materials for processing or sale, and stocks of finished goods (cost estimated at 17.25 million)	25% damages could have been avoided.	25% of SAT 17.25 million= SAT 4.31 million	SAT 4.31 million
Tourism	Damages to property, assets and services (cost estimated at 27.7 million)	At least 10% of the damage could have been avoided shifting assets.	25% of SAT 27.7 million= SAT 6.93 million	SAT 6.93 million
Schools	Damages to infrastructure, furniture, equipment, and education materials (cost estimated at 7.2 million)	15% of damages could have been avoided	15% of SAT 7.2 million= SAT 1.08 million	SAT 1.08 million
Housing	1835 houses partially damaged	10% of damages could have been avoided	Repairs @ SAT 2725	SAT 0.5 million
Household possessions	Possessions in most houses damaged are lost. Total housing damage is SAT 38.35 million. Possessions damaged are 5% of this amount.	Possessions saved in additional 10% of the cases.	Total possessions damaged is 5% of SAT 38.35 million = SAT 1.92 million Additional 10% saved with EWS	SAT 1.92 million
Total				SAT 19.23 million *(USD 8.43 million)*

Total benefit considering probabilistic forecasting (90%): 8.43 x 0.8 USD 6.74 million

Cost-benefit analysis for 10 years

Total costs for 10 years (C): USD 3.10 million

Total benefits for 10 years, assuming 2 instances of

such damages over 10 years: 6.74 x 2 USD 13.48 million

Total benefit = 126.62 = **4.35**

Total costs 3.10

In other words, for every USD 1 invested in this EWS, there is a return of USD 4.35 in benefits.

ANNEX 5: GOVERNMENT PRIORITIES UNDER THE LDCFPROJECT

In general, this is a very ambitious plan which directly reflected from the PDNA. Unlike other countries, Government always goes with their priorities! But for designing a project, a detail feasibility studies (FS) required - detailed planning and design, construction and O&M routines would follow the strategies, plans, methods, guidelines and FS level of design. Though there was no consideration of climate change in this plan. Incorporation of climate resilient design standard and hazard of concern should be taken into consideration. I didn't comments on the cost as it came mostly again from the PDNA estimation (as well, I don't know the local cost), detail cost estimation may also require before project design. Based on the current data, my suggestions would be:

PROCUREMENT PLAN		TECHNICALLY ASPECT OF THE PROJECT	NECESSARY ASSESSMENTS REQUIRED	APPROPRIATE FOR LDCF	COST ESTIMATE (WST)
PROJECT - ROCKWALL					
1	Vaisigano Rockwall Project Design*	Using rock is better than concrete. Technically sound but continued investment in maintenance is required, especially after storm events	The Vaisigano river is complex river system in Samoa and flooded frequently. Its carries lot of fine sediments (non cohesive silty sand). Thus the river bed movement, sediment budger and shoreline evaluation of this river is essential to understand to define revetment work, channel improvement and bank stabilization etc. The model case for Mississippi river could be follow in this case. Though WR of MNRE has	Rock walls placed along vulnerable shorelines can provide protection against storm surges and coastal flooding. Climate change need to consider for design to justify LDCF.	$ 1,000,000.00
2	Vaisigano Rockwall Project Construction Phase 1 (Vaisigano Bridge - Leone Bridge)				$ 2,397,807.50
3	Vaisigano Rockwall Project Construction Phase 2 (Leone Bridge - Lelata Bridge)				$ 2,488,508.00
3	Vaisigano Rockwall Project Construction Phase 3 (Lelata Bridge -West River - Lelata Waterfall)				$ 2,002,748.00
4	Vaisigano Rockwall Project Construction Phase 4 (East River Branches to Lelata Waterfall)				$ 2,069,540.00

PROCUREMENT PLAN		TECHNICALLY ASPECT OF THE PROJECT	NECESSARY ASSESSMENTS REQUIRED	APPROPRIATE FOR LDCF	COST ESTIMATE (WST)
	Fagalii, Solosolo & Luatuanuu Design & Supervision		HEC-RAS model but this model is 1D model but which is not be adequate to provide the diversified analytical tools for river morphological computations that is essential to devise RTW and crossing structures in integration for sustainable river engineering solutions. A 2D model (i.e. MIKE-21 C; Delf-3D) is required for fully hydraulic study together with morphological changes. For doing only a detail hydraulic study $1M is not sufficient. The existing HEC-RAS modelling can be continued to be applied for one dimensional averaged hydraulic parameters of water way crossing structures like bridges, culverts hydraulics, but would A detail study is required to define strategy, type of protection works required. The SIA need to conduct after the hydraulic study.		$ 200,000.00

PROCUREMENT PLAN		TECHNICALLY ASPECT OF THE PROJECT	NECESSARY ASSESSMENTS REQUIRED	APPROPRIATE FOR LDCF	COST ESTIMATE (WST)
			As one of the objective of the rock wall would be scenic view and recreation, advection / dispersion and/or water quality need to consider while doing the hydraulic modelling.		
PROJECT - BRIDGE CONSTRUCTION					
	Fagalii Central Bridge Construction	These activities need to cross check with the Master Plan of the Government and how much it requires if the relocation/resettlement activities implement. Major damages of the bridges are scouring and deposition. In order to sustain cultural and economic developments along a river, it is essential for LTE to identify total sediment transport. These can be applied to the solution of engineering and environmental problems associated with natural and human activities.	If just replacement or retrofitting activities consider, a detail NWP modelling together with scale modelling is essential to define the climate proof infrastructure. Its recommended not to re-build conventional bridge rather consider climate proof extra dose bridge. We need to understand the peak discharge is not design discharge. Several discharge levels be evaluated to ensure that the design is adequate for all discharge conditions up to that selected as the design discharge for structures associated with the riprap	Raising and strengthening bridges can assist in maintaining access for evacuation and passage of emergency services. High capital investment and continued maintenance are required.	$ 400,000.00
	Luatuanuu West Bridge Construction				$ 400,000.00
	Solosolo West Bridge Construction				$ 300,000.00
	Ti'avea Bridge Design & Supervision				$ 500,000.00
	Ti'avea Bridge Construction				$ 2,500,000.00
	Sopo'aga Bridge Design &				$

PROCUREMENT PLAN		TECHNICALLY ASPECT OF THE PROJECT	NECESSARY ASSESSMENTS REQUIRED	APPROPRIATE FOR LDCF	COST ESTIMATE (WST)
	Supervision		scheme.		500,000.00
	Sopo'aga Bridge Construction				$ 4,000,000.00
	Lauli'I West Bridge Repair Works				$ 100,000.00
PROJECT - ROAD CONSTRUCTION					
	East Coast Road Package 1	Improved road connectivity will assist community to facilitate their access to better services.	As roads are 60-70% damages during cyclone Evan. It is essential to conduct a basin model to re-define design discharge level and drainage requirements. Roads that benefit the highest number of people connect markets and remote villages need to provide high priority.	The roads need to comply with either climate smart/proof standards.	$ 1,732,425.00
	East Coast Road Package 2				$ 1,732,425.00
	East Coast Road Package 3				$ 1,732,425.00
	East Coast Road Package 4				$ 1,732,425.00
	Sopoaga Road				$ 816,753.00

ANNEX 6: SAMOA RECOVERY AND RECONSTRUCTION WORKPLAN 2013-2015

See attached spreadsheet

ANNEX 7: TERMS OF REFERENCE FOR TEAM MEMBERS

See attached document

ANNEX 8: LIST OF PHYSICAL AND SOCIO-ECONOMIC DATA REQUIREMENTS

See attached document

http://www.adaptasiapacific.org

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Number of Activities	Activity:	Area	Lead Agency	Outputs	Outcomes	Approx. Budget	Baseline	Indicator	Beneficiary	Business as usual	Sustainability	Reliability	Risk & Assumptions	CCA
"RIDGE-TO-REEF" INTEGRATED WATERSHED MANAGEMENT PLAN FOR GREATER APIA														
1	**Develop IWMP for the Greater Apia area**	Water resources Management	MNRE	An integrated water management plan for the 5 catchments in the Apia area focused on vulnerability and adaptation of climate change	The IWMP plan able to address vulnerability assessment and adaptation planning addresses ridge to reef overall systems i.e.: environment, (river systems) infrastructure, (protection systems) natural, (watershed and ecosystem), institutional (policy, legislation and economic (cost/benefit) from the whole catchments.	USD 200,000	Samoa Flood Management Action Plan, Watershed Management Plan, Water Policy, sectoral plans, coastal management (CIM Plan)	Five major indicators- environment, (river systems) infrastructure, (protection systems) natural, (watershed and ecosystem), institutional (policy, legislation and economic(cost/benefit)) from all five catchments.	National Stakeholders	Neither environmentally sustainable, nor is it sustainable in financial and social terms. There is no direct linkage among all existing plans.	Proper application and regular monitoring and upgradation of the plan. A 5 year cycle has been proposed.	NA	Integration of interagency plan and prioritize activities.	IWMP will design based on future climate change scenarios.
2	**Design flood protection measures (feasibility study, climate resilient design, cost-benefit, EIA, SIA, etc.)**	Water resources Management	MNRE	A framework of steps needed for the design of flood protection measures, including: i) feasibility study; ii) climate-resilient/"building-back-better" design; iii) environmental and social impact assessments & (iv) Cost-benefit analysis.	(1) Standard guidelines for creating a supportive environment, institutional structure to implement IWMP. (2) Standard factors and criteria for feasibility study, climate resilience design, environment and social impact assessment.	USD 1,000,000	Samoa Flood Management Action Plan, Watershed Management Plan, Water Policy, sectoral plans, coastal management (CIM Plan)	All constructions follows standard climate proof design	National Stakeholders	The Government of Samoa has implemented several flood mitigation measures through different projects and programs with the support of SOPEC, EU and AUSAID but still there is a lack of capacity on integrated flood management, land use zoning on flood risk, flood forecasting and early warning systems.	Strict regulation on design standards.	NA	Integration of interagency plan and prioritize activities.	Flood protection design will be based on future climate change scenarios.
HARD MEASURES FOR PROTECTION OF COMMUNITY ASSESTS														
3	**Build flood protection infrastructure along Vaisigano River**	Water resources Management	LTA	Construction of 900 m length of embankments on each side of the river between Vaisigano and Leone bridges.	100-year return period flood embankment constructed and used for multiple purposes.	USD 3,500,000		% of communities are well protected and enhance their quality of life	% of communities	There appears to have been much speculation that tidal levels have a significant effect on peak flood water levels in the lower Vaisigano River. The highest recorded tide level in Apia Harbor in the past 15 years was approximately 1.67 m above mean sea level.	Regular maintained of infrastructures.	Could be replicate to other river basin as well.	Cost benefits and return period consideration for constructions.	The design need to follow climate smart design and will able to protect any future extreme events.
4	**Reconstruct community assets following "building-back-better" approaches**	Infrastructure	MWTI	50 houses for Cyclone Evan- affected area; 30 houses to provide models for building back better to relocate households from Sogi to Nuu-Falelauniu with sanitation facilities	Demonstration of building back better approach to enhance community resilience	USD 3,400,000		% of communities are well protected and enhance their quality of life	% of communities	No standard regulation for design building back better. Under the Cyclone Shelter project, UNDP has come up with a climate proof housing design which is currently in the process of approved by the Government as standard.	Standard design will ensure the strength of the infrastructures and save community in extreme events.	All the country should follow one standard.	Retrofication of old houses and promoting new regulations.	Will enhance community safety and assets in any natural events.
5	**Improved sanitation coverage to Cyclone Evan affected area**	Sanitation	PUMA	# of sanitation facilities constructed; Community management of sanitation facilities is improved; trained staff to maintain sanitation facilities regularly; Subsidized support to communities without septic tank systems for low income households in reticulated water supply area	# of communities with a WatSan committee established; Community management of sanitation facilities is improved; Improved access to and use of sustainable sanitation; % of people in the target communities using latrines on a daily basis; % of latrines managed by local WatSan committees facilities among targeted communities; # of community WatSan committees with technicians trained to perform basic maintenance sanitation facilities	Per household cost USD1500 (materials cost only)	JICA-supported ADB projects cover 400 vulnerable communities with improved access to and use of sustainable sanitation facilities	# of fully functioning household latrines constructed	% of households	Increased health and hygiene diseases in the community. According to Framework of Action (2012-2016), Water for Life has described current access to improved sanitation coverage is 87% of the total population. But in reality the number is perhaps less and community has less capacity to conduct proper maintenance regularly.	Undertaking community-based training to maintain the sanitation facilities will ensure the access to improve sanitation facilities. At the same time it will reduce diseases, and provide other social value to ensure sustainability.	This project may not able to meet the overall country demand. Other donors or community initiatives could follow the same principles.	Communities may be totally dependent on Government. Public-private partnerships may need to be introduced in future.	This project will enhance the quality of life, especially for women and children.
6	**Access to safe drinking water, rural water treatment plants, and new pipe networks**	Water supply	WRD/WSS sector, , Private sector, SWA	(1) # of water treatment plants constructed (slow sand filter); community-based committee established to maintain and improve the water treatment plant. (2) Alaoa Water Treatment Plant - Flood Protection Works- Bundwall 130m long and 11m wide, 75m long 16m wide floodway/channel to control flood flow behind primary treatment area and 174m long 23m wide floodway to control flood flow between primary treatment and secondary treatment areas, 5 cell reinforced concrete box culvert and causeway	(1) # of households having access to safe drinking water; # of communities with WatSan committees established; Community management of water supply facilities improved. (2) WTP secure from 1 in 100-year flood event	(1) Per unit cost USD 6000 (material cost); (2) USD 1.5 M	Currently 97.3% population has access to improved drinking water (Framework of Action 2012-2016, p 21). 80% of population are supported by Samoa Water Authority (SWA) and 20% is community driven. The Australian Government has supported the most feasible options to set up cost-effective community-based water treatment plants, and the government is also supporting this initiatives.	(1) # of community has full access to safe drinking water; (2) Approximately 16,000 persons (50% female) and 450 commercial / institutional properties will benefit	% of households, Institutions	According to WSS, 17% of the total population lacks safe drinking water mostly in the rural areas. This increases the number of water-borne diseases. According to MoH (2011) 46% suffer diarrheal disease, and most cases involve children under 5 years old. Most cases also occur in the wet season.	Community-driven maintenance and increased quality of life will ensure the sustainability of the plant.	This may need to cover the whole 17% of the population that is affected. Other co-financing should replicate efforts of the same standards.	Communities must be encouraged to establish a maintenance fund for regular monitoring and testing of water quality.	This will enhance the quality of life during extreme weather events as well as reduce water-related diseases for populations

Number of Activities	Activity:	Area	Lead Agency	Outputs	Outcomes	Approx. Budget	Baseline	Indicator	Beneficiary	Business as usual	Sustainability	Reliability	Risk & Assumptions	CCA
7	**Drainage improvements and flood control works in Greater Apia**	Water resources management	LTA	Construct approx 3555 m of drainage/channel improvements in Sopoaga Road to increase flood control.	Improve flood control and the environment for quality of life.	USD1,000,000	Integrated Apia Master Plan for Water Supply, Sanitation & Drainage has defined the design standard which could be followed in this case.	Improve natural drainage and reduce floods and/or the impact of floods in the selected municipalities.	Community	Communities experience severe flood impacts		This work could be replicated according the priorities of the master plan	Ensure environmental awareness has increased and the health and safety of both the residents and the travelling public have improved	Enhance communities' access to better road networks and safety.
SOFT MEASURES FOR PROTECTION OF COMMUNITY ASSESTS														
8	**Implement ecosystem-based approaches to watershed management and flood mitigation**	Water resources Management	MNRE	(1) Development of flood forecasting techniques for all 5 river basins in Greater Apia; (2) Generation of medium- and long-range weather/climate predictions; (3) Improved interpretation and communication for sectoral decision making; (4) Development of storm surge model with coastal inundation capacity; Capacity building of the Met office to operationalize the coastal inundation forecasting models.	(1) Advance and accurate operational flood forecasting system is in place to provide warnings to communities; (2) Strategic and planning decisions for disaster risk and climate change adaptation; (3) of communities able to receive coastal inundation warning information well enough in advance to take appropriate actions.	USD1,000,000	MNRE should provide timely and reliable flood warning and flood forecasting information for proper community response. The Water Resources Division needs to implement a fully distributed flood forecasting model for the Vaisigano River basin.	Reliability of information. Coverage, dissemination and emergency response.	% of communities	Flood forecasting and warning is a prerequisite for successful mitigation of flood damage. Its effectiveness depends on the level of preparedness and correct response.	Capacity building on warning products understanding and response in appropriate time.	This program could apply all the hazard prone river basin and coastal areas.	Interpretation and reliability of forecasts.	
9	**Ensure climate smart building codes**	Water resources Management	MWTI	(1) Finalization of revised building codes; (2) Training on revised building codes for community application; (3) Equipment to test the structure quality for appropriate assessment; (4) In-house experts to review design (i.e. steel design experts).	All sectors follow building codes. PUMA ensure and train local community/masons on the new design and practice. The revised building codes approved by highest authority.	Finalization of building code $50,000; Training to communities $100,000; Equipment and vehicles $100,000	UN-Habitat has created a working group and provided technical experts to draft the revision and incorporate new components on climate proofing, disability, environment, etc.	The committee meets regularly to finalize the revision. % of houses approved under new building codes	% of communities	Damage of houses, increased deaths	Regular capacity building of the community is essential to ensure the application of building codes.	Promote building codes though grants, soft loans and other packages to encourage the community as well as implementing strict regulations.	Capacity building of the community as well as trained and skilled staff to design reviews at MWTI	Climate-smart infrastructure for community resiliencies
10	**Establish climate forum**	Water resources Management	MNRE, Met	Establish dialogue process between forecast providers and users.	• Ensure that forecasts/warning information products, including their uncertainties and limitations, are communicated to and understood by users; • Encourage the use of forecasts to mitigate risks in climate-sensitive sectors, including, but not limited to agriculture, water resources, disaster management, and health; • Receive user feedback for improving usability of forecast products; • Provide a platform for inter-agency coordination of policies, and sectoral plans and programs for dealing with potential impacts of hydro-meteorological hazards; • Provide a platform for long-term process of understanding risks posed/opportunities brought about by past, current, and future climate;	USD 200,000 (workshop @ 100,000; product development @ 100,000)	There has been no intervention to ensure that forecasts/warning information products, including their uncertainties and limitations, are communicated to and understood by users	# institutes participating regularly and providing feedback	communities	Climate information not understood and utilized by sectors. High exposure to climate risk.	Through interaction and capacity building of community.	Replicate the program using climate field schools so that community members receive some formal education on climate variability and climate change and are able to make their decision calendars.	Understanding and application of climate forecast information.	Sectors fully aware of climate risk and take appropriate sectoral adaptation
11	**TA to assistance on 4 hydropower risk assessments**	Water resources Management	EPC, MWR	Assessment of hydropower for future extreme events	all 4 hydropower plants are fully assessed for retrofication for climate proofing	USD 200,000	ADB has provided grants for the reconstruction of two hydropower plants damaged by Cyclone Evan. The new design standard will include future extreme events protection. The same guidelines could be followed to asses the existing four hydropower plants and find co-financing for retrofication.	4 hydropower plants fully assessed for future extreme events risk	communities	Damage to hydropower plants greatly affects human life, and reconstruction within a short time is difficult. Understanding the risk and mitigation is essential.	Through assessment and co-financing mechanisms, the existing hydropower lifetime could be enhanced.		Consider design standard and return period for cost estimation	Enhance community resilience
12	**Renewable energy, enhanced climate resilience and the potential for building sustainable economic opportunities**	Energy	Renewable Energy Division	Methodically testing and cataloguing the biogas potential of a wide range of possible feedstocks that can be used in biodigesters to produce biogas, also for commercial scale operations	Renewable energy, enhanced climate resilience and the potential for building sustainable economic opportunity	USD 300,000	In 2012, the British High Commission supported a demonstration project in Piu Village to prove that an invasive vine (merremia) could be used as feedstock to produce biogas that could be used in cooking and lighting for village households	# households using bio gas as a cooking material	communities		community engagement will ensure the biodigester technologies in operation, and in the use of biogas. The biogas can be used as a free cooking fuel resource for the host site and charitable community groups.	Demonstration project in Piu Village to prove that an invasive vine (merremia) could apply for the pilot villages	Capacity building of the community and maintaining a constant supply of biogas	Climate friendly 'natural' gas for the country's energy systems.

SAMOA RECOVERY AND RECONSTRUCTION WORKPLAN 2013-2015

The Recovery Strategic Plan of Action and Work-plan is based on the government of Samoa's Recovery & Reconstruction Framework, March 2013, for the different sectors affected by Cyclone Evan in December 13, 2012. To this end, the Workplan reflects activties planned by each Sector for FY 2013-2014 and medium to long-term recovery/reconstruction for FY 2014-2015.

Principles of the Recovery Framework

The recovery Strategic Plan will be based on relevant good practices experience in disaster management including lessons learnt, particularly from the tsunami recovery. From the government perspective, it will rely considerably on existing resources for programming and integration of recovery initiatives.

The 'Building Back Better' principle is a key guiding principle that seeks to put in place processes and structures which are more resilient to a range of common hazards such as cyclone winds, flooding, earthquakes, landslides, tidal surges and tsunamis. Creating more resilient structures and systems is translated into creating more effective systems which use innovation, best practice, technology and local knowledge to enhance recovery options.

