



Tuvalu International Waters Ridge to Reef Project

By: Government of Tuvalu



Final Report

April 2016 to September 2020

Prepared by: Pesega Lifuka
Project Manager



Empowered lives.
Resilient nations.

Pacific
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du Pacifique

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June 2022

Preface

In May 2016, the Ministry of Foreign Affairs, Environment, Labour, and Tourism established a new Project named the Tuvalu International Waters Ridge to Reef Project. The Tuvalu IW R2R with one of its components that utilizes the compost from green waste produced by the Department of the Waste Management, was approved by the cabinet to be transferred and housed under the Ministry of Home Affairs and Rural Development which is currently named as the Ministry of Local Government and Agriculture.

At the early stages of its discourse, the Tuvalu IW R2R managed to engage and established stakeholders and communities that formed a steering committee that significantly assist the project in delivering its components that has been approved during its inception in December 2016. However, not all trajectories come to pass without challenges encountered which is a common one where few people at first always have a different opinion on new innovative technologies. Nonetheless, the challenges did not deter the ground team to continue to venture and by building partners in the undertaking in which the synergies became the foundation of the anticipated benefits for the communities.



Walter P. Kaua

Acting Director

Department of Waste Management.

Acronyms

FAO	Food and Agriculture Organization
GEF	Global Environmental Facility
GEM	Geoscience, Energy and Maritime Division
IW	International Waters
IWRM	Integrated Water Resource Management
M&E	Monitoring and Evaluation
MYCWP	Multi-Year Costed Workplan
NPSC	National Project Steering Committee
R2R	Ridge to Reef
RPCU	Regional Programme Coordination Unit
SPC	The Pacific Community
UNDP	United Nations Development Programme
UNE	United Nations Environment
WFP	Work and Financial Plan

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Basic Project Data

Project Title	Ridge to Reef - Testing the Integration of Water, Land, Forest & Coastal Management to Preserve Ecosystem Services, Store Carbon, Improve Climate Resilience and Sustain Livelihoods in Pacific Island Countries
Project Site/ Location	Funafuti, Tuvalu
Project Objectives	To test the mainstreaming of 'ridge-to-reef' (R2R), climate resilient approaches to integrated land, water, forest, and coastal management in Tuvalu through strategic planning, capacity building, and piloted local actions to sustain livelihoods and preserve ecosystem services.

Contract Information	Contract number	MoA 16/297
	Original Project Duration	April 2016 to December 2019
	Contract Extension (if applicable)	Jan 2020 to September 2020
	Contracting Party	Secretary of the Ministry Local Government and Agriculture
	Contracting Party Signatory	Mr. Temate Melitiana (Original)
	Mr. Falasese Tupau (Extension)	
	Contract Amount (SPC-R2R)	USD \$200,000
	Counterpart (Agency, Department)	USD \$20,000 estimated
	Counterpart of other partners (e.g., development partners, NGOs, CSO, Academic, etc.)	USD \$10,000 estimated



Executive Summary

The achievements of the GEF IWRM programme were the foundation of which the emergence of the International Water Project.

On the 44th meeting in June 2014 the GEF approved the UNDP/UNEP/FAO multi-focal area “Pacific Islands Ridge-to-Reef National Priorities – Integrated Water, Land, Forest and Coastal Management to Preserve Biodiversity, Ecosystem Services, Store Carbon, Improve Climate Resilience and Sustain Livelihoods” program (GEF Pacific R2R Programme). The goal is to maintain and enhance Pacific Island countries’ ecosystem goods and services (provisioning, regulating, supporting and cultural) through integrated approaches to land, water, forest, biodiversity, and coastal resource management that contribute to poverty reduction, and sustainable livelihoods and climate resilience. The GEF Pacific R2R Programme has fifteen child projects, one of which is the Regional IW R2R project.

The GEF focal area on international waters (IW) aims to deliver tangible and quantifiable national and global environmental benefits by focusing on a more cross cutting approach to water, land, and coastal management. Moreover, the IW ridge to reef project is a mechanism delivered by the Pacific Community (SPC) to provide support in areas of science-based planning, human capital development, policy and strategic planning, results-based management likewise the knowledge sharing. The GEF Pacific Regional IW Ridge to Reef project has fourteen (14) national demonstrations, which include the Tuvalu IW R2R demonstration project. The IW R2R project is about testing innovative technologies and measures for the integration of land, water, forest, and coastal ecosystems along the ridge to reef continuum.

During the implementation of the project, a demonstration site is to be built so that the people must have the knowledge and be convinced to adopt this new technology. Tuvalu prioritized municipal waste pollution reduction as a key focus and opted to test dry-litter technology and related measures to reduce nutrient offloads polluting ground water and aquifers and adjacent coastal marine nearshore and lagoon areas. The Tuvalu IW R2R project planned investigation to convert at least 10 per cent of near shore wash-down pig pens to dry-litter composting systems. Another is to implement targeted scientific approaches to optimize

on-site waste management systems and to identify causal links between land-based contaminants and the degradation of coastal waters. The project also planned to build and increase the national and local capacity for waste management implementation to enable best practices in coastal waters, land, and public health protection.

A Memorandum of Understanding (MoA) was signed by Tuvalu and SPC in support of rolling out support for the implementation of the Tuvalu IW R2R demonstration project. The MoA provides clear details on duties and responsibilities, provisions on governance and finance, as well as monitoring and reporting. To deliver all the above outputs, all resources needed financial resources and technical assistance was provided by the SPC R2R while the housing of the project has been accommodated by the Government of Tuvalu under the Ministry of Local Government and Agriculture.

In the overall delivery of the project objectives, most of the planned activities have been executed and so as expected results attained. Though, there have been some setbacks, in the overall delivery and operation of the project that has been possible with the support of the Government of Tuvalu in safeguarding this project to date. These setbacks are reflected in the lack of achievements in the project targets (municipal pollution reduction from 1616 TN kg/yr to a revised target of 536 TN kg/yr. The project only achieves 164 TN kg/yr instead. The main reason was that testing of DLT was only limited to one semi-commercial sized piggery which approximates to about four (4) standard size piggeries. The original target DLT nursery piggeries were twenty-four (24).

The measured values of nutrients offloaded into the surrounding environment were only measured from point and non-point sources once through several sites in the Funafuti lagoon. Levels of municipal waste pollution in the lagoon were measured at 0.075 TN mg/L, which was below the default guess value of 0.10 TN mg/L. However, at certain sites, there were high coliform counts suggesting contamination of water with animal and human waste.

The objectives of the project were partly achieved or have been ranked as “moderately satisfactory” for reasons explained in the progress of project inputs and outputs outlined earlier. This rating is influenced by several factors including managerial and technical constraints. This is particularly related to experiences in the construction and demonstration of DLT piggeries plus regular monitoring of selected sites for water quality and other relevant indicators.

There are already signs of sustainability in the project now that the Funafuti commercial DLT piggery is already advanced in its design and development, along with communities in several outer islands also expressing interest. However, it remains essential that the government particularly the relevant agencies of waste, environment, fisheries, and local governments, continue collaborating through training and planning of using project results to inform ongoing efforts of mainstreaming ridge to reef and community to cabinet approaches in integrated coastal management and planning.

Introduction

Situational Analysis, project issues, needs

Water, land, and the surrounding coastal areas of the islands of Tuvalu are all part of the ecosystem which provides the lifeline for the residing population. Most of the islands of Tuvalu particularly Funafuti, the capital of Tuvalu, these important components of the ecosystem are being observed to have critical issues which are believed to have been orchestrated by land-based activities. In fact, it is evident in the capital that the seriousness of these issues has been further compounded by the increasing urbanisation movement from outer islands to the capital. Ecosystems, in fact, do comprise water, land and coastal areas which are all interlinked and in such cases the issues are also more related. In many reports on Tuvalu particularly on the issues of water, the most highlighted ones are the needed clean water supply and the household or municipal used water containment problem.

The shortage of clean water supply is an obvious one since Tuvalu is an atoll and is currently relying on harvested rainwater. But the fluctuating rainfall patterns in Tuvalu have an impact on the supply of rainwater. However, ground water, still, it is a source for the people on some of the outer islands. Contrary, in the capital, reports have expressed that the impact of development has caused the underground water not to be suitable for household purposes. Apparently, in the capital Funafuti, because of the absence of a centralised sewage system, the toilet flushing to septic tanks is the main system.