Scope of Recovery: People Centered' and Value For Money (VFM)

Priority recovery activities will be geared towards strengthening the resilience of affected communities and areas for building back better with focus on the most vulnerable elements of society as well as those physically impacted by the cyclone and flooding event. Priority allocation and input flow will be vulnerability as well as damage led. The most vulnerable elements of society will be targeted as well as those physically impacted by the Cyclone and flooding event. Foremost, the recovery scope aims to build a sustainable process through focusing on the most vulnerable and 'Value For Money' (VFM). For example, while external contracts will be considered as essential where there are evident human resources gaps in Ministries, these governmental entities will ensure that is getting value for the funds spent on such contracts.

General Policy: Guidelines for Recovery Interventions

The government's Recovery Framework for Samoa has established a general policy for recovery, which is based on the Cyclone Evan disaster management new paradigm, and on lessons learnt by addressing the following guidelines for intervention: Vulnerability; Inclusive and Informed Decisions; Human Rights & Protection; Common Reporting; Institutional Arrangements; Risk Management; and Monitoring & Evaluation.

SP Code Sector Plan (SP)	Strategy 2013-2015	OUTCOMES	OUTPUTS	INDICATORS	RESPONSIBLE PARTY	Districts/Villages	Target 2013	Target 2014	2014-2015 J	A	S	O	N	D	BUDGET (SAT)	SOURCE OF FUND	RESOURCES REQUIREMENTS
Entity: Samoa Water Authority, STA																	
Sector: WATER SUPPLY AND SANITATION																	
Sector objective: Reliable, clean, affordable water and basic sanitation within the framework of Integrated Water Resources Management, for all people in Samoa to sustain health improvements and alleviate poverty Key WS objective: To increase access and improve provision of reliable, clean and affordable water supplies Specific objective: Linked to Sector Plan Strategy No. 3.3 - To restore and improve water quality / reliability and security of water supply to rural and urban communities Specific targets for 2013-14: See separate columns for persons benefitting and percentage complete in each year Indicators: Restoration of access to clean, reliable and secure water supply																	
Urgent Recovery Works																	
Provision of emergency water supplies throughout affected areas, the complete removal of debris from SWA facilities and clearance of access routes, fencing to secure facilities	To provide the resources - personnel, amenities, transport, communications, plant and equipment to restore water supply to cyclone affected areas as soon as possible	Effective mobilisation of resources to undertake restoration of damaged water supply systems in both urban and rural service areas; access to facilities for normal operations and maintenance; water supply restored to approximately 70,000 people only 12 days after cyclone; secure and safe facilities restricting unauthorised personnel from access	Access routes and facilities cleared of debris and fallen trees etc; 7 generators installed and boreholes operational; works repaired at 13 urban and rural service areas - intakes, networks and WTP facilities - some temporary some permanent; fencing at boreholes and treatment facilities	Water supply to thirteen (13) urban and rural systems restored. Approximately 70,000 severely affected persons and 73,000 partially affected persons benefitted. Between 48% and 50% of these are female - 38% are children less than 15years old, 18% are between 15 and 24 years and 5% are over 65 years old. Seven (7) generators installed benefitting 30,000 persons.	SWA, Private sector, development partners, MOF, MNRE, WSCU, DMO, LTA, MWCSD	Throughout Upolu in all SWA mandated areas	100%								1,658,583	**GOS / SWA**	
Reconstruction Works																	
Tafitoala WTP - upgraded replacement of intake, raw water main, and part treated water main; WTP repairs to chlorination facilities, fencing and buildings; and construction of improved access road and floodway	Return the Tafitoala WTP back to pre-cyclone conditions but incorporating new materials for pipelines to ensure improved resilience to disaster - investigations, detailed design and construction	Restored access to the WTP and delivery of safe water supply to service area communities	New intake facility, upgrade of raw water main and part treated water main, WTP facility, and construction of new access road with floodway / culverts	Approximately 4,000 persons in 5 villages benefit (48% female)	SWA, Private sector, MOF, AusAID, MWCSD, Village Councils, LTA, MOH	Tafitoala to Siumu	60%	40%							1,000,000		
Tiavi intake, raw water pipeline, chlorinator building and distribution main repairs	Liaison with LTA, investigations, detailed design and construction of water supply facility repairs including resilience measures and climate change adaptation considerations	Secure intake facility and distribution pipelines constructed alongside Cross Island Road (CIR) new construction works that includes extensive drainage for severe events	New intake facility at the Tiavi, repairs to raw water main and chlorination facility and reconstruction of 8 drain crossings along CIR	Approximately 2,500 persons in 2 villages benefit (48% female)	SWA, Private sector, MOF, LTA	Cross Island Road and adjacent areas - Tiavi to Siumu	100%								200,000		
Fuluasou Water Treatment Plant - repair of operator house, office block and fences damaged by fallen trees	Return the Fuluasou (JR) WTP back to pre-cyclone conditions	Restoration of secure WTP facility	New operator house, office block and new fencing and gates	Secure facility for SWA and appropriate working / living conditions for site staff	SWA, Private sector, MOF	Fuluasou	100%								140,000		
Malololelei Raw Water Main - upgraded replacement of damaged pipeline temporarily repaired and improved access road	Investigations, secure land, options analysis to ensure value for money, detailed design and construction of new access road and raw water pipeline with improved resilience to be secure for 1 in 100 year flood event	Secure supply of raw water to the WTP	Approximately 400m of new ductile iron main cut into river valley floor and encased in concrete. New access road for construction of works and maintenance	Approximately 4,000 persons in 5 villages benefit (50% female)	SWA, Private sector, MOF, MWCSD, MNRE, land owners, LTA	Total Malololelei service area from Vaoala to Papauta	100%								830,000		
Alaoa Spring Boxes - total reconstruction of spring boxes in river valley and 850m of raw water pipeline	Investigations, detailed design and reconstruction of spring boxes to built back better to withstand 1 in 100 year flood event and pipelines generally outside the valley line for increased resilience and using improved materials	Improved delivery of service to communities and the hospital	Two new spring boxes and 850m of new ductile iron raw water pipeline	Approximately 2,000 persons and Apia main hospital benefit (50% female)	SWA, Private sector, MOF, MNRE, MWCSD, Village Councils, LTA	Southern Apia outskirts adjacent to CIR - Vaillima, Papauta and hospital	50%	50%							770,000		
Alaoa Water Treatment Plant - Replacement of filter sand swept away by cyclone flooding	Continuation of urgent slow sand and rapid sand filter rehabilitation works	WTP operating efficiently within its design capacity. Improved service delivery and water quality	Total renovation of all slow sand and roughing filters	Approximately 16,000 persons (50% female) and 450 commercial / institutional properties will benefit	SWA, Private sector, MOF, MOH, JICA	Alaoa service area - central Apia	100%								300,000		
Alaoa Water Treatment Plant - reconstruction of the operator house, chlorination building and fencing swept away by cyclone flooding and replacement of chlorination	Return the Alaoa WTP back to pre-cyclone conditions but incorporating build back better approach in design and construction methods	Restoration of secure WTP facility providing disinfected water to customers	New operator house, new chlorination building with working equipment and new fencing and gates	Approximately 16,000 persons (50% female) and 450 commercial / institutional properties will benefit	SWA, Private sector, MOF, MOH	Alaoa service area - central Apia	50%	50%							300,000		
Alaoa Transmission Main - replacement of current temporary pipeline and construction of new sub-main for river valley communities	Urgent replacement of temporary transmission main to reduce substantial water losses through improved design, use of resilient materials and construction methods and remove illegal connections by providing new sub-main	24 hour supply to households along the river valley, reduced water losses and costs of production	Approximately 150m of 400 / 450mm dia transmission main and 400m of 50mm sub-main including 30 household connections	Approximately 16,000 persons (50% female) and 450 commercial / institutional properties will benefit together with additional 30 households (210 persons) receiving improved quality water	SWA, Private sector, MOF, MWCSD, Village Councils, MNRE, LTA	Alaoa service area - central Apia	100%								450,000		
Disaster Risk Reduction Works																	
Comprehensive Community Disaster and Climate Risk Management Program (CDCRM) for awareness raising - coordinated approach with MNRE (WRD) concentrating on catchment management, care for water resources and river systems, respect for water supply facilities and wise use of water including monitoring and evaluation of awareness program and DRR interventions.	To prepare and disseminate messages, developed with community groups, at national and community level on approaches to minimise impacts from disasters and climate change and overall care of water resources and systems. Monitoring and Evaluation of program to determine effectiveness of awareness campaigns and progress / effectiveness of DRR interventions.	Watershed catchments and river systems appreciated and cared for by communities so that water resources have best chance possible of being sustainable. Communities use water wisely and appreciate the value of water for life and health.	Integrated National and community coverage of CDCRM program for disaster recovery and climate change resilience in care of watershed catchments, water resources, river systems, water supply facilities and water conservation. National coverage through TV and radio campaigns and talk back shows. Focus group discussions at community / village level.	Nationwide coverage for overall campaign. Approximately 40 villages for community approach addressed to men, women, youth and vulnerable groups. Between 48% and 50% of these are female - 38% are children less than 15years old, 18% are between 15 and 24 years and 5% are over 65 years.	SWA, MNRE (WRD) DMO, MOF, MWCSD, Village Councils, Women's Committees	Overall Samoa and concentrating on priority water supply catchment areas at the community level		100% 10%	Implementation						150,000		
Tafitoala WTP Flood Protection and Channel Diversion Works	Investigations, options analysis to ensure value for money, detailed design and construction of flood protection works including resilience measures and climate change adaptation considerations	WTP secure from 1 in 100 year flood event	135m long rock bundwall around WTP as stabilising structure 150m long and 11m wide floodway diversion channel	Approximately 4,000 persons in 5 villages will benefit (48% female)	SWA, Private sector, MOF, AusAID, MNRE, MWCSD, LTA	Tafitoala to Siumu		5%	Investigation & design						1,150,000		
Alaoa Water Treatment Plant - Flood Protection Works	Investigations, options analysis to ensure value for money, detailed design and construction of flood protection works including resilience measures and climate change adaptation considerations	WTP secure from 1 in 100 year flood event	Bundwall 130m long and 11m wide, 75m long 16m wide floodway/channel to control flood flow behind primary treatment area and 174m long 23m wide floodway to control flood flow between primary treatment and secondary treatment areas, 5cell reinforced concrete box culvert and causeway	Approximately 16,000 persons (50% female) and 450 commercial / institutional properties will benefit	SWA, Private sector, MOF, AusAID, MNRE, MWCSD, LTA	Alaoa service area - central Apia		5%	Investigation & design						3,430,000		
Alaoa Transmission Main - Permanent Realignment	Investigations, options analysis to ensure value for money, secure land, detailed design and build back better construction of relocated main to ensure no further impact by climate change	Secure supply to customers, reduced leakage and chance for illegal connections, disaster risk mitigated	Approximately 2.3km of 300 / 400 / 450mm dia transmission main located away from the river valley subject to erosion to higher stable alignment	Approximately 16,000 persons (50% female) and 450 commercial / institutional properties will benefit	SWA, Private sector, MOF, MNRE, MWCSD, Village Councils, LTA	Alaoa service area - central Apia		5%	Investigations and secure land						3,500,000		

SAMOA RECOVERY AND RECONSTRUCTION WORKPLAN 2013-2015

The Recovery Strategic Plan of Action and Work-plan is based on the government of Samoa's Recovery & Reconstruction Framework, March 2013, for the different sectors affected by Cyclone Evan in December 13, 2012. To this end, the Workplan reflects activties planned by each Sector for FY 2013-2014 and medium to long-term recovery/reconstruction for FY 2014-2015.

Principles of the Recovery Framework
The recovery Strategic Plan will be based on relevant good practices experience in disaster management including lessons learnt, particularly from the tsunami recovery. From the government perspective, it will rely considerably on existing resources for programming and integration of recovery initiatives.

The 'Building Back Better' principle is a key guiding principle that seeks to put in place processes and structures which are more resilient to a range of common hazards such as cyclone winds, flooding, earthquakes, landslides, tidal surges and tsunamis. Creating more resilient structures and systems is translated into creating more effective systems which use innovation, best practice, technology and local knowledge to enhance recovery options.

Scope of Recovery: People Centered' and Value For Money (VFM)
Priority recovery activities will be geared towards strengthening the resilience of affected communities and areas for building back better with focus on the most vulnerable elements of society as well as those physically impacted by the cyclone and flooding event. Priority allocation and input flow will be vulnerability as well as damage led. The most vulnerable elements of society will be targeted as well as those physically impacted by the Cyclone and flooding event. Foremost, the recovery scope aims to build a sustainable process through focusing on the most vulnerable and 'Value For Money' (VFM). For example, while external contracts will be considered as essential where there are evident human resources gaps in Ministries, these governmental entities will ensure that is getting value for the funds spent on such contracts.

General Policy: Guidelines for Recovery Interventions
The government's Recovery Framework for Samoa has established a general policy for recovery, which is based on the Cyclone Evan disaster management new paradigm, and on lessons learnt by addressing the following guidelines for intervention: Vulnerability; Inclusive and Informed Decisions; Human Rights & Protection; Common Reporting; Institutional Arrangements; Risk Management; and Monitoring & Evaluation.

SP Code Sector Plan (SP)	Strategy 2013-2015	OUTCOMES	OUTPUTS	INDICATORS	RESPONSIBLE PARTY	Districts/Villages	Target		2014-2015						BUDGET (SAT)	SOURCE OF FUND	RESOURCES REQUIREMENTS
							2013	2014	J	A	S	O	N	D			
						TOTAL BUDGET						SAT			12,220,000		

Legend

Planned but not executed
Planned and executed
Planned and not yet executed (ongoing)

SAMOA RECOVERY AND RECONSTRUCTION WORKPLAN 2013-2015

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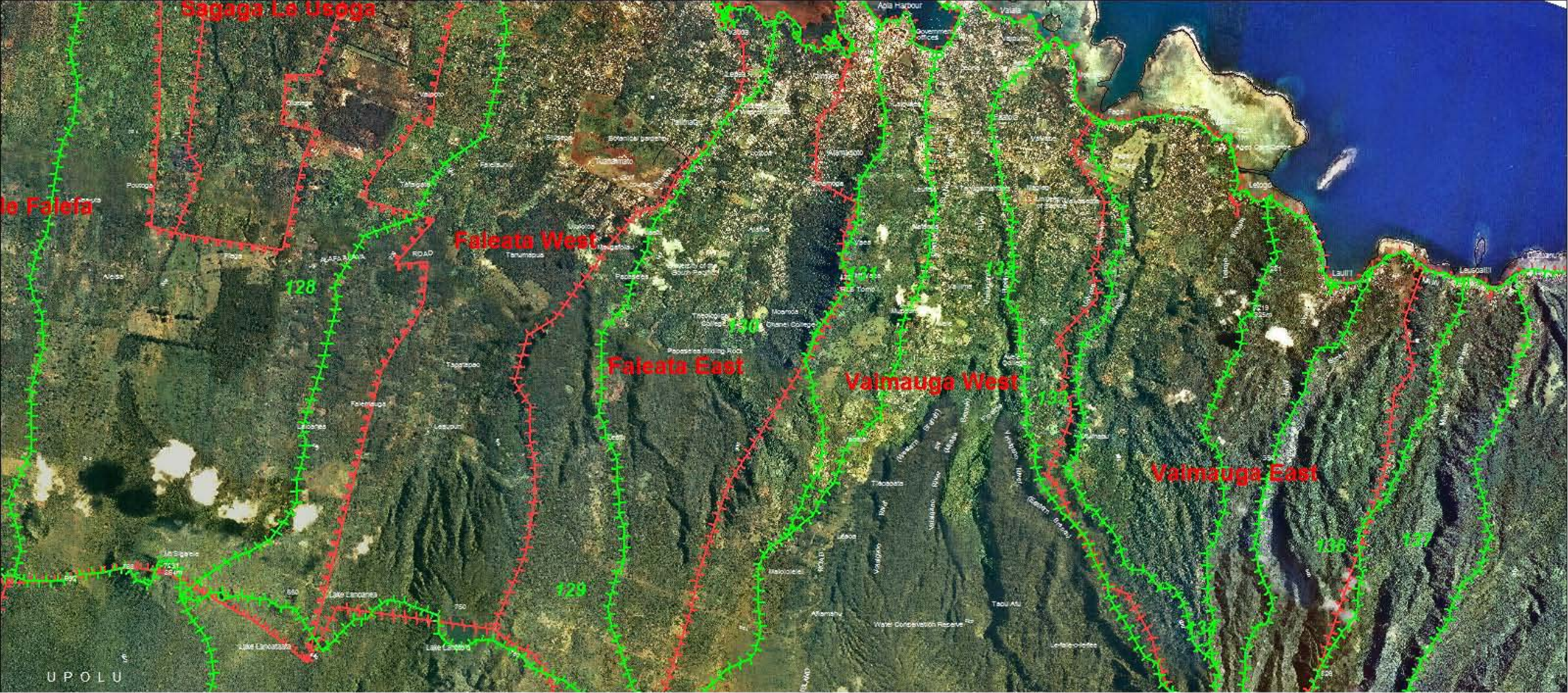
							2013	2014	J	A	S	O	N	D			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ANNEX 8: LIST OF PHYSICAL AND SOCIO-ECONOMIC DATA REQUIREMENTS

Components of the Integrated Watershed Management and Flood Control Plan	Data requirements	Data source	Experts
Physical characterization of the watershed			
a. Geophysical features			
Climate	Climate series	Met division	GIS expert
Geology	Geological maps		Geotechnical engineer/Geologist
Soils	Soil maps		
Hydrology	Runoff data and Hydrological models	Water Resources Division	Hydrologist
Vegetation cover	Forest and vegetation cover	Forestry Division	Environmental Engineer
Water quality	Water quality data	WRD? MOH?	
Protected areas	Map of protected areas	DEC	
b. Socio-economic features			
Population (including location)	Census and location maps		Economist
Land use	land use maps	Land Management Division	Town Planner
Land tenure	land tenure maps	Land Management Division	Community engagement expert
Infrastructure analysis (including location)	infrastructure location maps	PUMA	GIS expert
(c) Water use and pollution			
Water use and pollution	Distribution of water use and potential source of water pollution	Water Resources Division	Engineer
(d) Conduct flood risk assessment			
Rainfall stations	AWS network	Met Division	Hydrologist and/or civil engineer with climate change or flood modeling experience
Gauging stations	Gauging stations network	WRD	
Flood scenarios	Climate change scenarios/Flood modeling	WRD-Met Division	
Identification of risk zones	Risk maps	WRD/PUMA	
Identification of infrastructure at risk	Climate change risk studies	WRD/PUMA/LTA	
Identification of population at risk	Climate change and/or flood risk studies (previous studies)	WRD/PUMA/MWCSD/DMO	
(e) Flood mitigation measures			
a. Possible structural mitigation		WRD/PUMA/MWCS	Civil Engineer

options	Flood risk assessment studies, climate change risk assessment studies, historical flood (water level) data,	D/ DMO	
River banks			
Rockwall			
River channeling			
River diversion			
Retention dams			
Flood storage			
Resilient buildings?			
Reforestation			
Land Use Change			
Sea wall			
Breakwater			
Beach nourishment			
b. Non structural measures			
Flood early warning systems			
Identification of Relocation options			
Flood awareness and preparedness			
(f) Prioritization of flood mitigation options			
Cost benefit analysis	Asset valuation and location map (GIS format), flood models, costing of engineering solutions	WRD/PUMA/MWCSD/ DMO	Civil Engineer with expertise in engineering cost benefit analysis
(g) Engineering design for the prioritized alternatives			
	Data requirement will depend on the type of engineering solution selected through cost benefit analysis	Need to be identified at later stages and will depend on the option selected for implementation	Civil Engineer
(h) Environmental and social impact assessments			
Project specific EIA	Data requirement will depend on the type of engineering solution selected	Need to be identified at later stages and will depend on the option selected for implementation	Environmental engineer or scientist
Community consultation			

ANNEX 7: TERMS OF REFERENCE FOR TEAM MEMBERS

CONSULTING SERVICES FOR DETAILED DESIGN SERVICES UNDER THE INTEGRATED WATER MANAGEMENT PLAN FOR SAMOAN ISLAND

1. BACKGROUND INFORMATION

Samoa is exposed to a number of natural hazards and vulnerable to other extreme climate events. The impacts of climate-related events are felt right across the nation's economic, social and environmental systems, which becomes an issue of great concern. At the same time there is still lack of coordination and integrated planning to address Disaster Risk Reduction (DRR), Climate Change Adaptation (CCA) and infrastructures planning within the institutions. The flood and other hazards warning system still not in advance mode to ensure quick dissemination and response by its community at risk. Thus an Integrated Water Management Plan (IWMP) for greater Apia (major focus on Vaisigano River Basin) has been proposed under this activity.

2. OBJECTIVE

1. The IWMP need to provide a rational management and wise use of Soma's water resources, peoples quality of life improved by the equitable, safe and reliable access to water for production, disaster, health and hygiene and enhance an efficient integration and management of adaptation and DRR/DRM into national development planning and programming.