This system seems to be the major concern as a sanitation problem with septic tank leakage and uncontrolled liquid sanitation waste which has created harmful and excessive nutrient loads in the Funafuti lagoon. Many septic tanks have failed since the installations as they are built privately and poorly constructed; however due to the sandy soils, even functioning tanks still do little to reduce the pollution load to the environment. As a result, evidence from carried out research suggests that coastal marine life even in the lagoon is being impacted by pollution and is likely the cause of Sargassum seaweed overgrowth and chronic problems with ciguatera that began sometime before 2010.

Moreover, the discharge of wastewater from pig pens was identified as a key contributor to the deterioration of the Funafuti coastal environment. Pig feeding is a part of the Tuvaluan culture where most families do have a pig pen. Though there has been an improvement in pig pens where most of them have floors cemented, the containment of the pig waste is not yet properly managed as the people use the wash down practice to upkeep the cleanliness of their pig pens. The casual links between this cultural activity with the Funafuti lagoon being polluted with a high level of nutrients were identified and confirmed by most of the donor funded studies. As a result, the coastal habitats of Funafuti Island particularly around the populated area are now under surveillance with measures taken to address these issues.



Project Scope, components, and anticipated results

Using the table below, enumerate the key components and anticipated outcomes.

Key Components	Expected Outputs	Anticipated Outcomes
Demonstration of innovative approaches to pig waste management on Funafuti Atoll, Tuvalu	<p>1.1 Appropriate onsite pig waste management piloted</p> <p>1.2 Domestic pig waste managed, and environmental impact contained</p> <p>1.3 Sustainable waste management enhanced through targeted engagement strategies</p>	<p>1.1 Improved domestic pig pen operations catalyzed via piloting of locally appropriate methods for on-site pig waste management (target 50 pig pens)</p> <p>1.2 Environmental and public health safeguarded via targeted reductions in nutrient and pathogen contamination of coastal areas</p> <p>1.3 National uptake of sustainable pig waste management methods stimulated through community awareness and training.</p>
Targeted scientific approaches to optimize on-site waste management systems and to identify causal links between land-based contaminants and the degradation of coastal waters	<p>2.1 Science based and community driven design and management of eco-sanitation (compost toilet) systems</p> <p>2.2.1 Science based and community driven design and management of dry-litter piggery system</p> <p>2.3.1 Ecosystem process monitoring programme established providing science-based information</p>	<p>2.1 Evidence based scaling up of eco-sanitation through optimal design and operation of systems to meet international standards for water safety and use of human compost in Tuvalu</p> <p>2.2 Evidence based scaling up of dry-litter piggery systems through optimal design and operation of systems to meet international standards for water safety and use of animal compost in Tuvalu</p> <p>2.3 Ecological health of coastal waters of Funafuti Atoll is characterized and land-based contamination processes established for key ICM planning and investment.</p>
National and local capacity for waste management implementation built to enable best practices in coastal waters, land, and public health protection	<p>3.1 Volunteer waste management networks are formally established towards forming an enhanced culture of environmental protection in Tuvalu</p> <p>3.2 Increased householder uptake of and donor support for onsite sanitation systems</p> <p>3.3 Enhanced access to effective information relating to on-site waste management issues and linkages with environmental and public health to increase public awareness</p>	<p>3.1.1 Volunteer waste management networks are formally established towards forming an enhanced culture of environmental protection in Tuvalu</p> <p>3.2.1 Increase household uptake of and donor support or on-site sanitation systems</p> <p>3.3.1 Enhanced access to effective information relating to on-site waste management issues and linkages with environmental and public health to increase public awareness</p>

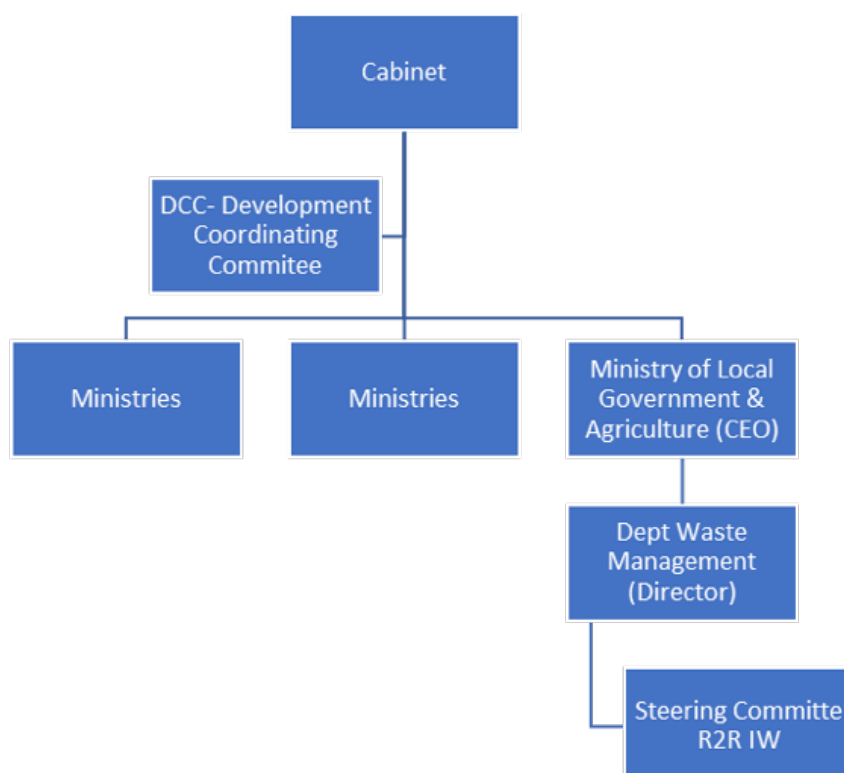
Project Organization and Management

The International Waters Ridge to Reef Project was originally under the Department of Environment as its Lead Agency. A few months later into its operation, from the recommendation of the Regional Program Coordination Unit (RPCU) and the Director of Waste at that time, it was transferred to the Department of Waste Management. The main reason for the transfer was the recycling operation of the Department of Waste that can assist the provision of shredded green waste for the demonstration of the Dry Litter Piggery.

The Department of Waste was previously known as the Solid Waste Agency of Tuvalu or SWAT and is the only governmental agency that is fully responsible for all waste management activities and programs in Tuvalu, including Funafuti and all outer islands. In that sense, the Department is fully responsible for the collection of all solid and partly liquid wastes on the islands. As the Lead Agency in this project, the Department of Waste Management was established by legislation Waste Operations and Services Act 2009 (WOSA) and was funded by the EU under the 10th EDF Tuvalu Water, Waste and Sanitation project (TWWS), and the first set up as the project-based Waste Management Unit under an Australian-funded project in the late 1990s. It has continued to better organize waste services, including collection, disposal, sorting, recycling, burning, and burying, into a relatively efficient operation, much improved over the pre-SWAT era when funding levels and other dedicated resources were much lower. A cleaner and healthier Tuvalu for today and the future generation is the vision statement that is visualized and is reflected in its Tuvalu Integrated Waste Policy and Action Plan 2017 – 2026.

This Policy and Action Plan 2017 – 2026 defines the optimal desired future state of the country regarding managing waste. Its mission is to develop, implement and strengthen appropriate waste strategies through concerted efforts of the Government, stakeholders, and communities to improve the environment and the health of the people of Tuvalu. The International Waters Ridge to Reef Demonstration Project is governed and guided by the stewardship of the National Project Steering Committee (NPSC). The establishment of the committee was possible with the assistance of the Director of the Department of Waste Management Mrs Susana Taupo. Hence, there were some issues during the establishment of the NPSC.

The National Project Steering committee sits under the Department of Waste Management in which the current Acting Director of the Department Mr Walter Kaua is the chairman. The STAR and the IW were supposed to be under one NPSC. But the STAR opted to be on its own. That resulted in the IW forming its own NPSC. Given the relationship of the NPSC, to the Inter-Ministerial Committee (DCC), the IW NPSC is at the Departmental level. All the requests for support of the NPSC activities from other ministries must move up to the respective CEO of the Ministry to the DCC to investigate the request for approval. Please refer below:



Project Stakeholders and Engagement

Stakeholders	Contact	Synergies	Collaboration
Dept. of Fisheries	Mr Semese Alefaio Principle Fisheries Officers	<ul style="list-style-type: none"> Lagoon Water Monitoring Collaborating with STAR objectives 	<ul style="list-style-type: none"> Staff training, monitoring programme. Can work together with STAR on common objectives. Members of National Project Steering Committee.
Dept. of Agriculture	Mr. Uatea Vave Acting Director	<ul style="list-style-type: none"> Pig waste Provide advice on pig waste, composting, avenues for use 	<ul style="list-style-type: none"> Collaborating with STAR Project objectives Collaborate on any compost/gardening training can work together with STAR on common objectives Member of the inter-ministerial committee Member of National Project Steering Committee
Dept. of Lands	Mr. Faatasi Malologa Director	<ul style="list-style-type: none"> Pig waste management 	<ul style="list-style-type: none"> Collaborating with STAR Project objectives Support with mapping current piggery locations Relating this to land management planning Member of the inter-ministerial committee Member of National Project Steering Committee
Dept. Environment	Mr. Soseala Tinilau Director	<ul style="list-style-type: none"> Expertise in the aspects of the Environment 	<ul style="list-style-type: none"> Member of National Project Steering Committee Political Focal Point of the IW Dept
Public (Environmental) Health	Mr. Vine Sosene	<ul style="list-style-type: none"> Provide all related matters on health aspects 	<ul style="list-style-type: none"> Member of National Project Steering Committee
Kaupule	Ms. Maryanne Vunisarati Funafuti ISP Manager	<ul style="list-style-type: none"> Falevatie Pig waste management 	<ul style="list-style-type: none"> Support monitoring and community consultation Support community engagement for piggeries Member of National Project Steering Committee
Dept. of Waste Management	Mr. Walter Pulogo Acting Director	<ul style="list-style-type: none"> Pig waste management Provide mulch for pilot pig pens free of charge – with MoA 	<ul style="list-style-type: none"> Collaborate on waste management training/workshops Chairman National Project Steering Committee
National Council of Women	Mrs. Sagale Telaulini.	<ul style="list-style-type: none"> Community engagement activities Provide an entry point for gender mainstreaming in all activities 11 	<ul style="list-style-type: none"> Member of National Project Steering Committee
Women Department	Mrs. Lanuola Faasiai Director	<ul style="list-style-type: none"> Gender Department 	<ul style="list-style-type: none"> Collaboration on matters with women. Government support on Gender issues Member of National Project Steering Committee

Public Works Dept	Mr. Pisi Seleganiu	<ul style="list-style-type: none"> Falavatie Pig waste management Monitoring and redesign Provide technical assistance for the construction/ modification of piggeries Would need an MoA 	<ul style="list-style-type: none"> Member of National Project Steering Committee
TANGO	Mr. Maina Talia CEO TANGO	<ul style="list-style-type: none"> Identifying finance options for waste management Waste management options Work with GEF Small Grants Programme 	<ul style="list-style-type: none"> Collaborate on community engagement activities Member of the National Project Steering Committee
TNPSO	Mr. Itaia Lausaveve CEO - TNPSO	<ul style="list-style-type: none"> Engage with Private Sector Collaborate on engagement with public and private 	<ul style="list-style-type: none"> Member of National Project Steering Committee
STAR R2R	Mr. Mataio Tekinene former STAR Co-Ordinator/ The Current STAR Co Ordinator is Mrs. Ivy Tumua.	<ul style="list-style-type: none"> Water Monitoring and sharing all synergies activities in line with IW. Collaborate on engagement with public and private 	<ul style="list-style-type: none"> Member of National Project Steering Committee From the inception workshop of the Tuvalu IW on 7th December 2016 the engagement has these Objectives.

The first was to create a common understanding and support of the project and its vision, goals, objectives, and implementation plans. The second was to exchange knowledge and experiences on International Waters Management (IWM) and the third was to develop a shared vision of the broader opportunities and benefits emerging from the project implementation and outreach. In the engagement strategy, the methods of engagement level widely used for the demonstration project include face to face meetings, public meetings, focus groups, facilitated events, presentations, and printed publications.

However, with the public engagement, the situation has changed in the context of Funafuti. The experienced prompt that the communities seem to have a different perception of what must be delivered by projects. It may be that people have been selective about what is most beneficial to them. Moreover, the engagement of most individuals and families in the government projects has left few to participate in community awareness programs. It may be a rapid shift in the living standards including technology has taken place in Tuvalu, particularly in Funafuti. These may be some of the observations relating to the participation of communities in projects. Yet, for the IW stakeholders particularly the members of the National Project Steering Committee, in the beginning, their participation was at a high level, but the commitments of permanent members and other staff of the same department to attend the latter meetings signals a decreased rate of participation.