5. SCOPE

The project needs to hire exact calculated person-months of consulting services for international and national consultants. Consulting services for this assignment will be engaged by an international consulting firm in association with national consulting firm(s) for a total fixed amount of person-months for consulting services (international and national). Project will recruit additional five/six consultants on an individual basis for a total fixed period (international and national). These includes one Hydrologist, Coastal Engineer, Economist, Social Expert and Resettlement Specialist, who will lead the overall assessments and document preparation in close coordination with their national counterparts hired under the firm. Three national consultants will be hired individually, including a Project Management Expert, Development Project Proforma (DPP) Expert, and a Procurement Expert, to guide and assist in smooth and timely PPTA implementation in close coordination with key government stakeholders. The terms of reference (TOR) for the firm's consulting services will include, but not be limited to, the following:

6. DETAILED LIST OF CONSULTANTS

A. Scope of Works for Consulting Services

The Samoan government will recruit a consultant firm to provide the following services for the ensuing project:

(i) Assessment of problems based on: (i) demand projections, future climate change scenarios according to 5th IPCC Assessment Report or CSIRO scenarios for the pacific
(ii) The identification of the policy objectives for water management
(iii) The identification and feasibility assessment of structural and non-structural measures in the context of future climate change.
(iv) The formulation and impact analysis of alternative strategies.
(v) Public consultations to discuss problems, objectives and possible measures or strategies for enhancing the resilience of communities' physical assets and livelihoods across Samoa, to climate change and natural disasters
(vi) The development of the required database and construction of models. This is driven by the policy priorities, problems and identified measures to reduce the different types of floods and coastal inundation.
(vii) The evaluation of alternative strategies for implementation of IWMP.

The Consultants will be engaged under the Project Management Unit (PMU) for a total period of three (3) years or overall project period. The consulting team will be comprised of a team of international and domestic consultants based on fixed time frame. The team will be headed by an international Team Leader supported by a national Deputy Team Leaders and other experts. The consultants will make a monthly presentation on work progress to the Working Group.

B. Inputs

The consultancy team will be responsible to the Project Director in the PMU for efficient and effective delivery of services. The consultants' team will have members based at the PMU and will closely coordinate with PIUs. The consultants will assist the PMU and PIUs in solving specific technical and other project related issues and problems as defined by their TOR. Position and duration of the services for the international and domestic consultants are shown in the table below:

	Person months		
Positions	**International**	**National**	**Number**
Project director			
Hydro-geologist			
Climate Change Adaptation Specialist			
Water Supply Specialist			
Drainage and Flood Control Engineer			
Environmental Engineer			
Economist			
Town planner			
Structural and Design Engineer			
Communication Expert			
Environment Expert			
GIS Expert			
Total			

C. Specific Tasks and Activities for Team Members of DDS Consultancy

1. Project director (Team Leader)

The consultancy team will be headed by a Team Leader (Project director) having a post-graduate degree in Civil Engineering/coastal Engineering or relevant field with over 20 years of experience, of which at least 15 years involved in planning and design of urban/coastal development projects and will have a minimum of 10 years proven work experience and skill in similar position in similar developing countries especially in Pacific Islands. The Team Leader will be familiar with all aspects of the tasks listed in the scope of works and will have overall responsibility for managing the team. He will act as a counterpart to the Project Director. Duties of the Team Leader will include, but not limited to, the following:

- Outlines in as much detail as possible the strategic direction and the actions required to implement the IWMP plan and flood protection measures.
- Identifies potential members relevant to the different phases and/or working committees (i.e., Technical Committee, Working Group) as required throughout the project.
- Engages in providing technical inputs, public awareness and other engagement activities by working closely with the Samoan authorities to best utilize resources and enhance linkages.
- Ensures that the preparation and implementation of the IWMP is done in consultation with local and regional stakeholders.
- Forms working committees, as required, meeting project deliverables. The Steering Committee creates and approves the Terms of Reference for all working committees. (Working committees are formed as required and disbanded once their task is complete.)
- Works closely with the MNRE and MoF to identify priorities in the project and meet other stakeholders accordingly.
- Sets target dates and deliverables for the completion of the IWMP. Reviews materials and provides input within the timelines provided. (Materials include products developed by working committees.)
- Reports on progress to the MNRE.
- Identifies any resource needs and forwards these requests to the MNRE for further action and approval.

2. Climate Change Adaptation Specialist

He/she will have post-graduate degree in Civil/Environmental Engineering, climate science, or related degree with over 8 years of experience, of which at least 5 years involved in planning and design of climate resilient infrastructure projects, preferably in vulnerability and risk assessment and adaptation related projects. Duties of the Climate Change Adaptation Specialist will include, but not limited to, the following:

- Assist the team leader in incorporating climate resilience into the development of IWMP by detailed identification of climate change risks and vulnerability that are relevant to IWMP.
- Incorporate climate resilience into specification for construction work working with engineer team.
- Conduct cost benefit analysis of different climate change adaptation strategies
- Assist the PMU in the selection of eligible subprojects using subproject selection criteria;
- Review recommendations of other experts, and work closely with water supply and drainage engineers and other experts on team including urban planner, etc. to incorporate adaptation into both physical and non-physical design components;

- Work closely with the engineers to identify, quantify, and clearly report the incremental costs of climate adaptation in the project design

3. Water Supply Specialist

He/she will have a post-graduate degree in Hydrology or Civil Engineering with specialization in drinking water supply and source development (ground and surface water) with over 15 years of experience in planning and designing these activities, and a minimum of 10 years proven work experience and skill in similar position in developing countries, and expertise in salinity intrusion. He/she will also work closely and oversee the work of the national water supply and sanitation expert on the team. He/she will be responsible of the following:

- Assist in selection of water supply subprojects following subproject selection guidelines (note: subprojects may include intakes, production wells, treatment plants, overhead tanks, bulk water facilities, distribution pipelines, etc);
- Work closely with climate change specialist to incorporate climate adaptation into water supply designs, with particular focus on salinity intrusion into ground and surface waters;
- Oversee preparation of feasibility study, detailed engineering designs, including specifications, drawings, and detailed cost estimates for water supply components
- Incorporate climate resilience into MNRE's specification for construction work working with engineer team.
- Help in preparation of bidding documents and bill of quantities;
- Conduct physical surveys for identification of subprojects including but not limited to community toilets, location intakes, and all related facilities.
- Calculate the incremental costs of climate adaptation into water supply subprojects;
- Develop mechanism of identification of water supply system leak detection and leak management to prevent water losses;
- Assist Team Leader in engagement of sub-contractor for water supply leak detection survey, supervise their works and report to the Team Leader;
- Any other responsibilities assigned by Team Leader,

4. Drainage and Flood Control Engineer

He/she will have a post-graduate degree in Civil Engineering with specialization in drainage with over 15 years of experience in planning and designing these activities, and a minimum of 6 years proven work experience and skill in similar position in developing countries. He/she will be responsible of the following:

- Work closely with climate change specialist to incorporate climate adaptation into drainage designs;
- Assist the PMU in the selection of eligible subprojects using subproject selection criteria;
- Prepare feasibility study, detailed engineering designs, including specifications, drawings, and detailed cost estimates for drainage and flood control components
- Calculate the incremental costs of climate adaptation into drainage subprojects;
- Incorporate climate resilience into specification for construction work working with engineer team.
- Consults with Hydrologist or flood modeler/system developer to estimate drainage capacity and requirement for the flood and inundation modeling.
- Help in preparation of bidding documents and bill of quantities;
- Conduct physical surveys for identification of subprojects.

- Assist environmental engineer in identifying places for public toilet, wash station, transfer station and sludge disposal to ensure linkage to safe drainage;
- Any other responsibilities assigned by Team Leader and Project Director

5. Hydrologist

He/she will work closely with the Environmental Engineer and Drainage/Flood control Engineer and climate change specialist to undertake planning watershed management and flood forecasting activities. He/she should have at least 12 years of experiences in hydro-geological studies and a post-graduate degree in hydrology, geology, or related field with experience in hydrological modeling and experience in donor funded projects. He/she will be responsible of the following:

- Conduct necessary hydrological modeling, studies and surveys towards planning and design of flood protection measures, flood forecasting and early warning system;
- Will work closely with the international water supply specialist and climate change specialist in planning and executing studies and reporting findings;
- Assess the potential of future inundation scenarios in the river basin.
- Any other responsibilities assigned by Team Leader and Project Director

6. Environmental Engineer

An Environmental Engineer having post-graduate degree in Civil/Environmental Engineering with over 9 years of experience and having 5 years practical experience in planning and designing urban infrastructure. He/she will be responsible of the following:

- Oversee the environmental issues of IWMP, specifically issues related to water quality and waste management.
- Develop improved mechanism and introduce the same to collect, segregate and disposal of solid waste for clean environment and public health;
- Explore and identify alternative sanitation options including decentralized systems compatible with local capacity;
- Identify and assist (working with drainage engineers) in the appropriate location, design, construction and management of transfer stations, pit latrines, public toilet, and wash stations;
- Conduct survey to identify existing equipments and machineries for handling solid waste, determine need for such equipments, prepare procurement plan and assist PMU for timely procurement and distribution;
- Design decentralized sanitation systems and solid waste recycle plants;
- Any other responsibilities assigned to him/her by Team Leader and the Project Director.

7. Structural and Design Engineer

Structural Engineer will have to have a post-graduate degree in civil engineering with over 15 years experience in the field of design of civil works. He/She will help PMU and PIUs in the structural design of civil construction works under guidance and supervision of the Team Leader. His/her tasks include, but not limited to, the following:

- Oversee the design of flood mitigation measures (e.g., sea wall, rock wall, river channeling, beach nourishment, breakwater etc)
- Collect relevant data, information related to structural design of the adopted schemes;

- Undertake feasibility study, detailed design, prepare design reports for the adopted schemes;
- Assist in the preparation of detailed estimate and bill of quantities;
- Check/inspect sites that need special attention;
- Any other responsibility assigned to him by the Team leader and the Project Director.

8. Town planner or Architect

A Town planner or an Architect having a post-graduate degree in Architecture and having 15 years of work experience with 10 years practical experience in preparation of urban planning or architectural plan and design of infrastructure in urban areas will support consultant's team in gathering data of existing land use, preparing layout plans, addressing urban planning issues relevant to IWMP, and design for municipal facilities with particular attention to :

- Transport facilities such as Boat Landing (jetty)
- Associated buildings of subprojects including those for water supply, and community toilets
- Any other responsibilities assigned by Team Leader and Project Director

9. Communication Expert

He/she should have at least 5 years of experience in social communication and safeguards work or social and community development, and a post-graduate degree in social science, anthropology or related fields, with previous experience in donor-funded projects. He/she will be responsible of the following:

- Prepare communication for projects with land acquisition and involuntary resettlement based on detailed designs in accordance with the Resettlement Framework guided by UNDP's Safeguards Policy Statement (2009).
- Work closely with design engineers in preparing Communication plans.
- Undertake necessary census and socioeconomic surveys and data collection, conduct meaningful consultations with project-affected people for drafting the social safeguard documents
- Any other responsibilities assigned by Team Leader and Project Director

10. Environment Expert

He/she should have at least 10 years of experience in environmental safeguards work and have a post-graduate degree in environmental science or environmental engineering, with previous experience in donor-funded projects. He/she will be responsible of the following:

- Prepare environmental assessments including SIA with EMPs for all subprojects based on detailed designs
- Work closely with design engineers in preparing SIA.
- Undertake necessary data collection, conduct meaningful consultations with project-affected people for drafting the environmental safeguard documents
- Submit draft SIA to EA to MNRE for review and clearance prior to bidding.
- Include EMPs into bidding and contract documents.
- Any other responsibilities assigned by Team Leader and Project Director

11. GIS expert

He/she should have at least Master's Degree in Geography (GIS), computers or related field, four years or more of experience in a similar position, proficiency in ArcGIS packages, Microsoft Word, Outlook and PowerPoint in Excel and other MS office applications. In line with guidelines for the preparation of a UNDP-GEF/LDCF compliant project document, the GIS specialist will Work collaboratively within IWMP's GIS unit at Samoa to provide GIS services to all key technical team members. He/she with ensure that all objectives regarding GIS/MIS tools and services are provided on schedule. Map production, satellite image analysis, remote sensing, data basis, NRM and agriculture/irrigation studies and technical support are to be provided throughout the project.

Main tasks will involve:

- Conduct research to locate and obtain existing databases, thematic layers and grid data for relevant areas of Samoa possibly using the sources from met division (e.g., climate series, terrain information etc)
- Source, prepare and structure GIS data in accordance with the requirements, and guidelines defined by other experts in the project (e.g., hydrologist, geotechnical engineer, environmental engineer etc).
- Describe all layer fields in the geodatabase, and characterize metadata for each layer.
- Prepare data dictionaries and illustrate the data structure.
- Digitize/create new thematic layers, using scanned maps, satellite images and GIS data, in accordance with the structure and coding system defined by the GIS Supervisor.
- Georeference scanned maps, and transform them to the datum and projection system used by IWMP (more specifically to UTM 42, WGS 84).
- Produce maps and graphs in accordance with the design and criteria defined by the GIS Supervisor and the various Component Team Leaders, using ArcGIS and Excel.
- Integrate census, socio-economic and biophysical data, as well as all other types of information from available sources of Samoan and enter these data as new attributes to existing layers or as new coverage.
- Maintain the integrity between the various thematic layers, adjusting feature limits in accordance with the layer hierarchy.
- Perform spatial analysis for producing the geographic statistics required by the various Team Leaders.
- Operate and maintain GIS system hardware, software, plotter, digitizer, color printer, and video camera.
- Manage GPS data and digital pictures taken in the field in accordance with the protocol defined by the GIS Supervisor (ex. creation of gpx, kmz and shp files; naming and management of the georeferenced pictures).
- Ensure a daily backup of all data managed by IWMP.
- Perform all other GIS-related activities useful for IWMP;
- Uphold the mission, values, and spirit of IWMP in coordinating the program and in interacting with all community members.
- Follow and enforce all IWMP Codes of Conduct, including but not limited to the Sexual Abuse and Exploitation, Drug and Alcohol Policy and equal employment opportunity policy. Report any violations to appropriate IWMP authority, and participate in preventative initiatives.
- Follow and enforce all IWMP organizational policies, procedures, and guidelines including but not limited to personnel, security, communications, finance, procurement, and logistics. Report any violations to appropriate IWMP authority.
- Actively seek opportunities that will complement ability to fulfill position's responsibilities as well as further professional development, such as taking part in internal and external trainings and participating on relevant advisory boards.

PROJECT NAME: ECONOMY-WIDE INTEGRATION OF CC ADAPTATION AND DRM/DRR TO REDUCE CLIMATE VULNERABILITY OF COMMUNITIES IN SAMOA

TITLE OF THE CONSULTANCY: ENVIRONMENTAL/HUMAN DEVELOPMENT ECONOMIST (UNDP-GEF ADAPTATION PROJECT)

The Agro-Economic Evolution of the Agriculture Sector : A Diagnosis

Table of Contents

Eduardo R. Quiroga
January 28, 2014

Prolegomenon

In the process of doing project preparation for the agriculture and livelihoods component, far too many issues arose either in terms of data reliability or the economic / agriculture trends in which the country was moving. It is important to point that during the scoping working sessions it was generally assumed that there was sufficient information available in several completed and ongoing projects to design the present project. However, as I began delving into the data for the purposes of designing an agriculture and livelihoods component it became evident that the quality of the extant information was mixed. While some data set was adequate, there were shortcomings in those reports related specifically to agriculture. Issues concerning reliability, replicability and transparency arose. Some of these projects are now under review.

If this project had been a standard initiative within the perimeter of a given region, then large issues would have matter less. This, however, is an economy-wide initiative, which is why it was essential to understand the large national issues. An economy-wide approach would be relevant to the prevailing conditions, only to the extent that these core issues are addressed. Therefore, it became essential to conduct a rapid diagnostic exercise of the agricultural sector, despite all of the difficulties associated with data reliability.

This rapid diagnosis is based on Agricultural Census data and a few other available sources. Although all the data series were taken into consideration, the 2009 information took precedence for planning purposes because it is closer to real time. It took painstaking effort to "test" the coherence of the information available.

Hereunder you will find the preliminary findings, conclusions and recommendations from the diagnostic exercise. A summary of the key parameters for the development of certified organic agriculture drawn from the experience of WIBDI is also included. These parameters can only provide a ballpark approximation as the information needs to be refined through surveys and in-depth reviews of issues related to the resilience of agricultural technology to be introduced.

The present set of information is probably sufficient for a joint review to determine what direction this economy-wide approach should consider taking before proceeding with the project preparation. Especially what form should it take the institutional support to the transition from natural-resource-based agriculture into science-based agriculture with special reference to climate resilient agriculture. This appears to be inevitably linked with an agricultural infrastructure.

The Agro-Economic Evolution of the Agriculture Sector : A Diagnosis

Executive Summary

Key Findings

General

Overseas remittances, tourism and external aid are main sources of Samoa's national revenue. The contribution of the agriculture sector (agriculture and fisheries) to the economy has shrunk significantly over the past ten years from 17 % in 1999 to less than 10 % in 2010. The "Agricultural Sector Plan 2011-2015" intends to revive village agriculture through initiatives to redevelop agricultural traditional crops as well as encouraging diversification.

A village economy based on subsistence agriculture prevails in Samoa. Currently 86 % of the household agriculture holdings were situated in customary land (Table 3). Evidence is unavailable on the effect of prevailing land tenure arrangements on productivity and income. There is no information on productivity in any of the three agricultural census conducted, so it is difficult to ascertain what difference, if any, tenure arrangements have on productivity and income.

Agro-Economic Characteristics of Rural Households

The 2009 Agriculture Census enumerated 23,164 households in Samoa, with the largest concentration of people in the North West Upolu region (31.5 %), followed by Savaii and the rest of Upolu (both having 25 %) and then the Apia Urban Area (with 18.5 %) (Table 4). Nationally the average number of people per household is 7.1. [1]

Most of the population falls into the 15-59 year age group, which accounts for 54 % of the total population (Table 5). The under 15 year age group accounts for 38 % of the total population, the 15-59 year group for 54 %, and the 60 years and over age group for 7 %. Amongst the regions, North West Upolu is the region that contributes the most to the 15-59 year age group.

Rural Households and Agricultural Activity

For Samoa as a whole, only 3% of the total households produce surplus for the market, that is, 728 households out of a total of 23 164 households (Table 6). These 728 households are concentrated in the Northwest and the remaining Upolu regions, followed by Suvaii and the Apia Urban Area. The remaining 93% of the households (22, 436 households) operate different degrees of subsistence farming geared primarily towards meeting the needs of the family unit. It is important to note that the 3% of market-oriented farmers has plummeted from a previous 5% reported in the 1999 and 1989 Census.[2]

This pervasive atomization of market participation suggests a process of agricultural involution. Indeed, the Census data of the last two decades is consistent with this pattern of involution in the sector (Table 7). Thus, the total number of hectares under cultivation in 2009 is half of that of 1989. This considerable reduction of cultivated land has been accompanied by a fragmentation of the production units.[3] Most holdings consist of more than one parcel of land, though the total number of land parcels has had small modifications. The average size of the parcels has been reduced, contributing to the overall decrease in agricultural land use. All of these changes are consistent with the amplification of agricultural holdings geared towards producing for home consumption alone.

Composition and Distribution of Cropping Patterns

In the 2009 Census, the total land area covered by the 15,793 holdings in Samoa was 37,358 ha, yielding an average holding size of 2.35 ha (Table 8).

Of the 37,358 ha in holdings, approximately 31,000 ha have been used for crop cultivation (Table 9). The production of trees combined with food crops has prevailed in Samoa's agriculture. Coconut, which provides both food and cash, is the predominant crop. Root crops (taro, yam, ta'amu) are the staple crops and are produced to ensure sufficient carbohydrates for the family unit. Carbohydrate requirements are supplemented by banana and breadfruit production. The population has relied on coconuts, bananas, root crops, breadfruit and fish for much of their diet.

Fruits and vegetables

Samoa has grown fruit and vegetables, with a greater emphasis on vegetables over fruits, since the islands were originally populated. The growth in the tourism sector, which requires a continuous supply of high quality fruits and vegetables, has not led to greater production of these commodities. Indeed, large amounts of fruits and vegetables are imported into Samoa. The substitution of import by the local production of fruits and vegetables has become a possible growth opportunity.

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[1] Bureau of Statistics Agriculture Census Analytical Report 2009, Samoa 2012, page 24. As indicated, this rapid survey is based primarily on 2009 Agricultural Census

[2] Bureau of Statistics Agriculture Census Analytical Report 2009, Samoa 2012, Table 4.6

[3] There is no one answer to the questions of the optimum size of a farm to assure maximum productivity; the reasons being that productivity is affected not only by the level of technology and institutional support but also by the associated land and water resources. However, to enhance the productivity of a farm, the farmer needs the assurance of effective control of the land for the long term so he can reap from the investment on the land.

Technology

The Agricultural Census of 1989, 1999, and 2009 contain no information regarding the social and economic barriers to the use of technology or the economic effects of applying technology on an on-farm level. The current application of technology consists primarily of the use of fertilisers, some agro-chemicals and minor equipment to apply these agricultural inputs. Overall, the prevailing use of agricultural inputs is consistent with a production system geared towards meeting the subsistence needs of the family unit.

Credit

Subsistence agriculture does not use credit because there is no surplus for the market from which to repay the loan. It is therefore unsurprising that in 2009 only 5 % of households had credit loans. Most loanee- households were situated in the Apia Urban Area and reported that they were able to use their agriculture sales to service their loans. In 1999 and 1989 the number of loans were 9.6 % and 22.2 % respectively, as compared to 2009. Again this corroborates that the pattern of involution in the sector has been pervasive since 1989.

Agricultural labour

The 2009 Agriculture Census recorded a total number of 3,045 paid labourers (Table 11), almost a 50% increase from 1999. In 1999, 87 % of labourers were males, and in 2009 the proportion increased to 94 %. Currently female labour accounts for 5 % of the total number agricultural labourers.

Income from agricultural production

The 2009 Agriculture Census starkly concludes that.. "agriculture in Samoa is to a large extent for home consumption." Half of the total agricultural holdings (51%) reported that they have not earned anything from the last cropping season. The relative proportion of agricultural holdings failing to earn any income is even higher in the Apia area (68%) and Northwest Upolu (61%).[4] Nonetheless, the Agricultural Census notes that two decades ago " Savaii agriculture was an income earner for almost all households, with 86 % of holdings deriving some income and only 14 % deriving no income from their agricultural activity."[5] Regrettably, the Agricultural Census does not collect information on productivity [yields], or prices [different markets, seasons] to analyze why there is only a 3% agricultural holdings intending to produce surplus for the market.

Conclusions

All evidence depicts Samoa's farming systems as characterized by closely interdependent production activities which links crops with trees. This appears to condition a narrow base for production that is confined to a few root crops, vegetables and fruits that are grown unevenly on a small scale, plus coconuts and cocoa grown as cash crops.

In the absence of incentives to produce surplus for the market, prevailing circumstances might induce households to gear production towards meeting the subsistence needs of the family unit, in particular if there is cash available from remittances. In addition, some root crops like yam are cultivated as cyclone relief. It is possible that the prevailing level of technology compounded by the limited availability of credit may have consolidated both the atomization of market participation and the fragmentation ofland use. Unintentionally, the overall result has been the amplification of agricultural holdings into operations geared towards home consumption alone.

[4] Bureau of Statistics Agriculture Census Analytical Report 2009, Samoa 2012, page 43
[5] Bureau of Statistics Agriculture Census Analytical Report 2009, Samoa 2012, page43

An Immediate Actionable Agenda (Preliminary Framework)

Samoa's agricultural sector is at a cross-roads. With such an atomized market participation, there is no other option but to transform subsistence agriculture, as it can lead to an unsustainable use of land and associated natural resources.

Farmers need to sell a portion of - of their farm produce to outside markets. This requires enhancing agricultural productivity within a sustainable framework. To this end, new technology must be introduced. This new technology must promise a significant increase in yield or a reduction of costs in order to make the effort worthwhile.

This opens up a window of opportunity. It should be possible to propose new technology to farmers in the context of climate resilient agriculture. Established development experience indicates that it is desirable to introduce different packages of practices when introducing new technology because of the intimate way in which different farm practices interact in affecting yields.[6] This allows the opportunity to introduce technology that is based on principles of climate resilient agriculture which will increase productivity. Agricultural activity cannot develop beyond the subsistence stage without commensurate changes in other areas of the agricultural sector, opening up the need for an overarching strategy to increase productivity on an economy-wide scale.

This overarching strategy must be anchored in one principle of agriculture development, that is, that agriculture is a situation-specific undertaking.[7] In this context, proven development experience has been based on a three-pronged approach.

1) Level One. In a given region, the easiest approach to increase productivity is to spread the methods and materials used by the best farmers in the region. Thusly, the approach would be to move from region to region spreading the methods and materials of the best farmers. This is like picking low hanging fruit.
2) Level Two. The approach is to adopt the methods and materials that have been developed in other regions or countries that have similar agricultural characteristics. This approach is more capital intensive as it becomes necessary to conduct analytical studies on selected crops and carry out on-farm trials,either on the farms of the most advanced farmers or on experimental stations over a period of time.
3) Level Three. The approach is geared to establish experimental research to develop a new strain of crops, soil treatments, disease control measures, livestock medicines, etc. A host of the current farm supplies, such as hybrid seeds, insecticides, fertilizers, etc., came from this latter source. Additionally, land and water development programs can also increase production by enhancing the productivity of land and labour through irrigation, drainage and land management practices.[8]

Approach 1: Certified Organic Agriculture: A Preliminary Module

This approach can be considered an application of the first principle of the strategy.
WIBDI is a local private enterprise that has been working over the last two decades on certified organic agriculture. It has accumulated knowledge about the certified organic production of a set of vegetables and fruits under the management skills and know-how of Samoan smallholding farmers. The decisive achievement of WIBDI is that over the years it has mastered the market for each product. Therefore, the risk of loss by not being able to place perishable produce is reduced considerably.

As discussed in the previous section:

- organic agriculture takes a balanced approach to crop production so that it conserves soil and water resources. It focuses on building and maintaining soil humus (organic matter content) through practices such as green mulching and manuring. These practices diminish nutrient leaching, soil erosion and ultimately can lessen the effects of drought. It also has the potential to contribute to capturing atmosphere carbon dioxide and help reduce climate variability

[6] Agricultural Development Council. Marketing problems associated with small farm agriculture. Michigan State University. Report on ADC/RTN seminar. East Lansing, 1979
[7] Schultz, T.W. Transforming traditional agriculture. New Have: Yale University Press, 1964
[8] Hayami, Y. & V.W. Ruttan. Agricultural development: an international perspective. Baltimore: The John Hopkins University Press, 1971

- it also focuses on the sustainable management of soil fertility by increasing fallow periods, companion planting and intercropping. For the control of pests and diseases it uses the proven low-input practices of integrated pest management,

In close cooperation with WIBDI, we have put together a preliminary set of agro-economic coefficients for the production [organically certified] of selected fruits and vegetables: coconut, misiluki, pawpaw, nonu and laupele (Table 12). These tree-crops and vegetables can be considered representative of the country's production potential. The coefficients are preliminary and require vetting with the WIBDI as well as field truthing.

In light of the findings from the present Diagnostic exercise and in the context of the coefficients, it is possible to draw potential parameters for future planning.

Table 12. Organic Agriculture Development: Preliminary Agro-Economic Coefficients at Full Development in USD
[NB: these are yearly costs and financing is required for six years]

Crop	Yield [ton/ ha] Or [unit/ha]	Farm-gate Price [$/ ton]	Gross value production [$]	Start up cost [$/ ha/year]	Labour requirements [days/year]	Training cost household/$ /year	Net Return per ha [$]
Coconut				6754	1075	6182	
Misiluki				4273	2589	5727	
Pawpaw				1974	1265	5498	
Nonu				1089	1578	5045	
Laupele				2521	253	5544	

Source: from WIBDI estimates

Beneficiaries : Selection of Target Villages and Farmers

From the Diagnostic exercise, it is now evident that only a minor proportion of households intend to produce surplus for the market. As previously mentioned, through the working sessions with the Internal Affairs Division of the MWCD, a practical way to select potential beneficiaries emerged; It consists of working with villages situated in the coastal habitat that have already prepared development plans of their own. This context would allow for pro active discussions concerning the village interest in organic farming and whether their lands are in the right condition for conducting organic farming. Table 13 contains the list of villages who have prepared development plans.

Table 13. Preliminary Set of Villages for Implementation

Upolu Island	Savaii Island
Salepoiao	Seasoai
Cragaipo	Foailuga
Saoga	Fagapau
Apega	Sili
Savoia	Aopo
	Sagone
	Saleilua

Source: personal communication from MWCD

The number of farmers that will be selected should depend on the funds available. As will be discussed below, the start up will require credit funds.

On-Farm Investments

The Diagnosis indicates that half of the farmers do not earn anything from their farming operations. Above all, only 3% of farmers intend to produce surplus for the market. Under these conditions, there will be the need for

credit to start up the operation. The amount of funds required ranges from USD 6000 to 1000 per family. In fact, the investment on equipment for coconuts and misiliku may require long term credit. As indicated, the funds identified are for the first year. There will be the need for additional funds over the next five years. These additional funds have not been estimated by WIBDI due to a lack of information on credit modalities; in fact, the first year costs have been repeated. These elements can be improved. It is important to note that there is one MF firm in Apia and WIBDI that has run credit operations.

Labor Requirements

The Diagnostic exercise indicated that the total number of agricultural labourers is about 3,045 persons, most of whom are male. The labor requirements are important, as is illustrated in Table 13. The production of vegetables and fruits are labour intensive, as already discussed. Therefore, the number of hectares dedicated to vegetables and fruits need to be carefully calibrated as a function of the labour availability, in particular during peak periods. It would not be surprising, if when the crop calendar is prepared, one finds that the constraint is labour availability rather than capital. However, labour requirements (Table 12) need to be reconsidered as certain activities have potentially been left out or overestimated.

Cost of Training

WIBDI was requested to estimate the cost training of the different crops under consideration as there is no national extension system. This is not easy as WIBDI operates as a private enterprise. The preliminary costs estimated run between USD 6000 and 5000 per family/cropping season. When preparing the cropping calendar, there will be the need to estimate economies of scale. For example, in any given region, the question arises as to how many families can be served by one trainer. The training of trainers will also need to be considered, in a manner such that each of the trainees should train a given number of farmers that are either part of the project or outside the project.

In addition to the training exercise, there is the need to coordinate the available extension services. The extension services must support the training efforts and vice versa. We should also make certain that there is consistency between the message passed on by the extension services and the training. One procedure which ensures continuity is the farmer-to-farmer extension method. Every farmer trained becomes a potential extension agent and his farm becomes a demonstration plot. Evidently there is the need to select farmers for this approach.

Net Return per Family

It is possible to estimate the net return per family with the information that is missing in Table 13 which WBDI can provide. First, we need to have the yields in tons for each crop [units for misluki]. The sale price for the crop at farm gate is essential. As per discussions with WIBDI the company will purchase all the production at the farm gate ongoing prices. The product of both yields by farm gate prices gives the gross value of production. The net value is the result of subtracting all other costs from the gross value of production.

Experts have estimated that farmers will accept new techniques, including climate resilient principles, when resulting increases in yields range above 40%. The reason being that there is significant uncertainty as to how effective the new technology will be on each farmer's own field, in particular the climate resilient principles. The farmer may be certain about the results of traditional methods; however he is uncertain not only about the new methods but also about his ability to use them. In any event, he also knows that with poor weather the returns from his crops can be severely diminished from the maximum obtainable in a good year. Moreover, a new technology is dependent upon a range of climatic and soil conditions, therefore the farmer rightly takes into account the possibility that the new technology will not yield as much in his own field as it does in experimental plots. In light of these significant uncertainties, and aggravated by climate resilient principles, only the potential of substantive returns can overcome the conservatism of the farmer.

MAIN REPORT

The Agro-Economic Evolution of the Agriculture Sector : A Diagnosis

Objectives

The key issues arising from prevailing climate variability and global warming effects on Samoan agriculture have been outlined in the previous section. This section intends to summarily review the structure of the agricultural sector in terms of its performance during the last decade. The purpose of this assessment is to [1] inform on the nature of the sector's immediate constraints and potential for climate change adaptation; [2] identify the risks involved in the process of adaptation from the standpoint of the smallholder.[9]

Accordingly, this section will proceed as follows.

- It will commence by tracing the recent trends in the national economy to identify the economic challenges facing the country.
- Subsequently, the characteristics of the sector's agro-economic evolution will be delineated and land use patterns will be examined in the context of the agro-economic evolution of the last decade.[10]
- In turn, the prevailing cropping patterns which influence the nature of the agriculture technology used and the income derived will be considered.
- In conclusion, on the basis of the constraints and potential identified, the preliminary steps towards climate change adaptation will be proposed for consideration.

Limitations of this Diagnosis

This exercise intends to determine the nature of the current conditions of the agricultural sector based on a cursory review of its historical evolution. Based on this diagnosis, the probable outcome will be estimated, holding everything being equal. Diagnostic exercises are fundamental to programme change. Several constraints militate against this diagnosis.

- ✓ Firstly, despite the fact that there were two scoping missions in Samoa, the interaction took place with national stakeholders. There was no interaction with farmers on the ground due to limited time. This is a desk review, as it is evident there are several empirical gaps that require field verification.
- ✓ Secondly, during the scoping working sessions it was assumed that there was sufficient information available in several completed and ongoing projects to design the present project. However, as we began delving into the data for the purposes of designing an agriculture and livelihoods component, it became evident that the quality of the information in those projects related to agriculture was mixed. Issues concerning reliability, replicability and transparency arose. Throughout this exercise every effort has been made to cross check the information used. If there are inaccuracies it will be easy to identify them for rectification.

Backdrop: Macroeconomic Trends

The Independent State of Samoa is a small and open economy where total merchandise trade (largely imports with only small exports) makes up more than half of the nominal GDP.[11] Total merchandised exports contributed

[9] It is important to point that during the scoping working sessions it was generally assumed that there was sufficient information available in several completed and ongoing projects to design the present project. However, as we began delving into the data for the purposes of designing an agriculture and livelihoods component it became evident that the quality of the extant information was mixed. While some data set was adequate, there were shortcomings in those reports related specifically to agriculture. Issues concerning reliability, replicability and transparency arose. Some of these projects are now under review. Therefore, it was vital to obtain a big picture of the agriculture situation through a rapid diagnostic exercise. The information conveyed in the Agriculture Census of 1989, 1999, 2009 afforded an opportunity to conduct an exercise to identify the sector's constraints and potentials.

[10] As discussed, the present review is necessarily based on the latest agricultural census. Bureau of Statistics Agriculture Census Analytical Report 2009, Samoa 2012. Unless otherwise specified the tables have been cross referenced indicating the source.

[11] This section draws on the work of: FAO Sub-regional office for the pacific islands. Report On a scoping mission in Samoa and Tonga. Agriculture and tourism linkages In pacific island countries. Study to assess constraints, potentials increase the understanding of policy and institutional arrangements needed to enhance synergies. January 2012

only SAT$ 28.1 million. The main merchandised exports are fish, beer and a few agricultural commodities (i.e. products derived from coconut, nonu and taro). Remittances (SAT$346.7 million), services (largely tourism – SAT$226 million) and on the capital account, official development assistance grants of SAT$145.2 million were significant net transfers on the current account and contributors to foreign reserves in the fiscal year 2010/11. Imports in 2010/11 were SAT$641.3 million,almost 23 times larger than exports at SAT$28.1 million

Tourism has been the fastest growing area of the economy over the last decade and is now the second largest contributor to foreign exchange, after remittances. The tourism sector has been estimated to contribute about 20% of the GDP. The Strategy for Development of Samoa 2008 – 2012 and the Samoa National Export Strategy 2008-2012 both recognise tourism as the leading sector for future national economic growth and employment.

Over the last decade the agricultural sector's economic performance has been sluggish, as output has stagnated and exports have declined. Although agriculture still maintains a key role in food security, Samoa's population has become increasingly dependent on food imports, with total food and fish imports reaching the SAT$165 million mark in 2009 (equivalent to 30% of total imports). Fruit and vegetable imports alone reached nearly SAT$9 million (Central Bank of Samoa, 2010). As will be discussed below, commercial agriculture is a marginal component of total agriculture, whereas subsistence agriculture accounts for the lion's share of the agricultural activity.

In brief, a village economy based on subsistence agriculture prevails in Samoa. The latest Agricultural Census (2009) indicates that only 3% of smallholding farms intend to produce surplus for the market. Remittances from family members working overseas, tourism, and external aid are the main sources of national revenue, in that order of importance. The contribution of the agriculture sector (agriculture and fisheries) to the economy has shrunk significantly over the past ten years from 17 % in 1999 to less than 10 % in 2010. In this vein, the "Agricultural Sector Plan 2011-2015" overall goal is "to increase agricultures relative contribution to GDP from its current level of 10 % to 20 % by 2015'' To this end, the Plan intends to revive village agriculture through initiatives aimed at redeveloping agriculturally traditional crops as well as encouraging diversification. Government anticipates providing support in agricultural development, i.e. research, extension, quarantine, regulation, marketing information and infrastructure. It has also acknowledged that the development of crops with market potential will require the leadership of private entrepreneurship.

The Landscape

Samoa's total land area is 2,830 km^2. Samoa consists of two main islands, Savaii and Upolu, with eight smaller islands, Apolima, Manono, Fanuatapu,Namua, Nu'utele, Nu'ulua, Nu'ulopa, and Nu'usafe'e. Savaii is the largest island with 1,700 km^2. The second largest island is Upolu with an area of 1,100 $km^{2;}$ this is where the capital Apia is located (Table 1). The climate of Samoa is tropical. The islands are of volcanic origin. Beyond the narrow coastal plains, the mountain ranges rise steeply to a maximum of 1,859 meters on Savaii and 1,100 meters on Upolu,intersected by fertile valleys. Lush vegetation and rain forest cover the greater part of the country. With very little seasonal variation, the average daily temperature range is from 22^o C to 30^o C, with humidity averaging 80 %. The wet season extends from November through April, and the dry season from May to October, during which period the climate is pleasant because of fresh trade winds. The annual rainfall averages 2,880mm, although there is great variation with latitude and location.

Table 1. Samoa: Physical Characteristics and Size

Land use	Ha	Km2	%
Total land mass	283, 100	2, 831	100
Total forest	171, 000	1, 710	60
Agriculture	67, 000	670	23
Other [urban, lava formations]	45, 100	451	17

Source: Own elaboration based on FAO Statistics 2013: Table 4, Table 41

Population

The people of Samoa are primarily Polynesian. In 2006 the Population Census recorded a population of 184,000, with males representing 52 % of the total population and females 48 %. The population is predominantly rural (Table 2). The country consists of about 330 villages and is divided into 41 districts.

Table 2. Urban – Rural Population Distribution

Population	Number of people	%
Total [2011]	184, 000*	100.0
Urban	36, 616	19.9
Rural [2011]	147, 384	80.1

Source: Own elaboration based on FAO Statistics 2013: Table 1
*Population Census 2006

Evolution of Customary Land Tenure Pattern

Historically, the social unit of Samoan life is the 'aiga' or extended family. The 'aiga' is headed by at least one matai, who is appointed by the consensus of the aiga. There are two distinct types of matai titles, the "Ali'i' or Chief Matai and the 'Tulafale' or Orator Chief. The matai assumes responsibility for directing the use of family land, and other assets belonging to the aiga. He must by his behaviour honour the title he bears and the people he represents. In return for his leadership, the matai is rendered services by the 'tautua' (untitled).

Local authority is also in the hands of the matai, who constitute the council or 'fono' of the village. Presiding over the fono is the 'Sui o le Malo' (village mayor), a position appointed by Government on recommendation from the village council. A Women Representative 'Sui Tamaitai' is also appointed by Government on the recommendation of the women's' councils; this representative acts as the contact between the government and the women in the villages.

Rooted in this social organization is the Samoan Way or 'fa'a-Samoa', which places great importance on the dignity and achievement of the group rather than its individual members. Religion plays an important role in Samoan life, with the majority of the people adhering to the Christian faith.

The institution of land tenure in agricultural development is pivotal. Where there is little technological development,land is the main source of wealth. But income from land cannot be realized without labour. Thus land tenure relationships usually coincide with power relationships, such as the capacity to mobilize society's resources, including political allegiances. Hence, land tenure significantly affects the pace of agricultural development.
Land tenure apportions social and economic opportunities to those who are born in specific land tenure categories. Although mobility from category to category is theoretically possible, it is not always viable for economic and historical reasons. Tenure positions are ascribed by tradition, not achieved.

Currently, 86 % of the household agriculture holdings were situated in customary land, a small reduction from 90 % in 1999 (Table 3). This reduction came from small increases in freehold land and to a limited extent in leased Government and leased freehold land. Evidence is unavailable concerning the effect of prevailing land tenure arrangements on productivity and income. One important reason for this lack of evidence is the lack of information on productivity in any of the three agricultural census conducted, making it difficult to ascertain what difference, if any, these tenure arrangements have on productivity and income. Also, as indicated, there may be cultural norms that preclude the achievement of the individual (fa'a-Samoa). If so, then group arrangements could be considered. At this point, however, for lack of information, all these possibilities remain moot issues.