Project Results and Achievements

Below is an update of progress reports from the midterm report.

The results can best be presented following the results logic.

Component/ Outcomes/ Outputs	Indicate the appropriate name of the component, the desired outputs, and activities	Indicate the Status of implementation (choose from the following: Completed or not completed indicate the reason)
Component 1	1. Demonstration of innovative approaches to pig waste management on Funafuti Atoll, Tuvalu	
Output 1.1.1	1.1.1 Appropriate onsite pig waste management piloted	Completed
Activity 1	1.1.1.1 Assessment of Pig Waste impacts and management practices.	Completed
Activity 2	1.1.1.2 Review pig waste management options including cost considerations	Completed As above
Activity 3	1.1.1.3 Consult, design, and construct one (1) semi-commercial sized ¹⁾ and improved domestic pig pen. (dry litter) Deviated from the plan: focus on the Saugavaka Piggery Project.	Not Completed only achieve 21 TN kg/year at the end of the project; the target was 536 TN kg/year.
Output 1.2.1	1.2.1 Domestic pig waste managed, and environmental impact contained	Deviated from plan
Activity 1	1.2.1.1 Assessment of baseline nutrient and pathogen loads from current pig waste management practices	Deviated from the plan: Focused on Saugavaka Project
Activity 2	1.2.1.2 Monitoring program initiated with the construction of improved domestic pig pen	Deviated from the plan: Focused on Saugavaka Project
Activity 3	1.2.1.3 Assessment of reduction in nutrient and pathogen loads from improved domestic pig waste management practices	Deviated from the plan: Focused on Saugavaka Project
Output 1.3.1	1.3.1 Sustainable waste management enhanced through targeted engagement strategies	Completed: Refer Mid Term
Activity 1	1.3.1.1 Review past and current community engagement regarding pollutant causes, impacts, and control, and develop and deliver participatory engagement approaches	Completed: Refer Mid Term report

¹ semi-commercial sized pig pen is equivalent to 4 standard size pig pens housing combination of gestate (pregnant), lactating (mothers) and nursery (babies) pigs

Activity 2	1.3.1.2 review, develop and conduct community engagement approaches for the design, adoption, and siting of sustainable pig waste management options	Completed: Refer Mid Term report
Activity 3	1.3.1.3 review (existing/similar), develop and conduct technical training for the construction and maintenance of sustainable pig waste management methods	Deviated from plan: Focused on Saugavaka Project
Component 2	Targeted scientific approaches to optimize on-site waste management systems and to identify causal links between land-based contaminants and the degradation of coastal waters	
Output 2.1.1	2.1.1 Science based and community driven design and management of eco-sanitation (compost toilet) systems	Completed: Refer Mid Term Report
Activity 1	2.1.1.1 Current baseline data on community perceptions of eco-san, and nutrient and pathogen reduction, established and gaps identified through desktop review, including investigative data collection where necessary	Completed: Refer Mid Term Report
Activity 2	2.1.1.2 Design and implement a monitoring framework and develop a design assessment based on the results of options.	No Longer Valid: As per Mid Term Report
Activity 3	2.1.1.3 Recommendations presented to Project Management Group for review and endorsement	Completed as mentioned in Activity 1.
Output 2.2.1	2.2.1 Baseline data collected; analyzed and assessed.	Completed: Indicated per Mid Term Report
Activity 1	2.2.1.1 Review existing examples as it relates to pig waste management; Dry Litter; Deep Litter; Septic Wash Down (both local and international references) and compost use	Completed: Indicated per Mid Term Report
Activity 2	2.2.1.2 Community perceptions on dry litter system recorded and analyzed	Completed: AS per Mid Term Report
Activity 3	2.2.1.3 Nutrient and pathogen levels established in Tafua Pond and Fogafale Lagoon	Completed: As per Mid Term Report
Output 2.2.2	2.2.2 Recommendations made to Project Management Group and endorsed	Completed: Refer Mid Term Report