Table 3. Evolution of Land Tenure Pattern

Tenure Type	2009	1999	1989
	%	%	%
Customary Land	86	90	94

Leased Customary Land	1	1	1
Leased Government Land	3	2	2
Own Freehold Land	9	6	3
Leased Freehold	1	0	0
Other / not stated	1	1	0

Source: Bureau of Statistics Agriculture Census Analytical Report 2009, Samoa 2012, Table 5.3

Agro-Economic Characteristics of Rural Households

The 2009 Agriculture Census enumerated 23,164 households in Samoa. To establish the population's regional distribution, the 2009 Agriculture Census grouped all districts in the country into four census regions, i.e. Apia Urban Area [AUA], North-West Upolu [NWU], Rest of Upolu [ROU] and Savaii (Table 4). Thus, the largest concentration of people is found in the North West Upolu region, which accounts for 31.5 % of the total population, with Savaii and Rest of Upolu both having 25 % and Apia Urban Area having 18.5 %. Nationally, the average number of people per household is 7.1. The average number of people per household across regions varied from a low of 6.6 in Apia Urban Area to 7.3 in Savaii and 7.4 in the Rest of Upolu. This shows a trend towards smaller households when compared to an average of 8.0 people in a household in 1999 and 8.8 in 1989.[12]

Table 4. Regional Distribution of Population and Number of Households

Item	Total Population [2009]	Percentage	Households [#]	Percentage	Average number of people per household
Samoa	163 523	100.00	23 164	100.00	7.1
Apia Urban Area	30 206	18.47	4 555	19.66	6.6
NW Upolu	51 432	31.45	7 447	32.15	6.9
Rest of Upolu	40 855	24.98	5 509	23.78	7.4
Savaii	41 030	25.09	5 663	24.45	7.3

Source: Own elaboration based on Bureau of Statistics Agriculture Census Analytical Report 2009, Samoa 2012, Table 4.4 and Table 4.5

Most of the population is concentrated in the age group of 15-59 years, as it accounts for 54 % of the total population (Table 5). The under 15 year age group accounts for 38 % of the total population, the 15-59 year group accounts for 54 %, and the 60 years and over age group for 7 %. Amongst the regions, North West Upolu is the region that contributes the most to the 15-59 year age group total.

Table 5. Age Pyramid

Age Bracket	% of Total Population [%]
60>	8
< 15	38
15 - 59	54

Source: Own elaboration based on Bureau of Statistics Agriculture Census Analytical Report 2009, Samoa 2012, Table 4.3

Households and their Agricultural Activity

The Agriculture Census uses five sociological categories to establish the level of agricultural activity.

- The **non-agriculturally active** are composed by [1] non agricultural and [2] minor agricultural households;
- The **agriculturally active** include households oriented towards [3] subsistence, [4] mainly for home consumption and [5] mainly for sale agricultural activity..

[12] Bureau of Statistics Agriculture Census Analytical Report 2009, Samoa 2012, page 24

These categories are sociologically rooted. This social typology of rural life, though rich in portraying a "fa'a-Samoa" outlook, yields little information to understand the underlying aspects of economic performance. It will be necessary to infer this learning from development experience. This knowledge is pertinent so as to advance our understanding of agriculture and climate change adaptation.

With the exception of the households focused on the market, all categories are basically subsistence oriented as there is no evident intention to produce a surplus for the market. In subsistence agriculture, the labour force, management, and even capital comes from the same household. Farm business is necessarily mixed with family considerations. For example, decisions regarding major consumption expenditures, such as housing, conflict directly with productive investments of the farm business. An error in a business decision can have disastrous consequences for the family unit. This is why subsistence farming is rational and conservative. Smallholding farmers commonly produce a surplus of what the farm family chooses to consume and sells that surplus in the market in order to purchase non-farm goods and services. The extent of this surplus varies according to the prevailing economic incentives to production, i.e. farm size, transportation infrastructure, remunerative prices, and competitive markets. These factors are normally situation-specific, as agriculture is ecosystem dependent. The cardinal point here is that the marketed surplus links the farm household with the market and makes the marketing price relationships instrumental in the allocation of family resources, which are also farm-business resources.[13]

The 2009 Agriculture Census data indicates that for Samoa as a whole, only 3% of the total households produce surplus for the market (Table 6), that is, 728 households out of total number of 23 164 households. These 728 households are concentrated in the Northwest and Rest of Upolu regions, followed by Suvaii and the Apia Urban Area. The remaining 93% of the households (22 436 households) operate different degrees of subsistence farming geared primarily towards meeting the needs of the family unit, such as vegetable gardens around their homestead. It is important to note that this 3% of market-oriented farmers has plummeted from a previous 5% reported in the 1999 and 1989 Census.[14] Although there is no direct evidence, it can be conjectured that cash requirements to meet household needs not- produced- on- farm come from remittances. This atomized participation in the market suggests a process of agricultural involution.

Table 6. Regional Distribution of Households by Level of Agricultural Activity

Item	Non Agricultural		Minor Agricultural		Subsistence Focused		Only for Home Consumption		Market Focused	
	#	%	#	%	#	%	#	%	#	%
Samoa	3806	100	3572	100	7776	100	7282	100	728	100
Apia Urban Area	1771	46	1834	51	626	8	228	3	96	13
North West Upolu	1508	40	1293	36	2747	35	1666	23	233	32
Rest Upolu	313	8	309	9	2009	26	2641	36	237	33
Savaii	214	6	136	4	2394	31	2747	38	162	22
As % of Total HH [23164]	***3806***	***16***	***3572***	***15***	***7776***	***34***	***7282***	***31***	***728***	***3***

Source: Own elaboration based on Bureau of Statistics Agriculture Census Analytical Report 2009, Samoa 2012, Table 4.7 and Table 4.6

Indeed, the Census data of the last two decades (Table 7) is consistent with this pattern of involution in the sector. Thus, the total number of hectares under cultivation in 2009 is half of that of 1989 when the Agricultural Census began. This considerable reduction of land under cultivation has been accompanied by a fragmentation of the production units.[15]

The average size of a holding in 2009 is approximately half of that of 1989. Similarly, the current average size of parcels is also about half of those in 1989. To some extent, the impact of natural disasters and the infestation by

[13] Mellor, J. The economics of agricultural development. Ithaca: Cornell University, 1974, pp 244-248

[14] Bureau of Statistics Agriculture Census Analytical Report 2009, Samoa 2012, Table 4.6

[15] There is no one answer to the questions of the optimum size of a farm to assure maximum productivity; the reasons being that productivity is affected not only by the level of technology and institutional support but also by the associated land and water resources. However, to enhance the productivity of a farm, the farmer needs the assurance of effective control of the land for the long term so he can reap from the investment on the land.

pests and diseases such as the taro leaf blight in 1993 could have contributed to the decline in crop land in the 90s. However, taro production has since picked up, as shown in the 2009 Census data, and there has not been a significant population increase so the competition over land has not necessarily escalated. The relatively unchanged land tenure arrangements over the last decades testify to limited competition over land (cf Table 5). Also, historically, emigration has been a distinctive feature of Samoan society.[16]

In essence, the 50% decrease of agricultural land use from 1989 to 2009 has led to a reduction in landholdings' size, reflecting a pattern of fragmentation of holdings. Most holdings consist of more than one parcel of land, though the total number of land parcels has had small modifications. The average size of parcels has been reduced, contributing to the overall decrease in agricultural land use. All of these changes are consistent with the amplification of agricultural holdings geared towards producing for home consumption alone.

For the purpose of climate change adaptation, it is vital to understand the drivers of this involution. Are remittances diminishing the incentives to produce a surplus for the market? There is need for more focused analysis on this issue through survey analysis.

Table 7. Evolution of Land Use by Agricultural Active Holdings

Agricultural Census	FAO Total Agricultural Land [Ha]	Actual Land Use [ha]	Ag Active Households [#]	Active Ag Holdings [#]	Ratio ha/ holding [ha]	Total Parcels [#]	Average Parcel/ Holding	Parcel average area[ha]
Agricultural Census [2009]	67, 000	37,358	15,786	15,793	2.37	33,332	2.11	1.12
Agricultural Census [1999]	67,000	53,384	14,725	14,734	3.62	35,317	2.40	1.51
Agricultural Census [1989]	67,000	67,376	10,884	11,099	6.07	33,796	3.04	2.00

Source: Own estimate based on FAO [2013 Table 4], Bureau of Statistics Agriculture Census Analytical Report 2009, Samoa 2012 , Table 5.1, Table 5.2

Agro-Economic Evolution of the Agriculture Sector

FAO estimated Samoa's total land mass as 283,100 ha, where 171, 000 ha correspond to forested area (natural and plantation). [17] The total agricultural land comprises about 67,000 ha. The area dedicated to permanent crop is 38, 994 ha;] and arable land represents 24, 991 ha of which about 10, 840 ha is organic agriculture (Table 7). Meadows and pasture land represent 3, 015 ha.[18] Livestock activities are village based and are composed of cattle, pigs and poultry. Livestock operations appear geared towards meeting family rituals primarily. There seems to be very little economic value attached to livestock.[19]

Table 7: Prevailing Land Use Pattern

Agriculture land use	Ha	%
Total agricultural land [2009]	67, 000	100
Arable land [2009]	24, 991	37.3
Meadows, pasture [2009]	3, 015	4.5
Permanent crops [2009]	38, 994	58.2
--of which Organic [2009]*	10, 840*	27.8*

Source: Own elaboration based on FAO Statistics 2013: Table 4, Table 48
* The 10,840 ha are part of the permanent crops

[16] Bureau of Statistics Agriculture Census Analytical Report 2009, Samoa 2012 , Table 1.1

[17] During the last three decades, Samoa's forest has been depleted to the point of near exhaustion through commercial and agricultural use.

[18] Inconclusive evidence suggest that pasture land for livestock has been increasing.

[19] Fishing, however, appears as an important occupation in the village economy as it provides a major source of protein in the diet and an important source of cash income.

Composition and Distribution of Cropping Patterns

In the 2009 Census, the total land area covered by the 15,793 holdings in Samoa was 37,358 ha yielding an average holding size of 2.35 ha (Table 8).

Table 8. Distribution of Agriculturally Active Households by Holdings and Hectares

Level of Agricultural Activity	Households		Holdings		Area		Ratio ha/ holding
	[#]	%	[#]	%	Ha	%	Ha
Subsistence Focused	7776	49	7779	49	18403	49	2.35
Only Home Use	7282	46	7286	46	17233	46	2.35
Market Focused	728	5	728	5	1722	5	2.35
Total	15786	100	15 793	100	37 358	100	2.35

Source: Own elaboration based on Bureau of Statistics Agriculture Census Analytical Report 2009, Samoa 2012, Table 4.6 and Table 5.1; FAO 2013, Table 4

Of the 37,358 ha in holdings, approximately 31,000 ha have been used for crop cultivation (Table 9). As discussed earlier, the land under cultivation has decreased by almost half as compared with 1989 when the Agricultural Census began collecting information. The production of trees combined with food crops has prevailed in Samoa's agriculture. Coconut, which provides both food and cash, is the predominant crop. Root crops (taro, yam, ta'amu) are the staple crops, and are produced to ensure sufficient carbohydrates for the family unit. Carbohydrate requirements are supplemented by banana and breadfruit production. The population has relied on coconuts, bananas, root crops, breadfruit and fish for much of their diet.

Table 9. Evolution of Cropping Patterns as a Percent of Total Agricultural Land Area
[ha]

Cropping Pattern	1989		1999		2009	
	%	Ha	%	Ha	%	Ha
Coconut	34.6	23,312	35.1	18,738	29.3	10,946
Taro	21.9	14,755	5.0	2,669	19.7	7,359
Cocoa	9.8	6,603	7.5	4,004	6.7	2,503
Ta'amu	4.8	3,234	9.0	4,805	7.4	2,764
Banana	3.4	2,291	8.1	4,324	13.7	5,118
Breadfruit	1.6	1,078	2.4	1,281	3.9	1,457
Kava	0.4	270	2.3	1,228	0.7	262
Yam	0.4	269	1.0	534	1.6	598
Other	23.1	15,564	29.6	15,801	17	6,351
Total Agricultural Land	100.0	67, 376	100.0	53, 384	100.0	37, 358

Source: Own elaboration based on Bureau of Statistics Agriculture Census Analytical Report 2009, Samoa 2012, Table 6.1. Note that the category 'Other' has been obtained by difference from major cropping patterns.

Coconut (*Cocos nucifera).* Coconut remains an important cash crop for Samoans. Exports of coconuts and coconut products since the late 1980s have been relatively non-existent. Although land use for coconut has declined since 1999, coconut continues to be a major crop in Samoa, not only for human consumption but also for feeding animals. Recently, there has been a push from the Ministry of Agriculture in encouraging farmers to

replant coconut trees in order to supply foreign market demand for coconut oil and other bi-products of coconut.[20] Apparently, in the past few years the production of coconut oil for export has slowly increased following private sector investment in coconut processing with a demand of 400,000 nuts per week.[21]

Taro *(Colocasia antiquorum*). Taro is one of the preferred starchy staple crops in Samoa. In 1993, the outbreak of the taro Leaf Blight nearly destroyed the crop. By 2009 production had steadily increased as resistant varieties have become available. Land use for planting taro has increased more than 3 fold from 2,669 ha in 1999 to 7,359 ha in 2009, but was still only 57% of the area planted in 1989.

The other main staples are banana, breadfruit and yam. Land use for these staples has been growing steadily since 1989 as a proportion of total land. It seems that banana and breadfruit are being interplanted where banana is the year round crop and breadfruit is a seasonal crop. This illustrates some steps farmers are taking in protecting themselves from the threat of other possible outbreaks such as taro leaf blight. This is a type of crop diversification.

Banana (*Musa sapientum*). The banana industry is predominantly a smallholder's business, however historically it was a lucrative export business. Disease and nematode build up have been largely responsible for its recession, aggravated by the cyclones Ofa in 1990, Val in 1991, and Heta in 2004. These cyclones caused extensive damage to banana plantations. Banana remains a major food item either at the villages where it is grown or in the urban markets where it sold, mainly Apia.

Breadfruit (*Artocarpus altilis*) is a key carbohydrate staple in Samoa. Breadfruit is indigenous to Polynesia and most of the known cultivars may be found in Samoa. Breadfruit is grown primarily as a combination tree-crop for inter planting among smallholding farmers throughout the country.

Yam (*Dioscorea numularia*) and Taamu (*Alocasia macrorhiza*), also known as the giant taro, are used mainly as a food reserve in light of the devastation caused by taro's leaf blight in 1993, as well as for a post cyclone situation. They grow well locally and provide an acceptable taro substitute as well as provide security of food supply to the fragile food system in the absence of storage facilities among rural households. The longer the yams are left in the ground, the higher the yields.

The Pacific yam (*Dioscorea numularia*) is a white fleshed tuber with an attractive taste and texture. This crop is perennial and has promising potential as a food reserve for inter planting in fuel- wood plantations because of its tolerance of shade.

Cocoa (*Theobroma cacao*). Cocoa is another long established crop for domestic consumption and was also a major source of export revenue. However, like coconuts, it also declined in the 1960s and early 1970s and very little replanting has taken place since then.

Kava (*Piper methysticum).* Since the European ban, Kava is no longer an export crop. However, there is a strong domestic market for kava with most supplies being shipped to the Fugalei market and small stores around the country. Although the European market remains closed, there have been concerted efforts taken by Pacific Island kava producing countries to reopen the export market.

Fruits and Vegetables

Samoa has grown fruit and vegetables, with a greater emphasis on vegetables, since the islands were originally populated. The growth in the tourism sector, which requires a continuous supply of high quality fruits and vegetables, has not led to a greater production of these commodities. Indeed, important amounts of fruit and vegetables are imported into Samoa. The substitution of import by local production of fruits and vegetables has become a possible growth opportunity.

The current supply of fruits and vegetables are mainly sold at the local market for home consumption.

[20] The Scientific Research Organisation of Samoa has been piloting the use of coconut oil for fueling diesel engines (SROS Annual report).
[21] Cited in: Bureau of Statistics Agriculture Census Analytical Report 2009, Samoa 2012, page 8

The 1989 and 1999 census of agriculture reported small quantities of land use for growing fruits and vegetables (Table 10). However, the 2009 census reveals an encouraging expansion in land use for fruit and vegetables as a proportion of the total agricultural land area. However, no yields of volumes of production are reported.

It is important to note that in 2009 FAO recorded 10,840 ha of organic agriculture (cf Table 7). Organic agriculture is a source of income growth for smallholding farmers. It is not evident where these 10,000 ha of organic agriculture are, however. Even on the assumption that the total number of ha involved in the production of vegetables and fruits reported in the 2009 Agricultural Census are organically certified, there would be another 8000 ha to account for.[22]

Table 10. Evolution of Fruit /Vegetable Production as percent of Total Agricultural Land Area

[ha]

Crop	1989		1999		2009	
	Ha	%	ha	%	Ha	%
Chinese cabbage	135	0.2	54	0.1	411	1.1
Tomato	68	0.1	160	0.3	561	1.5
Pumpkin	68	0.1	54	0.1	598	1.6
Papaya	68	0.1	107	0.2	299	0.8
Sub total	339	0.5	375	0.7	1,869	5.0
Total Agricultural Land	67,376	100.0	53,384	100.0	37,358	100.0

Source: Own elaboration based on Bureau of Statistics Agriculture Census Analytical Report 2009, Samoa 2012, Table 6.6

The Use of Technology and Agricultural Inputs

Subsistence agriculture is essentially natural-resource-based agriculture. Unless local/indigenous knowledge provides mechanisms to replenish soil fertility, among others, the long term prospects of subsistence farming are unsustainable use of resources. The transformation of sustainable agriculture requires technology that promises a significant increase in yield or reduction of costs in a sustainable framework. Although there is no information evaluating the role of technology in Samoan agriculture, the information below suggests that the use of agricultural technology is, in general, limited.

Thus, the Agricultural Census of 1989, 1999, 2009, contain no information regarding the social and economic barriers to the use of technology or the economic effects of applying technology on an on-farm level. Despite the fact that the Census information on technology is qualitative and descriptive, it is possible to logically draw inferences. Current technology consists primarily of the use of fertilisers and some agro-chemicals, as well as minor equipment to apply these agricultural inputs. Overall, the prevailing level of technology applied and the use of agricultural inputs are consistent with a production system geared towards meeting the subsistence needs of the family unit. There is no information on supply and demand of agricultural labor by seasons. The information about these elements is qualitative so it is not possible to conduct a comparative analysis or triangulations with situations similar to Samoa in order to gain insight.

For example, for the use of fertilisers, there is qualitative information available on the relative increase/decrease of fertiliser use in certain regions, but without information on yields obtained and the type of fertiliser used, the percentage increase / decrease means little, except quantities sold.

[22] Cf. FAO Statistics 2013: Table 4, Table 48

One useful finding is that the use of organic fertilisers has consistently increased throughout the regions within the last decade. This supposedly stems from spreading the idea of using composting through newspaper articles and education. It is reported, however, that the use of inorganic fertilisers has also shown some decline within the same decade. This fact corroborates the existence of organic agriculture as well as potential options for climate change adaptation.

The pattern of use of agricultural chemicals (herbicides, insecticides or fungicides) brings forth little useful information across the regions for the last decade, as there is no way of assessing its effect on productivity. However, in the 90s, in the taro growing areas affected by the taro leaf blight, there was a relative increase of agro-chemicals which subsided after new varieties of taro were supposedly brought in.

In terms of agricultural equipment, the Census data indicates that currently households have more equipment available. In 2009 the most common pieces of equipment were knapsack sprayers, power slashers, chainsaws and pickups or trucks. The knapsack sprayer is understandable for the use of agro-chemicals. The procurement of power slashers, chainsaws and pickups, evinces important purchasing power, however the data is not clear about its use in a context of pervasive subsistence agriculture.

Credit

To produce more crops per hectare, the farmer must spend more on plant material, farm implements and others. The absence of marketable surplus precludes the use of credit to obtain planting material and farm implements, which is why subsistence agriculture does not use credit; there is no surplus for the market from which to repay the loan. Unsurprisingly, perhaps, in 2009 only 5 % of households had credit loans. Most of these households were supposedly situated in the Apia Urban Area and reported that they were able to use their agriculture sales to service their loan.

In this context it is essential to keep in mind that, according to the Census of 1999 and 1989, the number of loans as compared to the level of 2009 were double and quadruple, 9.6 % and 22.2 %, respectively. Again this corroborates the finding that the pattern of involution in the sector has been pervasive from 1989 up to the present.

Another important finding relates to the role of the Development Bank. The number of loans from the bank have declined notably over the decade. Thus, in 1989, Development Bank's proportion of loans for agricultural purposes was 64 %. In 1999 it decreased to 59 %; and by 2009 it declined further to 37 %.

Therefore, we can infer that there is considerable potential for credit to become an instrument of sustainable development. However, several conditions must be simultaneously present to ensure the success of agricultural credit, as will be discussed below.

Use of Agricultural Labourers

In principle, in the context of subsistence agriculture, the family unit uses the labour from the family unit alone. As there is no production surplus for the market, there will not be any cash to pay for labour requirements. However, certain societies use labour reciprocity arrangements when there is a shortage of labour during peak production periods or other ritual arrangements.

In the 2009 Agriculture Census a total number of 3,045 paid labourers were recorded (Table 11), a nearly 50% increase from 1999. In 2009, the largest concentration of labourers employed was in Savaii (41 %) followed by Rest of Upolu (26 %), North West Upolu (24%) and the Apia Urban Area (9%). It is not clear if this distribution follows the location of the 3% of households with the intention of producing a surplus for the market. In 1999, 87 % of labourers were males, a decade later in 2009 the proportion increased to 94 %. Currently female labour accountsfor 5 % of the total number agricultural labourers.

Table 11. Regional Distribution of Labourers by Gender

Region	Total	Male		Female		
		Number	As % of total	Number	As % of total	Not stated
Samoa	3045	2869	94	148	5	28
Apia Urban Area	260	255	98	5	2	0
North West Upolu	736	676	92	59	8	1
Rest of Upolu	801	789	97	9	2	3
Savaii	1248	1149	92	75		24

Source: Own elaboration based on Bureau of Statistics Agriculture Census Analytical Report 2009, Samoa 2012, Table 4.15, Table 4.16

It is important to keep in mind that vegetables and fruits, though they command high- value market- prices as compared with, for example, staple crops, are perishable and labour intensive. The success of a vegetable\fruit operation requires large amounts of non-family labour during peak times, remunerative prices and adequate market arrangements so they reach the final consumer at the right time to avoid losses by spoilage or late delivery. In short, though the potential earnings from the production of vegetables/fruits are higher than staple crops, the organizational arrangements and capital needed for a successful campaign are challenging.

Income from agricultural production

The 2009 Agriculture Census starkly states that.. "agriculture in Samoa is to a large extent for home consumption." Half of the total agricultural holdings (51%) reported that they have not earned anything from the last cropping season. The relative proportion of agricultural holdings failing to earn any income is even higher in the Apia area (68%) and Northwest Upolu (61%). In Savaii and the Rest of Upolu, seemingly sales from the farms were a little better, since 47% and 41%, failed to earn income from the cropping season, respectively.[23]

Nonetheless, the Agricultural Census notes that two decades ago " Savaii agriculture was an income earner for almost all households, with 86 % of holdings deriving some income and only 14 % deriving no income from their agricultural activity."[24] Regrettably, the Agricultural Census does not collect information on productivity [yields], or prices [different markets, seasons] to analyze why there is only 3% of the agricultural holdings producing surplus for the market.

Summary

All evidence depicts Samoa's farming systems as characterized by closely interdependent production activities which links crops with trees. This appears to condition a narrow base for production. It is confined to a few root crops, vegetables and fruits that are grown unevenly on a small scale, plus coconuts and cocoa grown as cash crops. In the absence of incentives to produce surplus for the market, the prevailing circumstances might induce households to gear production towards meeting the subsistence needs of the family unit, in particular if there is cash available from remittances. Also some root crops like yams are cultivated as cyclone relief.
It is possible that the prevailing level of technology compounded by the limited availability of credit may have consolidated both, the atomization of the market participation and the fragmentation of the land use. Unintentionally, the overall the result has been the amplification of agricultural holdings into operations geared towards home consumption alone.

[23] Bureau of Statistics Agriculture Census Analytical Report 2009, Samoa 2012, page 43

[24] Bureau of Statistics Agriculture Census Analytical Report 2009, Samoa 2012, page43

A. Organic Agriculture Module

Selected Agro-Economic Coefficients [in preparation]

Table A.1 Coconut: On-farm Investment Cost per Beneficiary [rural household family] [estimated in USD]

Item	Year 1	Year 2-6	Total
Equipment: tractor for nut collection; facility for VSO production process, 20ft drier, tools for oil extraction	5 618	28 090	33 708
Plant material [testing-chemical equipment]	1 136	5 680	6 816
Total	6 754	33 770	40 524

Source: Estimates based on WBDI cost information from previous similar operations
USD 1.00 = T$ 2.20

Table A2. Coconut: On-farm Training Cost per Beneficiary [rural household family] [estimated in USD]

Item	Year 1	Year 2-6	Total
Equipment:	1 364	6 820	8 184
Plant material training	1 818	9 090	10 908
Transportation	1 636	8 180	9 816
Staff allowance and accommodations	1 364	6 820	8184
Total	6 182	30 910	37 092

Source: Estimates based on WBDI cost information from previous similar operations
USD 1.00 = T$ 2.20

Table A3 Misiluki: On-farm Investment Cost per Beneficiary [rural household family] [estimated in USD]

Item	Year 1	Year 2-6	Total
Equipment for harvesting, packing, handling in crates for Transportation and storage	3 364	16 820	20 184
Plant material [testing]	909	4 545	5 454
Total	4 273	21 365	25 638

Source: Estimates based on WBDI cost information from previous similar operations
USD 1.00 = T$ 2.20

Table A4 Misiluki: On-farm Training Cost per Beneficiary [rural household family] [estimated in USD]

Item	Year 1	Year 2-6	Total
Equipment:	909	4 545	5 454
Plant material and training	1 818	9 090	10 908
Transportation	1 636	8 180	9 816
Staff allowance and accommodation	1 364	6 820	8 184
Total	5 727	28 635	34 362

Source: Estimates based on WBDI cost information from previous similar operations
USD 1.00 = T$ 2.20

Table A5. Pawpaw : On-farm Investment Cost per Beneficiary [rural household family] [estimated in USD]

Item	Year 1	Year 2-6	Total
Equipment and tools for land clearing, compost, cutters	475	2375	2850
Plant material, different varieties of seed, trays, packaging	363	1815	2178
Designated storage room, tables, crates	1136	5680	6816
Total	1974	9870	11844

Source: Estimates based on WBDI cost information from previous similar operations
USD 1.00 = T$ 2.20

Table A6. Pawpaw : On-farm Training Cost per Beneficiary [rural household family] [estimated in USD]

Item	Year 1	Year 2-6	Total
Equipment:	1363	6815	8178
Plant material and training	1136	5680	6816
Transportation	1636	8180	9816
Staff allowance and accommodation	1363	6815	8178
Total	5498	27490	32988

Source: Estimates based on WBDI cost information from previous similar operations
USD 1.00 = T$ 2.20

Table A7. Nonu: On-farm Investment Cost per Beneficiary [rural household family] [estimated in USD]

Item	Year 1	Year 2-6	Total
Equipment, land, tools for clearing farm, cutters & others	293	1465	1758
Plant material, seed, saving trays, packaging	341	1705	2046
Crates for storage	455	2275	2730
Total	1089	5445	6534

Source: Estimates based on WBDI cost information from previous similar operations
USD 1.00 = T$ 2.20

Table A8. Nonu : On-farm Training Cost per Beneficiary [rural household family] [estimated in USD]

Item	Year 1	Year 2-6	Total
Equipment	909	4545	5454
Plant material for training	1136	5680	6816
Transportation	1636	8180	9816
Staff allowance and accommodation	1364	6820	8184
Total	5045	25225	30270

Source: Estimates based on WBDI cost information from previous similar operations
USD 1.00 = T$ 2.20

Table A.9 Laupele : On-farm Investment Cost per Beneficiary [rural household family] [estimated in USD]

Item	Year 1	Year 2-6	Total
Equipment, tools for clearing farm, plating materials, compost, water-tank for irrigation	1384	6920	8304
Plant materials, tree cuttings and packaging	455	2275	2730
Storage room and tables.	682	3410	4092
Total	2521	12605	15126

Source: Estimates based on WBDI cost information from previous similar operations
USD 1.00 = T$ 2.20

Table A10. Laupele: On-farm Training Cost per Beneficiary [rural household family] [estimated in USD]

Item	Year 1	Year 2-6	Total

Equipment	1136	5680	6816
Plant material for training	1136	5680	6816
Transportation	1636	8180	9816
Staff allowance and accommodations	1636	8180	9816
Total	5544	27720	33264

Source: Estimates based on WBDI cost information from previous similar operations
USD 1.00 = T$ 2.20

Table A11. Coconut : Estimates for Labour Requirements for One Unit of Production During One Campaign [1 ha]

Activity	Male		Female		Total
	15-25 years	26 -60 years	15-25 years	26 -60 years	
Land preparation	120	80	20	120	340
Seedling/transplanting	50	120	50	30	250
Weeding	150	120	-	40	310
Spraying	-	-	-	-	
Watching	50	110		15	175
Harvesting					
Total	370	430	70	205	1075

Source: Estimates based on WBDI cost information from previous similar operations

Table A12. Misiluki : Estimates for Labour Requirements for One Unit of Production During One Campaign [1 ha]

Activity	Male		Female		Total
	15-25 years	26 -60 years	15-25 years	26 -60 years	
Land preparation	219	299	232	299	1049
Seedling/transplanting	120	200	30	250	600
Weeding	150	250	100	150	650
Spraying	-	10	-	-	10
Watching	-	120	-	-	120
Harvesting	60	100	-	-	160
Total	549	979	362	699	2589

Source: Estimates based on WBDI cost information from previous similar operations

Table A13. Pawpaw: Estimates for Labour Requirements for One Unit of Production During One Campaign [1 ha]

Activity	Male		Female		Total
	15-25 years	26 -60 years	15-25 years	26 -60 years	
Land preparation	30	120	80	150	380
Seedling/transplanting	30	150	120	200	500
Weeding	-	-	100	150	250
Spraying	-	-	-	-	-
Watching	-	30	-	50	80
Harvesting	20	-	15	20	55
Total	80	300	315	570	1265

Source: Estimates based on WBDI cost information from previous similar operations

Table A14. Nonu: Estimates for Labour Requirements for One Unit of Production During One Campaign [1 ha]

Activity	Male		Female		Total
	15-25 years	26 -60 years	15-25 years	26 -60 years	
Land preparation	30	150	80	200	460
Seedling/transplanting	20	120	25	145	310
Weeding	50	50	12	130	242
Spraying					
Watching	10	100	14	126	250
Harvesting	20	120	20	156	316
Total	130	540	151	757	1578

Source: Estimates based on WBDI cost information from previous similar operations

Table A15. Laupele: Estimates for Labour Requirements for One Unit of Production During One Campaign [1 ha]

Activity	Male		Female		Total
	15-25 years	26 -60 years	15-25 years	26 -60 years	
Land preparation	16	30	11	25	82
Seedling/transplanting	9	25	8	30	72
Weeding	5	20	7	25	57

Spraying					
Watching					
Harvesting	5	5	12	20	42
Total	35	80	38	100	253

Source: Estimates based on WBDI cost information from previous similar operations

Table A16. Organic Agriculture Development: Preliminary Agro-Economic Coefficients at Full Development

[As these are yearly costs financing is required for six years]

Crop	Yield [ton/ ha] Or [unit/ha]	Farm-gate Price [$/ ton]	Gross value production [$]	Start up cost [$/ ha/year]	Labour requirements [days/year]	Training cost household/$ /year	Net Return per ha [$]
Coconut				6754	1075	6182	
Misiluki				4273	2589	5727	
Pawpaw				1974	1265	5498	
Nonu				1089	1578	5045	
Laupele				2521	253	5544	

The design of the experiment is structurally simple. There will be two arms – a control and a treatment. The treatment arm will receive the intervention package while the control will not. However, both groups will be surveyed at baseline, in the middle of the project's lifetime, and at the end of the project. It is imperative that the intervention package is applied in a consistent manner to all members of the treatment group to ensure that any conclusions drawn from the results are directly attributable to project activities.

Outcomes of Interest
The major outcomes of interest are women's enterprise outcomes and their household welfare. These include (but are not limited to): i) net revenues generated from agricultural production; ii) child health; iii) educational outcomes; iv) changes in savings behaviour; v) investment in assets (both household and enterprise); vi) improved nutrition; vii) clean water; and viii) sanitation.

Effect and Sample Size
Sample size is limited by budget. Based on a hypothesised effect size, the sample size is calculated using standard assumptions on power and precision, i.e. 80% and 0.05 respectively. Assuming a positive effect of a 10% increase in the value of income generated[1], a sample size of about 200 households would be needed. The household survey to be conducted under Output 2.2.1 (Outcome 2.2) will serve as the baseline survey. This survey will cover at least 100 villages and is consequently expected to include ~5,000 households. Participants in the livelihoods interventions will be selected from amongst these households and compared to non-participants from the same survey. The control group will be selected to closely match the treatment group with regard to socio-economic and other factors, in order to minimise the effect of any confounding variables on the outcome of interest.

Timeframe
The outcomes of interest will be measured at logical points during the project lifecycle of 6 years. The baseline survey will be conducted prior to implementation of project interventions. Measuring outcomes of interest will be repeated as part of the mid-term review of the project, which will occur after at least one year of the interventions having been delivered. This survey will be repeated again during the final terminal evaluation as the endline survey after the full 6 year term of the project.

Surveys
A baseline survey will be conducted before any project activities take place (estimated cost of $200,000 for data collection and analysis). This survey will collect important demographic and socio-economic data, including gender and age disaggregated information. These data will also include important outcome variables of interest such as income, child and family health indicators, enterprise profits and asset holdings. After initiating intervention activities, a midline survey will be conducted as part of the project mid-term review. The midline survey will collect the same information as the baseline and allow evaluators more detail on the dynamics of the intervention. Finally, after all intervention activities have been concluded (i.e. the intervention period as specified by the plan has come to its logical end) an endline survey will be conducted. Again, the same information will be gathered as during the baseline survey. The endline will allow evaluators to compare the DID between the treatment and control groups to analyse the impact that the intervention had on the target population.

Technical Expertise Required
A specialist will be engaged to:
- design and administer the household survey covering 100 villages (~5,000 households) for the baseline assessment;
- analyse the survey data to identify potential control and treatment groups;
- develop guidelines for midline and endline surveys to ensure that data is collected in a consistent manner; and
- Produce a detailed report on baseline information relating to outcomes of interest (including those described in this document and/or other appropriate measures).

[1] As evidenced increased savings, investment into assets, etc.

ENVIRONMENTAL AND SOCIAL SCREENING SUMMARY

Name of Proposed Project: Economy-wide integration of CC Adaptation and DRM/DRR to reduce climate vulnerability of communities

A. Environmental and Social Screening Outcome

☐Category 1. No further action is needed

☒Category 2. Further review and management is needed. There are possible environmental and social benefits, impacts, and/or risks associated with the project (or specific project component), but these are predominantly indirect or very long-term and so extremely difficult or impossible to directly identify and assess.

☒Category 3. Further review and management is needed, and it is possible to identify these with a reasonable degree of certainty. If Category 3, select one or more of the following sub-categories:

> ☒Category 3a: Impacts and risks are limited in scale and can be identified with a reasonable degree of certainty and can often be handled through application of standard best practice, but require some minimal or targeted further review and assessment to identify and evaluate whether there is a need for a full environmental and social assessment (in which case the project would move to Category 3b). See Section 3 of the Review and Management Guidance.
>
> ☐Category 3b: Impacts and risks may well be significant, and so full environmental and social assessment is required. In these cases, a scoping exercise will need to be conducted to identify the level and approach of assessment that is most appropriate. See Section 3 of Review and Management Guidance.

B. Environmental and Social Issues (for projects requiring further environmental and social review and management)

1. The project includes activities that could affect indigenous groups, as it will undertake reconstruction activities as well as development of alternative and diversified livelihoods. Village plans will be designed and implemented for 100 communities to respond, prepare, and recover from CC risks. However, communities may not perceive benefits of the application of climate sensitive adaptation measures and planning processes. Consequently, indigenous groups must be included in these activities, which may necessitate additional training and support to these groups. 2. The project is meant to promote gender equality through outputs influencing livelihoods and capacity-building of communities. However, if the project employs techniques and technologies that are not gender-sensitive, they may increase inequity between men and women or change their social roles in a way that reduces self-reliance. 3. The project will involve interventions which could affect communities directly and indirectly, such as construction of climate-proof flood protection infrastructure and

reconstruction of community assets following the "build-back-better" approach. The project will also revise watershed management plans that will likely lead to revision of land-use planning . These interventions may lead to land disputes amongst village members, adversely affecting village adaptation measures or community visioning and land use planning. These interventions could also have direct and indirect impacts in market patterns and businesses. 4. Construction of flood protection infrastructure could result in increased settlement in areas where the infrastructure has reduced hazard risk. The potential environmental and social effects associated with this will be assessed during the development of the integrated watershed management plan and the design of the flood protection infrastructure. Appropriate mitigation responses for any negative impacts will be clearly elaborated in the design of proposed interventions.

C. Next Steps (for projects requiring further environmental and social review and management):

This project underwent further environmental and social review during the PPG phase. Main outcomes of this screening include: - The proposed interventions finalised during the PPG phase are community-centred and gender-sensitve. Project activities include design and implementation of Village Disaster Management Plans for 100 communities to prepare for, respond to and recover from CC risks. Indigenous groups will be engaged during the design and implementation of these plans. Household surveys will be conducted to identify vulnerabilities and design counter-measures to enhance resilience. Community members will also be trained on the implementation of these plans. In this way, the interventions will be sensitive to the socio-cultural context of each community. The implementation of Village Disaster Management Plans will focus on the specific needs of women and other vulnerable groups (e.g. the elderly, people with disabilities). - The flood protection infrastructure to be constructed by the project will be community-focussed. Prior to construction, comprehensive planning will be undertaken including vulnerability and adaptation assessments, gap analysis, feasibility plans, cost-benefit analyses, environmental impact assessments and social impact assessments. This planning will include extensive consultations with local communities to ensure that interventions maximise social and environmental benefits as well as minimise social and environmnetal costs. On the basis of these plans, all potential negative impacts will be adequately mitigated during implementation. The potential environmental and social effects associated with this will be assessed during the development of the integrated watershed management plan and the design of the flood protection infrastructure. Appropriate mitigation responses for any negative impacts will be clearly elaborated in the design of proposed interventions. - The flood protection infrastructure will be constructed within the Vaisigano River. The infrastructure design will be based on the integrated watershed management plan and include key design principles that will mitigate any potential vulnerability of the infrastructure itself to the impacts of flooding during construction. After completion of the infrastructure, it will serve to protect vulnerable communities from climate risks. - Reconstruction of community assets following the "build-back-better" principle will also be informed by the integrated watershed management plan. This plan will be based on community consultations that will identify at-risk communities and physical assets. Reconstruction of community assets will take place outside of hazard zones so that communities can relocate away from areas that will be impacted by climate risks. - Local communities will be involved during the design of the community assets to be reconstructed. Similarly to the flood protection infrastructure, community members will be fully involved in decision-making and implementation of interventions. This will include stakeholder meetings and other forms of community consultations. A strategy to solve land disputes that may arise among village members will be implemented

following the standard practices of the Government of Samoa, which has experience in dealing with such concerns. - Communities may not initially perceive benefits of the application of climate sensitive adaptation measures and planning processes. Consequently, indigenous groups will receive training and sensitisation on the inclusion of climate resilience and DRM in village development processes. This will build communities' capacity to identify and prioritise measures for climate change adaptation for implementation through support provided by this project as well as other on-going initiatives in Samoa. - The support of micro-businesses has been designed to safely integrate women into decision-making, implementation and monitoring phases of the project. This entails development of diversified livelihoods that will cater specifically to the needs of women through its complementarity with the work undertaken by the Women in Business Development initiative.

D. Sign Off

_____

Project Manager: claudia.ortiz

Signed Date: 2014-05-15

ENVIRONMENTAL AND SOCIAL SCREENING CHECKLIST

Name of Proposed Project: Economy-wide integration of CC Adaptation and DRM/DRR to reduce climate vulnerability of communities

QUESTION 1

Has a combined environmental and social assessment/review that covers the proposed project already been completed by implementing partners or donor(s)?

Answer to Question 1:. . . . . .No

QUESTION 2

Do ALL outputs and activities described ONLY fall in the Project Document fall within the following categories?

1. Procurement (in which case UNDP's Procurement Ethics and Environmental Procurement Guide need to be complied with)

2. Report preparation

3. Training

4. Event/workshop/meeting/conference (refer to Green Meeting Guide)

5. Communication and dissemination of results

Answer to Question 2:. . . . . .No

QUESTION 3

Does the proposed project include activities and outputs that support upstream planning processes that potentially pose environmental and social impacts or are vulnerable to environmental and social change (refer to Table 3.1 for examples)? (Note that upstream planning processes can occur at global, regional, national, local and sectoral levels)

Evaluation Result of Checklist Table 3.1:. . . . . .Yes

TABLE 3.1 EXAMPLES OF UPSTREAM PLANNING PROCESSES WITH POTENTIAL DOWNSTREAM ENVIRONMENTAL AND SOCIAL IMPACTS

1. Support for the elaboration or revision of global- level strategies, policies, plans, and programmes. For example, capacity development and support related to international negotiations and agreements. Other examples might include a global water governance project or a global MDG project.	No
2. Support for the elaboration or revision of regional-level strategies, policies and plans, and programmes. For example, capacity development and support related to transboundary programmes and planning (river basin management, migration, international waters, energy development and access, climate change adaptation etc.).	No
3. Support for the elaboration or revision of national-level strategies, policies, plans and programmes. For example, capacity development and support related to national development policies, plans, strategies and budgets, MDG-based plans and strategies (e.g. PRS/PRSPs, NAMAs), sector plans.	Yes
4. Support for the elaboration or revision of sub-national/local-level strategies, polices, plans and programmes. For example, capacity development and support for district and local level development plans and regulatory frameworks, urban plans, land use development plans, sector plans, provincial development plans, provision of services, investment funds, technical guidelines and methods, stakeholder engagement.	Yes

QUESTION 4

Does the proposed project include the implementation of downstream activities that potentially pose environmental and social impacts or are vulnerable to environmental and social change?

Evaluation Result of Checklist Table 4.1:. . . . . .Yes

TABLE 4.1 ADDITIONAL SCREENING QUESTIONS TO DETERMINE THE NEED AND POSSIBLE EXTENT OF FURTHER ENVIRONMENTAL AND SOCIAL REVIEW AND MANAGEMENT	
1. Biodiversity and Natural Resources	
1.1 Would the proposed project result in the conversion or degradation of modified habitat, natural habitat or critical habitat?	No
1.2 Are any development activities proposed within a legally protected area (e.g. natural reserve, national park) for the protection or conservation of biodiversity?	No
1.3 Would the proposed project pose a risk of introducing invasive alien species?	No

1.4 Would the proposed project pose a risk of introducing invasive alien species?	No
1.5 Does the project involve the production and harvesting of fish populations or other aquatic species without an accepted system of independent certification to ensure sustainability (e.g. the Marine Stewardship Council certification system, or certifications, standards, or processes established or accepted by the relevant National Environmental Authority)?	No
1.6 Does the project involve significant extraction, diversion or containment of surface or ground water? For example, construction of dams, reservoirs, river basin developments, groundwater extraction.	No
1.7 Does the project pose a risk of degrading soils?	No
2. Pollution	
2.1 Would the proposed project result in the release of pollutants to the environment due to routine or non-routine circumstances with the potential for adverse local, regional, and transboundary impacts?	No
2.2 Would the proposed project result in the generation of waste that cannot be recovered, reused, or disposed of in an environmentally and socially sound manner?	No
2.3 Will the propose project involve the manufacture, trade, release, and/or use of chemicals and hazardous materials subject to international action bans or phase-outs? For example, DDT, PCBs and other chemicals listed in international conventions such as the Stockholm Convention on Persistent Organic Pollutants, or the Montreal Protocol.	No
2.4 Is there a potential for the release, in the environment, of hazardous materials resulting from their production, transportation, handling, storage and use for project activities?	No
2.5 Will the proposed project involve the application of pesticides that have a known negative effect on the environment or human health?	No
3. Climate Change	
3.1 Will the proposed project result in significant greenhouse gas emissions? The Environment and Social Screening Procedure Guidance provides additional guidance for answering this question.	No
3.2 Is the proposed project likely to directly or indirectly increase environmental and social vulnerability to climate change now or in the future (also known as maladaptive practices)? You can refer to the Environment and Social Screening Procedure Guidance to help you answer this question. For example, a project that would involve indirectly removing mangroves from coastal zones or encouraging land use plans that would suggest building houses on floodplains could increase the surrounding population's vulnerability to climate change, specifically flooding.	No
4. Social Equity and Equality	

4.1 Would the proposed project have environmental and social impacts that could negatively affect indigenous people or other vulnerable groups?	Yes
4.2 Is the project likely to significantly impact gender equality and women's empowerment ?	Yes
4.3 Is the proposed project likely to directly or indirectly increase social inequalities now or in the future?	No
4.4 Will the proposed project have variable impacts on women and men, different ethnic groups, social classes?	No
4.5 Have there been challenges in engaging women and other certain key groups of stakeholders in the project design process?	No
4.6 Will the project have specific human rights implications for vulnerable groups?	No
5. Demographics	
5.1 Is the project likely to result in a substantial influx of people into the affected community(ies)?	No
5.2 Would the proposed project result in substantial voluntary or involuntary resettlement of populations? For example, projects with environmental and social benefits (e.g. protected areas, climate change adaptation) that impact human settlements, and certain disadvantaged groups within these settlements in particular.	No
5.3 Would the proposed project lead to significant population density increase which could affect the environmental and social sustainability of the project? For example, a project aiming at financing tourism infrastructure in a specific area (e.g. coastal zone, mountain) could lead to significant population density increase which could have serious environmental and social impacts (e.g. destruction of the area's ecology, noise pollution, waste management problems, greater work burden on women).	No
6. Culture	
6.1 Is the project likely to significantly affect the cultural traditions of affected communities, including gender-based roles?	No
6.2 Will the proposed project result in physical interventions (during construction or implementation) that would affect areas that have known physical or cultural significance to indigenous groups and other communities with settled recognized cultural claims?	No
6.3 Would the proposed project produce a physical "splintering" of a community? For example, through the construction of a road, powerline, or dam that divides a community.	No
7. Health and Safety	
7.1 Would the proposed project be susceptible to or lead to increased vulnerability to earthquakes,	No

subsidence, landslides, erosion, flooding or extreme climatic conditions? For example, development projects located within a floodplain or landslide prone area.	
7.2 Will the project result in increased health risks as a result of a change in living and working conditions? In particular, will it have the potential to lead to an increase in HIV/AIDS infection?	No
7.3 Will the proposed project require additional health services including testing?	No
8. Socio-Economics	
8.1 Is the proposed project likely to have impacts that could affect women's and men's ability to use, develop and protect natural resources and other natural capital assets? For example, activities that could lead to natural resources degradation or depletion in communities who depend on these resources for their development, livelihoods, and well-being?	No
8.2 Is the proposed project likely to significantly affect land tenure arrangements and/or traditional cultural ownership patterns?	No
8.3 Is the proposed project likely to negatively affect the income levels or employment opportunities of vulnerable groups?	No
9. Cumulative and/or Secondary Impacts	
9.1 Is the proposed project location subject to currently approved land use plans (e.g. roads, settlements) which could affect the environmental and social sustainability of the project? For example, future plans for urban growth, industrial development, transportation infrastructure, etc.	Yes
9.2 Would the proposed project result in secondary or consequential development which could lead to environmental and social effects, or would it have potential to generate cumulative impacts with other known existing or planned activities in the area? For example, a new road through forested land will generate direct environmental and social impacts through the cutting of forest and earthworks associated with construction and potential relocation of inhabitants. These are direct impacts. In addition, however, the new road would likely also bring new commercial and domestic development (houses, shops, businesses). In turn, these will generate indirect impacts. (Sometimes these are termed "secondary" or "consequential" impacts). Or if there are similar developments planned in the same forested area then cumulative impacts need to be considered.	Yes

Climate Change Adaptation - LDCF/SCCF Adaptation Monitoring and Assessment Tool

Goal: Support developing countries to become climate resilient by integrating adaptation measures in development policies, plans, programs, projects and actions
Impact: Reduced absolute economic losses at country level (including loss of life, property and ecosystem services) due to climate change, including variability
Indicator: Economic loss trend over a project period and beyond due to climate change, including variability
Metric: Total property loss per event in $US/ Number of people affected by event during the project lifetime (Use CRED or Country Data)

Project Title	**Economy-wide integration of CC Adaptation and DRM/DRR to reduce climate vulnerability of communities in Samoa**
GEF ID	**5264**
Country	**Samoa**
Agency	**UNDP**
Trust Fund	**LDCF**
LDCF/SCCF Objective	**CCA-1**
	CCA-2
	CCA-3
Project's Primary Sector	**Cross-sectoral**
AMAT Completion date	**21-Jul-14**
Person Responsible for Completing the AMAT	
Name	
Position	

LEGEND - Color Codes
INPUT- Please Fill In
No Entry Required

Climate Change Adaptation - LDCF/SCCF Adaptation Monitoring and Assessment Tool

Goal: Support developing countries to become climate resilient by integrating adaptation measures in development policies, plans, programs, projects and actions
Impact: Reduced absolute economic losses at country level (including loss of life, property and ecosystem services) due to climate change, including variability
Indicator: Economic loss trend over a project period and beyond due to climate change, including variability
Metric: Total property loss per event in $US/ Number of people affected by event during the project lifetime (Use CRED or Country Data)

Objective 1: Reduce vulnerability to the adverse impacts of climate change, including variability, at local, national, regional and global level

	Outcome and Output Indicators	Metric	Terminal Results		Target at CEO Endorsement		Baseline	
Outcome 1.1: Mainstreamed adaptation in broader development frameworks at country level and in targeted vulnerable areas								
			Number	**Type**	**Number**	**Type**	**Number**	**Type**
Indicator 1.1.1	Adaptation actions implemented in national/sub-regional development frameworks	Number and type			15	Sector plans	11	Sector plans
					0		0	
					0		0	
					0		0	
					0		0	
					0		0	
			Type	**YES/NO**	**Type**	**YES/NO**	**Type**	**YES/NO**
Indicator 1.1.2	For each action listedunder indicator 1.1.1, indicate which ones include adaptation budget allocation and targets	Yes =Y, No=N			-		-	
					-		-	
					-		-	
					-		-	
					-		-	
			Type	**Score**	**Type**	**Score**	**Type**	**Score**
Indicator 1.1.3	For each action listed under Indicator 1.1.1, indicate to what extent targets set out in plans have been met	Score: 1= Not significantly 2= Significantly 3= significantly			-		-	
					-		-	
					-		-	
					-		-	
					-		-	
					-		-	
					-		-	
Output 1.1.1: Adaptation measures and necessary budget allocations included in relevant frameworks								
			Type	**Level**	**Type**	**Level**	**Type**	**Level**
Indicator 1.1.1.1	Development frameworks that include specific budgets for adaptation actions	List type of development framework and briefly describe the level of the action			-		-	
					-		-	
					-		-	
					-		-	
					-		-	
					-		-	
			Type	**Level**	**Type**	**Level**	**Type**	**Level**
Indicator 1.1.1.2	Sectoral strategies that include specific budgets for adaptation actions	List type and level			#REF!	#REF!	-	
					#REF!	#REF!	-	
					#REF!	#REF!	-	
					#REF!	#REF!	-	
					-		-	
					-		-	
					-		-	
			Type	**Level**	**Type**	**Level**	**Type**	**Level**
Indicator 1.1.1.3	Regulatory reform and fiscal incentive structures introduced that incorporate climate change risk management	List type and level			-		-	
					-		-	
					-		-	
					-		-	
					-		-	
					-		-	
Outcome 1.2: Reduced vulnerability in development sectors								
Based on development sector(s) that project/program targets, select appropriate indicator(s) from list below or provide relevant indicator to track reduced vulnerability in targeted development sector:								
Indicator 1.2.1	Infection rates of population to climate- sensitive diseases as compared with past population infected per year similar climatic conditions (% change)	% change			0.00%		0% change	
			Female	**Male**	**Female**	**Male**	**Female**	**Male**
Indicator 1.2.2	% of targeted population covered by innovative insurance mechanisms (disaggregated by gender)	% disaggregated by gender			0%	0%		
Indicator 1.2.3	Number of additional people provided with access to safe water supply and basic sanitation services given existing and projected climate change	number disaggregated by gender			-		-	
Indicator 1.2.4	Increase in water supply targeted areas	tons/m^3			-		no increase	
Indicator 1.2.5	Increase in agricultural productivity in targeted areas	tons/ha			-		no increase	
Indicator 1.2.6	Water availability for energy production	(liters/gallons available for hydropower)						
Indicator 1.2.7	Energy production from hydropower	(kW/hr generated from hydro)			-		-	
Indicator 1.2.8	% change in projected food production in targeted area given existing and projected climate change	% change of food production (measured in tons/year)			0%		0% change	
Indicator 1.2.9	% change in food availability given existing and projected climate change	% change in food availability (measured in tons/year)			0%		0% change	
Indicator 1.2.10	% change in income generation in targeted area given existing and projected climate change	% change in income (US $)			0%		0% change	
			Female	**Male**	**Female**	**Male**	**Female**	**Male**
Indicator 1.2.11	% of population with access to improved flood and drought management	% of population disaggregated by gender			0%	0%	0%	0%
Indicator 1.2.12	% of livestock farmers covered by a monitoring and early warning and response action scheme for climate sensitive plants pests and diseases	% of livestock farmers			0%		0%	
Indicator 1.2.13	% of cropland area covered by a monitoring and early warning and response action scheme for climate sensitive plants pests and diseases	% of cropland area (Ha)			0%		0%	
			Female	**Male**	**Female**	**Male**	**Female**	**Male**
Indicator 1.2.14	Vulnerability and risk perception index (Score) - Disaggregated by gender	The score for this indicator will have to be assigned based on the results of a conducted survey. The score ranges from 1 to 5 and below are the explanations of the rankings: 1. Extreme Vulnerability 2. High Vulnerability 3. Medium Vulnerability 4. Low Vulnerability 5. No Vulnerability			-	-	-	-
					100	100	-	
					-		-	
					-		-	
					-		-	
					-		-	
Output 1.2.1: Vulnerable physical, natural and social assets strengthened in response to climate change impacts, including variability								
As with Outcome indicators, include or select indicators, include or select indicator(s) relevant to sector project/program is targeting:								
			Type	**Level**	**Type**	**Level**	**Type**	**Level**
Indicator 1.2.1.1	Health measures introduced to respond to climate sensitive disease	Type and level			-		-	
					-		-	
					-		-	
					-		-	
					-		-	
					-		-	
			Type	**Level**	**Type**	**Level**	**Type**	**Level**
Indicator 1.2.1.2	Resilient infrastructure measures introduced to prevent economic losses	Type and level			-		-	
					-		-	
					-		-	
					-		-	
					-		-	

					-	-				
			Type	Level	Type	Level	Type	Level		
Indicator 1.2.1.3	Climate resilient agricultural practices introduced to promote food security	Type and level			-	-	-	-		
					-	-	-	-		
					-	-	-	-		
					-	-	-	-		
					-	-	-	-		
			Type	Level	Type	Level	Type	Level		
Indicator 1.2.1.4	Sustainable drinking water management practices introduced to increase access to clean drinking water	Type and Level			-	-	-	-		
					-	-	-	-		
					-	-	-	-		
					-	-	-	-		
					-	-	-	-		
			Type	Level	Type	Level	Type	Level		
Indicator 1.2.1.5	Sustainable water management practices introduced to increase access to irrigation water under existing and projected climate change	Type and level			-	-	-	-		
					-	-	-	-		
					-	-	-	-		
					-	-	-	-		
					-	-	-	-		
			Type	Level	Type	Level	Type	Level		
Indicator 1.2.1.6	Sustainable water management practices introduced to increase energy production from water resources under existing and projected climate change	Type and level			-	-	-	-		
					-	-	-	-		
					-	-	-	-		
					-	-	-	-		
					-	-	-	-		
			Type	Level	Type	Level	Type	Level		
Indicator 1.2.1.7	Type and level of innovative insurance mechanisms introduced to reduce climate-induced damages	Type and Level			-	-	-	-		
					-	-	-	-		
					-	-	-	-		
			Type	Level	Type	Level	Type	Level		
Indicator 1.2.1.8	Type and level of integrated disaster response measures to extreme climate events introduced to increase number of lives saved	Type and level			Disaster Risk Management Plans	Local (village)	None	N/A		
					-	-	-	-		
					-	-	-	-		
					-	-	-	-		
					-	-	-	-		
					-	-	-	-		
					-	-	-	-		
					-	-	-	-		
					-	-	-	-		
Outcome 1.3: Diversified and strengthened livelihoods and sources of income for vulnerable people in targeted areas										
			Female	Male	Female	Male	Female	Male		
Indicator 1.3.1	Households and communities have more secure access to livelihood assets	Score - Disaggregated by gender. *Score for this indicator will have to be assigned based on the results of a conducted survey. The score ranges from 1 to 5 and below are the explanations of the rankings: 1. No access to livelihood assets 2. Poor access to livelihood assets 3. Moderated access to livelihood resources 4. Secure access to livelihood resources 5. Very secure access to livelihood resources*			4	4	2	2		
Indicator 1.3.2	% increase per capita income of farm households due to adaptation measures applied	%			0%		0 % increase			
Indicator 1.3.3	% increase per capita income of households outside of climate change vulnerable sectors due to adaptation measures applied	%			0%		0% increase			
Output 1.3.1: Targeted individual and community livelihood strategies strengthened in relation to climate change impacts, including variability										
Indicator 1.3.1.1	% of targeted households that have adopted resilient livelihoods under existing and projected climate change	%			0%		0 targeted households			
Objective 2: Increase adaptive capacity to respond to the impacts of climate change, including variability, at local, national, regional and global level										
Outcome 2.1: Increased knowledge and understanding of climate variability and change-induced risks at country level and in targeted vulnerable areas										
Indicator 2.1.1	Relevant risk information disseminated to stakeholders (yes/no)	Yes=1, No=0								
Output 2.1.1: Risk and vulnerability assessments conducted and updated										
Indicator 2.1.1.1	Updated risk and vulnerability assessment	Yes=1, No=0								
Indicator 2.1.1.2	Risk and vulnerability assessment conducted	Yes=1, No=1								
Output 2.1.2.: Systems in place to disseminate timely risk information										
			Number	Type	Number	Type	Number	Type		
Indicator 2.1.2.1	Type and No. of monitoring systems in place	Number and type of monitoring systems			0		0			
					0	-	0	-		
					0	-	0	-		
					0	-	0	-		
					0	-	0	-		
Outcome 2.2: Strengthened adaptive capacity to reduce risks to climate-induced economic losses										
			Number	Type	Number	Type	Number	Type		
Indicator 2.2.1	No. and type of targeted institutions with increased adaptive capacity to reduce risks of and response to climate variability	Number and Type			100	Local communities (villages)	0	Local communities (villages)		
					0	-	0	-		
					0	-	0	-		
					0	-	0	-		
					0	-	0	-		
					0	-	0	-		
			Female	Male	Female	Male	Female	Male		
Indicator 2.2.2	Capacity perception index	Score (1 - 5) to be disaggregated by gender 1. No capacity built 2. Initial Awareness raised (e.g workshops, seminars) 3. Substantial training in practical application (e.g. vocational training) 4. Knowledge effectively transferred (e.g. passing examination, certification) 5. Ability to apply or disseminate knowledge demonstrated			-		-	-		
Indicator 2.2.3	Reduced annual property losses from baseline	Change in annual losses $US in the project area					US $0			
Output 2.2.1: Adaptive capacity of national and regional centers and networks strengthened to rapidly respond to extreme weather events										
			Mid -Term Results		Target at CEO Endorsement				Baseline			
Indicator 2.2.1.1		Theme:	Female	Male	Theme:	Female	Male		Theme:	Female	Male
	No. of staff trained on technical adaptation themes (disaggregated by gender). Themes: - Monitoring/Forecasting capacity (Early Warning System (EWS), Vulnerability mapping system) - Policy reform -Capacity development Sustainable forest management - Agriculture diversification - Improved resilience of agricultural systems - Strengthening infrastructure - Supporting livelihoods - Mangrove reforestation - Coastal drainage/irrigation system - Community-based adaptation - Erosion control/soil water conservation - Microfinance - Special Programs for women - Livelihoods - Water storage - Information and communication technologies (ICT) and information dissemination - Other										
			Mid-term Results		Target at CEO Endorsement				Baseline			
Output 2.2.2: Targeted population groups covered by adequate risk reduction measures										
			Female	Male	Female	Male	Female	Male		
Indicator 2.2.2.1	% of population covered by climate change risk measures (disaggregated by gender)	%			0.00%	0.00%	0%	0%		
Outcome 2.3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level										
			Female	Male	Female	Male	Female	Male		
Indicator 2.3.1	% of targeted population awareness of predicted adverse impacts of climate change and appropriate responses	Score (1 - 3) disaggregated by gender. The explanations of the rankings are based on survey results. The score ranges from 1 to 3: 1. No awareness level (< 50% correct) 2. Moderate awareness level (50-75%) 3. High awareness level (> 75% correct)			-		-	-		
Indicator 2.3.2	% of population affirming ownership of adaptation processes	% of population affirming ownership disaggregated by gender			0%	0%	0%	0%		
Output 2.3.1: Targeted population groups participating in adaptation and risk reduction awareness activities										
			Type	Scope	Type	Scope	Type	Scope		
Indicator 2.3.1.1		Type and Scope			-		-	-		
	Risk reduction and awareness activities introduced at local level. Examples: - Monitoring/Forecasting capacity (EWS, Vulnerability mapping system) - Policy reform - Capacity reform - Agriculture diversification - Improved resilience of agricultural systems				-	-	-	-		
					-	-	-	-		
					-	-	-	-		
					-	-	-	-		
					-	-	-	-		
					-	-	-	-		

	- Irrigated/resilience of agricultural systems - Sustainable forest management - Strengthening infrstructure - Supporting livelihoods -Mangrove reforestation - Coastal drainage / irrigation system - Community-based adaptation - Erosion control/sustainable land and water management - Microfinance - Special programs for women - Livelihoods - Water storage - ICT and information dissemination - Other				-	-	-	-		
			Number	Type	Number	Type	Number	Type		
Indicator 2.3.1.2	No. and type of community groups trained in claimte change risk reduction	Number and Type			0		0			
					0	-	0	-		
					0		0			
					0		0			
					0		0			
					0	-	0	-		
					0		0			

Objective 3: Promote transfer and adoption of adaptation technology

	Outcome and Output Indicators	Metric	Mid-Term Results		Target at CEO Endorsement			Baseline		
Outcome 3.1: Successful demonstration, deployment, and transfer of relevant adaptation technology in targeted areas										
Indicator 3.1.1	% of targeted groups adopting adaptation technologies by technology type (% disaggregated by gender)	% disaggregated by gender	Female	Male	Type	Female	Male	Type	Female	Male
		Type								
					Household-level processing equipment for	70	N/A	Household-level processing	N/A	N/A
					Sewing machines for handicraft production	70	N/A	Sewing machines for handicraft	N/A	N/A
					-	-	-	-	-	-
					-	-	-	-	-	-
			Mid-Term Results		Target at CEO Endorsement			Baseline		
Output 3.1.1: Relevant adaptation technology transferred to targeted groups										
Indicator 3.1.1.1	Type of adaptation technologies transferred to targeted groups.	Type						None		
			Type of technology	No. of HH	Type of technology	No. of HH		Type of technology	No. of HH	
Indicator 3.1.1.2	Type of relevant climate change adaptation technology implemented in selected areas by participatory stakeholders	Number of Households			-	0		-	0	
					-	0		-	0	
					-	0		-	0	
					-	0		-	0	
					-	0		-	0	
Outcome 3.2: Enhanced enabling environment to support adaptation-related technology transfer										
Indicator 3.2.1	Policy environment and regulatory framework for adaptation-related technology transfer established or strengthened	Score (1 - 5) . Explanations of the rankings: 1. No policy/regulatory framework for adaptation - related technology transfer in place 2. Policy/regulatory framework for adaptation-related technology transfer have been discussed and formally proposed 3. Policy/regulatory framework for adaptation-related technology transfer have been formally proposed but not adopted 4. Policy/regulatory framework for adaptation-related technology transfer have been formally adopted by the Government but have no enforcement mechanism 5. Policy/regulatory framework for adaptation-related technology transfer are enforced			-			-		
			Female	Male	Female	Male		Female	Male	
Indicator 3.2.2	Strengthened capacity to transfer appropriate adaptation technologies	Score (1-3) disaggregated by gender: 1. No capacity achieved (< 50% correct) 2. Moderate capacity achieved (50 - 75%) 3. High capacity achieved (>75% correct)			-	-		-	-	
Output 3.2.1: Skills increased for relevant individuals in transfer of adaptation technology										
			Female	Male	Female	Male		Female	Male	
Indicator 3.2.1.1	No. of individuals trained in adaptation-related technologies	Number of individuals disaggregated by gender			-			-		
Output 3.2.2: Relevant policies and frameworks developed and adopted to facilitate adaptation technology transfer										
Indicator 3.2.2.1	No. of policies developed or strengthened	Number of policies								

Annex 13. Sample Terms of Reference for Project Staff

The terms of reference here outline key functions for staff positions and should be further elaborated as necessary.

Project Manager

The Project Manager will be accountable to the MNRE CEO as well as the ACEO GEF Unit for overall management of the project, including ensuring that the project activities are carried out according to the required standards of quality and timeliness. In collaboration with the Finance and Procurement Officer, the Project Manager will provide overall monitoring of the use of funds, the procurement of materials/equipment and the recruitment of personnel. In addition, he/she will provide guidance on the strategic direction of the project. Responsibilities include:

- Facilitate the establishment of the project management structure during the inception phase and ensure that all members of the project management are aware of their roles and responsibilities.
- Ensuring effective partnerships and active engagement of all stakeholders within GoS, development partners, NGOs and local communities.
- Manage project resources (human and financial) to achieve project results in line with the project document.
- Monitor project activities and financial management of the project to ensure the project is on-track and on-budget. This includes development and adherence to:
    - annual and quarterly workplans;
    - procurement and recruitment plans; and
    - M&E framework.
- Ensure reporting requirements are met in timely manner, including Annual Progress Reports, Inception Report, Quarterly Reports, Mid-Term Review and Final Terminal Evaluation.
- Report and provide feedback on project strategies, activities, progress and challenges to the Project Board.
- Finalise TORs for key positions as well as recruit and supervise specialists hired for implementation of the project.
- Give guidance and provide reviews of technical specifications of project outputs and activities.
- Review and refine project indicators and baseline information as needed.
- Update project risk log.
- Day-to-day oversight and coordination of implementation of project activities

Finance & Procurement Officer

The Finance & Procurement Officer will ensure timely project delivery, financial management, transparent reporting/record keeping and procurement/recruitment according to annual workplans and procurement plans. Responsibilities include:

- Standardise the finance and accounting systems of the project while maintaining compatibility with the government and UNDP financial accounting procedures.
- Prepare revisions of the budgets including verifying budget and accounting data by researching files, calculating costs and estimating anticipated expenditures from readily available information sources.
- Process all types of payments requests for settlement purposes including quarterly advances to the partners upon joint review.
- Prepare status reports, progress reports and other financial reports.
- Prepare periodic accounting records by recording receipts; managing disbursements (ledgers, cashbooks, vouchers, etc.); reconciling data for recurring or financial special reports and assisting in the preparation of annual procurement plans.
- Undertake project financial closure formalities including submission of terminal reports, transfer and disposal of equipment, processing of semi-final revisions and support professional staff in preparing the terminal assessment reports.
- Assist in the timely issuance of contracts and the assurance of other eligible entitlements of the project personnel, experts, and consultants by preparing annual recruitment plans.

- Regular review of the overall project balance ensuring that expenditure is within the project budget.
- Prepare of annual budgets to support the annual and quarterly workplans, ensuring that budgeted amounts and expected disbursement schedules are reasonable, and remaining funds are sufficient
- Draft procurement/recruitment plan to support agreed workplan.
- Inform Project Manager and Project Board of financial/operational issues affecting project delivery and propose budget revisions/adjustments as necessary.
- Execute procurement and recruitment plan including procurement of equipment, materials and other goods as well as recruitment of project personnel, technical assistance and other services.
- Manage payroll and cash reserves of the project
- Prepare quarterly expenditure report, and request cash advance from UNDP.
- Manage financial and administrative aspects of project assets, maintain registers for inventory of non-expendable equipment and ensure that the equipment is safe and in proper working condition, providing regular updates to inform further implementation (e.g. next phase of station installation)
- Prepare financial/operational progress reports for project team, PB, or other meetings
- Identify reporting challenges and make adjustments to internal reporting procedure as necessary to address problems (if any), ensure that the minimum reporting requirements are met
- Ensure documentation and records are up-to-date and complete, meeting audit standards
- Support the regular monitoring, as well as evaluation and audit processes by providing reports, supporting documentation and other information as needed
- Provide information as needed for other purposes or ad hoc requests (e.g. UNDP or donor request, publications, communication materials, etc…)

Administration Officer

The Administration Officer will provide general administrative support to the MNRE Climate Change Unit. Responsibilities include:

- Participate in day-to-day activities relating to implementation of Climate Change Unit activities.
- Provide support to the preparation and distribution of reports, meeting minutes and communication materials as necessary.
- Keep calendar of meetings, workshops, and training programmes; facilitate their organisation and logistical arrangements.
- Maintain the electronic and physical filing system for documentation and communication.

Senior Knowledge Management and Communications Officer

The Senior Knowledge Management and Communications Officer will support the MNRE Climate Change Unit by providing information pertaining to up-to-date scientific knowledge and information on climate change effects and adaptation interventions. This officer will also support communication of this and other relevant information to relevant stakeholders as necessary as input into the development of training for GoS staff and communities on climate change adaptation. Responsibilities include:

- Develop and disseminate knowledge products on climate change adaptation using information from international best practices, the national database and lessons learned from this project.
- Compilation, analysis and interpretation of relevant information to development of synthesis papers, case studies and concepts to support integration of adaptation into sector plans, the National Climate Change Adaptation Strategy and the revisions to SDS.
- Provide technical information on medium- to long-term climate change effects and adaptation to inform recommendations for sector plans and national strategies.
- Provide technical information on medium- to long-term climate change effects and adaptation to support management and implementation of climate change adaptation activities across all sectors as well as those carried out by development partners and NGOs.
- Provide guidance on information relevant to training local communities, particularly science-based guidelines to prioritisation and design of community-based projects for climate change adaptation.
- Support the MNRE Climate Change Unit on establishing and managing the national climate and disaster risk database.

- Support the MNRE Climate Change Unit to conduct awareness campaigns on water resources, land management, village development, climate change adaptation and DRM.
- Support the MNRE Climate Change Unit to establish a national M&E framework with guidelines for collecting, analysing and reporting of data on water resources, land management, village development, climate change adaptation and DRM.

Principal Climate Change Policy Officer

The Principle Climate Change Policy Officer will support the Climate Change Unit to ensure the mainstreaming of climate change adaptation and disaster risk management into all sector plans and the SDS, as well as to develop a National Climate Change Adaptation Strategy. Responsibilities include:

- Identify entry points for climate change adaptation/DRM within current policy, strategy and planning frameworks.
- Coordinate the integration of the latest scientific knowledge on climate change adaptation into the revision of sector plans and the SDS, including gathering relevant information (in collaboration with the Senior Knowledge Management and Communications Officer)
- Support the development of recommendations for sector policies, plans and strategies to include explicit consideration of climate change adaptation and DRM.
- Collaborate with the development of a National Climate Change Adaptation Strategy.
- Contribute to the development of guidelines for preparation of public expenditure reviews that include an analysis of climate expenditure.
- Assist with development of advocacy material for policy integration for the use of national policy- and decision-makers, with particular reference to the effect of climate change on development as well as options for adaptation and DRM.
- Ensure gender mainstreaming in all revisions of policies, plans and strategies.
- Provision of advice and support through technical assistance to other project staff, as required.

ANNEX 14: OFFLINE RISK LOG

#	Description	Date Identified	Type	Impact & Probability	Countermeasures / Mngt response	Owner	Submitted, updated by	Last Update	Status
1	Poor coordination with AF and PPCR projects reduces opportunities for collaboration and alignment with interventions under LDCF project.		Operational & Strategic	P = 2 I = 2	Develop strong coordination arrangements between LDCF project and AF/PPCR projects. Use common members of Project Board (PB) and Technical Advisory Team (TAT) to coordinate workplans and procurement processes. Ensure regular communications of updates between project boards.	MoF, MNRE, and UNDP			
2	Delays in progress of baseline projects prevent implementation of interventions under LDCF.		Operational & Strategic	P = 2 I = 2	Ensure regular communication of targets and workplans between LDCF and baseline projects. When delays seem imminent, PB members to advocate for accelerating processes or design alternative strategies to deliver on outputs.	MoF, MNRE, and UNDP			
3	High staff turnover affects project implementation		Operational	P = 3 I = 4	Explore a partnership between the University of the South Pacific, the Secretariat of the Pacific Community and GoS, whereby national students or new graduates can be fast-tracked into working in the project in the case of staff turnover. These students could join the project as interns or on a time-bound entry-level contract. This will not only directly contribute to the project implementation capacity, but also help build a pool of young professionals who can contribute towards future initiatives in the environment space.	MoF, MNRE and UNDP			
4	Community participation decreases as benefits of adaptation measures and project		Organisational	P = 3 I = 4	Maintain constant communication with communities concerning project progress, targets and expected benefits. Implement tangible and visible activities to address community priorities early during project.	MoF, MNRE, MWCSD			

	interventions are not immediately evident.				Managef community expectations to ensure that they are aligned with project scope. Disseminate project findings and lessons learned through appropriate media to maintain project profile and positive community perception.				
5	Competing mandates and poor coordination between government departments/line ministries disrupt project activities.		Political	P = 2 I = 3	Continuously inform policy- and decision-makers of project aims and potential synergies with other projects as well as on-going government initiatives. Demonstrate links between on-the-ground implementation and policies/strategies, with particular reference to contributions to relevant mandates of line ministries. Engage with relevant Sector Coordination Units to ensure alignment of project with sectoral priorities.	MoF, MNRE, and UNDP			
6	Disaster events/ hazards destroy or delay project interventions.		Environmental	P = 2 I = 4	Maintain contact with Met Office to ensure adequate lead time when disaster is imminent. Schedule project activities during low storm risk periods to reduce likelihood of extreme climate events. Monitoring potential extreme events and ensure coordination of preparation and responses with the national DRM framework.	MNRE, MET office, MoF			
7	Land disputes amongst community members hamper implementation of adaptation interventions.		Organizational	P = 1 I = 4	Ensure adequate consultation with targeted communities throughout planning, design and implementation of project interventions. Maintain strict adherence to approved national practices concerning community involvement. Ensure that project activities are aligned with community priorities in a culturally and social responsible manner.	MNRE, MWCSD and Village Councils			
8	Limited human resources in		Operational	P = 1	Adequately resource the PMU including the securing of positions	MoF, MNRE and UNDP			

	government ministries and agencies delay project activities.			I = 3	to be recruited for key technical support. Ensure alignment with PPCR/AF technical assistance. Monitor project processes to identify limitations timeously and allow for alternatives to be implemented.				
9	Project interventions are not implemented in a gender- and culturally-sensitive manner.		Operational	P = 2 I = 4	Ensure that project team is sensitised to gender and cultural sensitivities. Involve women committees in planning and implementation of project activities.	MoF, MNRE and MWCSD			
10	Insufficient political and financial support from line ministries and other government deparments/ agencies.		Political	P =2 I = 2	Consistently reinforce the importance of adherence to agreed-upon roles and responsibilities for project progress. Update governmental decision-makers of project progress in order to garner high-level support and political will.	MoF, MNRE and UNDP			
11	Communities and governmental stakeholders don't distinguish resilience to climate change from baseline weaknesses.		Operational	P = 1 I = 2	Maintain proactive outreach communications strategy for duration of programme, including tailored awareness raising activities linked with the assessment, consultation and planning of adaptation interventions.	MoF, MNRE			
12	Implemented interventions are not climate resilient		Strategic	P = 1 I = 4	No interventions will be implemented unless they are demonstrably climate resilient. Constant monitoring of design/planning to ensure climate resilience is inherent.	MNRE, LTA, UNDP			
13	Unanticipated social and/or environmental impacts are caused by project activities.		Strategic	P = 1 I = 4	No interventions will be implemented unless they have adequate measures for mitigating social and environmental impacts. Constant monitoring of design/planning to ensure adequate mitigation measures are included.	MNRE, MWCSD, UNDP			

Annex 15. Experimental design for measurement of project impacts.

Introduction

As part of the LDCF project titled “Economy-wide integration of CC Adaptation and DRM/DRR to reduce climate vulnerability of communities in Samoa”, a quasi-experimental design component will be incorporated into the overall project activities to accurately measure benefits provided through the project. There is a general need to improve existing M&E procedures within such projects as they tend not to be rigorous on the dimension of attributing causal effects from project activities. Instead, positive or negative changes may be a result of cotemporaneous confounding factors occurring outside the scope of project activities. It is the intention of this quasi-experimental design component to demonstrate the improvement to M&E through minor changes to their design. With these small but powerful design changes, those assessing the efficacy of a particular project and project intervention will have a more rigorous foundation for their analysis of project effects.

The quasi-experimental design approach described here is known as the Difference-in-Differences (DID) approach. DIDs are a rigorous way to test the impact of an intervention of interest. This method is increasingly being used in various socio-economic studies to analyse the differences in outcomes between control and treatment groups, especially when treatment status is determined by factors beyond the researcher’s control. The basic construct of a DID experiment is quite straightforward. Two groups of people in a population of interest are surveyed before, during and after the intervention of interest is implemented. One of these groups – the treatment group – will comprise people involved in the project activities, while members of the other group – the control group – are not involved. A baseline survey will measure the outcome of interest in both groups prior to implementation of the intervention of interest. After the intervention is implemented on the treatment group and has run its course, an endline survey is again administered to measure the final value of the outcome of interest. The difference between the initial and final values of the outcome of interest is recorded in both control and treatment groups. These two differences are then compared to obtain the “difference-in-differences. In this way, the effect of the intervention is can be established.

The proposed experimental design for the LDCF project will attempt to understand the impact that diversification of community livelihoods will have. The project activities include the provision of improved household-based processing facilities, planting materials and equipment for handicraft production as well as technical training in agricultural production, handicraft production and the use of the equipment, based on selected value chains. The target group for this experiment are the community members involved in project activities under Output 2.1.3: *Sustainable micro-enterprises for youth and women on agro-businesses with a sustainable and resilient value chain approach to promote diversified livelihoods*.

Goal

The primary goal of the intervention is to improve household welfare in order to build resilience to climate-induced disasters. The target households currently engage in agriculture and handicraft production. Agricultural products include breadfruit, coconut, cocoa, *misiluki*, papaya, *laupele* and taro while handicraft products include wood carvings and textiles. The project hypothesises that introducing the specific technological input coupled with targeted technical training will allow women to improve the sustainability and profitability of their livelihoods. Use of the supplied technology and improved production skills will lead to improved enterprise outcomes, allowing women to invest in household welfare and further improvements to their businesses. Such investments are likely to lead to direct improvements in climate resilience – such as climate-proofed houses – as well as indirect improvements in climate resilience – such as greater savings that enable rapid post-disaster recovery.

Design

Structure

The design of the experiment is structurally simple. There will be two arms – a control and a treatment. The treatment arm will receive the intervention package while the control will not. However, both groups will be surveyed at baseline, in the middle of the project's lifetime, and at the end of the project. It is imperative that the intervention package is applied in a consistent manner to all members of the treatment group to ensure that any conclusions drawn from the results are directly attributable to project activities.

Outcomes of Interest
The major outcomes of interest are women's enterprise outcomes and their household welfare. These include (but are not limited to): i) net revenues generated from agricultural production; ii) child health; iii) educational outcomes; iv) changes in savings behaviour; v) investment in assets (both household and enterprise); vi) improved nutrition; vii) clean water; and viii) sanitation.

Effect and Sample Size
Sample size is limited by budget. Based on a hypothesised effect size, the sample size is calculated using standard assumptions on power and precision, i.e. 80% and 0.05 respectively. Assuming a positive effect of a 10% increase in the value of income generated[1], a sample size of about 200 households would be needed. The household survey to be conducted under Output 2.2.1 (Outcome 2.2) will serve as the baseline survey. This survey will cover at least 100 villages and is consequently expected to include ~5,000 households. Participants in the livelihoods interventions will be selected from amongst these households and compared to non-participants from the same survey. The control group will be selected to closely match the treatment group with regard to socio-economic and other factors, in order to minimise the effect of any confounding variables on the outcome of interest.

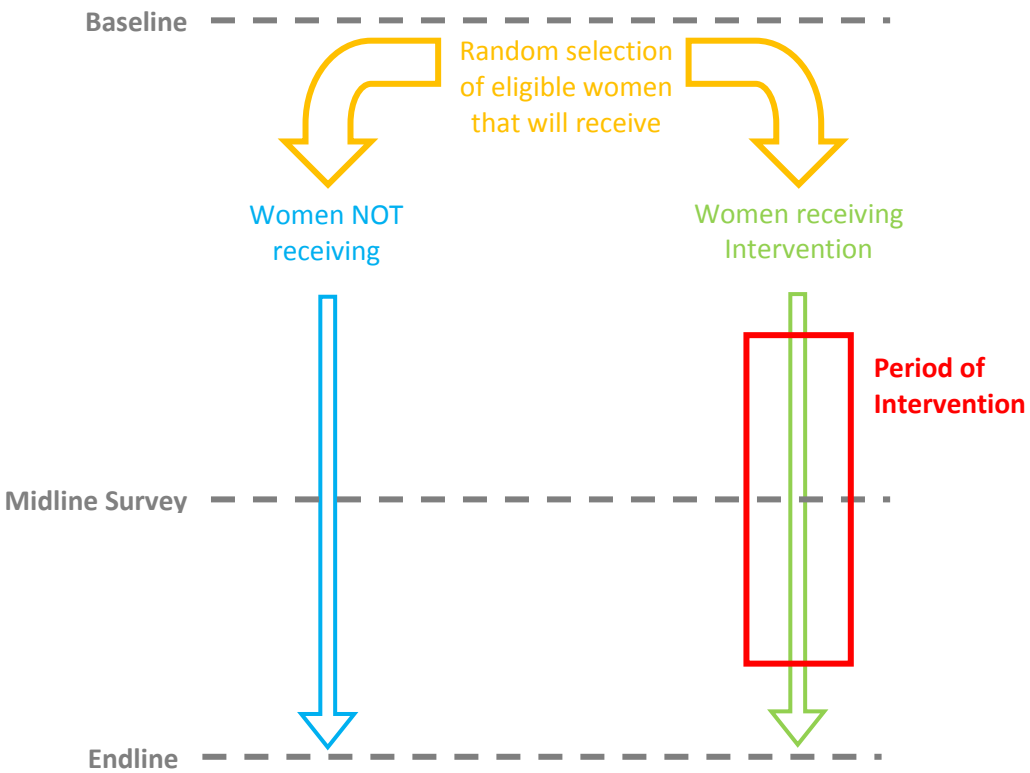
Timeframe
The outcomes of interest will be measured at logical points during the project lifecycle of 6 years. The baseline survey will be conducted prior to implementation of project interventions. Measuring outcomes of interest will be repeated as part of the mid-term review of the project, which will occur after at least one year of the interventions having been delivered. This survey will be repeated again during the final terminal evaluation as the endline survey after the full 6 year term of the project.

Surveys
A baseline survey will be conducted before any project activities take place (estimated cost of $200,000 for data collection and analysis). This survey will collect important demographic and socio-economic data, including gender and age disaggregated information. These data will also include important outcome variables of interest such as income, child and family health indicators, enterprise profits and asset holdings. After initiating intervention activities, a midline survey will be conducted as part of the project mid-term review. The midline survey will collect the same information as the baseline and allow evaluators more detail on the dynamics of the intervention. Finally, after all intervention activities have been concluded (i.e. the intervention period as specified by the plan has come to its logical end) an endline survey will be conducted. Again, the same information will be gathered as during the baseline survey. The endline will allow evaluators to compare the DID between the treatment and control groups to analyse the impact that the intervention had on the target population.

Technical Expertise Required
A specialist will be engaged to:
- design and administer the household survey covering 100 villages (~5,000 households) for the baseline assessment;
- analyse the survey data to identify potential control and treatment groups;
- develop guidelines for midline and endline surveys to ensure that data is collected in a consistent manner; and
- Produce a detailed report on baseline information relating to outcomes of interest (including those described in this document and/or other appropriate measures).

[1] As evidenced increased savings, investment into assets, etc.

Activity Sequence



Activity Sequence