Activity 1	2.2.2.1 Review existing examples as it relates to pig waste management; Dry Litter; Deep Litter; Septic Wash Down (both local and international references) and composts	Completed: Refer Mid Term Report
Activity 2	2.2.2.2 Community perceptions on dry litter system recorded and analyzed	Responses had been acknowledged
Activity 3	2.2.2.3 Nutrient and pathogen levels established in Tafua Pond and Fogafale Lagoon	Completed a per AGM resolutions.
Output 2.3.1	2.3.1 Water Quality monitoring programme established providing science-based information	Completed: AS per Mid Term Report- Coastal Monitoring after 30 th June 2018
Activity 1	2.3.1.1 Review and develop a program for monitoring assessments of land-based contaminants, including identification of priority sites for implementation	Completed: As per Mid Term Report- Coastal Monitoring after 30 June 2018
Activity 2	2.3.1.2 Implement a monitoring programme in partnership with Dept. of Fisheries	Completed: But the Dept. of Fisheries did not complete the intended plans.
Activity 3	2.3.1.2 Characterize baseline status of WQ and identify likely sources of land-based contamination	As above
Component 3	National and local capacity for waste management implementation built to enable best practices in coastal waters, land, and public health protection	
Output 3.1.1	Tuvalu Waste Management Network TOR endorsed	Deviated: Because of Covid 19 Pandemic.
Activity 1	Stakeholder consultation for the development of the network	Deviated: Covid 19 blocked the progress.
Activity 2	TOR for Waste Management Network prepared and endorsed by stakeholders and Project Steering committee	Deviated: Covid 19 blocked the progress.
Output 3.1.2	Tuvalu Waste Management Network operational	Deviated: Because of Covid 19 Pandemic
Activity 1	3.1.2.1 Inception meeting for Tuvalu Waste Management Network	Deviated: Covid 19 blocked the progress.
Activity 2	3.1.2.2 Outreach and training for network members, information exchange with the wider community	Deviated: Covid 19 blocked the progress.
Output 3.2.1	Low-cost waste management systems with sustainable options for financing provided	Deviated: Because of Covid 19 Pandemic
Activity 1	3.2.1.1 Assess and identify options for reducing costs of implementing optimized piggery waste management systems	The plan derailed because of the focus is now on the upscaling of the demo site

Activity 2	3.2.1.2 Identify potential sustainable financing options for communities and HH and develop guidelines for financing	Deviated: as above
Output 3.3.1	Appropriate community outreach and educational material produced	Completed
Activity 1	3.3.1.1 Review available information (local and international) as it relates to waste management (DLT) and environmental/public health	A review was carried out and no difference as per the review in the 2018 reports.
Activity 2	3.3.1.2 Procure technical services to produce communication materials as described in Outreach Strategy	Completed as some materials produced locally and in Fiji.
Output 3.3.2	Community outreach strategy implemented	Completed
Activity 1	3.3.2.1 Distribute materials through network outreach and other partners	Completed: Produced materials managed to distribute. Pamphlets etc.



Financial Summary

This report provides a short account of the status of fund utilization which is based merely on the multi-year work and financial plan.

SPC-R2R Financial Contribution

Amount	Total Amount Spent	Utilization Rate ² (in Percentage)
\$200,000	\$165,367.75	83%

Note: The total amount transferred was USD 168,445.56, which was fully utilized by the country. therefore, 100% of the fund was utilized based on the amount transferred.

The 84% is calculated based on the amount spent (USD168,445.56) divided by the amount allocated (USD200,000) multiplied by 100 i.e. $(168445.56/200000*100)$.

As per the reconciliation and transaction listing the total amount spent was USD 168,491.75. An extra amount of USD 46.19 (AUD 65 dollars) from the total amount transferred. This overspent is not part of the above table but is part of the reconciliation done by SPC.

Any other discrepancies in the amounts could be due to the exchange rate differences and the bank fees which are not reflected in the narrative report but are taken into consideration in the Final Financial Report.

Materialized Co-financing

Name of Co-financer	Type of Co-financing ³	Amount ⁴ (USD)
National R2R/SPC Funds	Cash	\$165,367.75

Implementation Progress Ratings

A brief and concise assessment of the results and achievements of the project from the perspective of the recipient. The assessment should endeavour to respond to the following assessment areas:

1. **Inputs:** To what extent have the planned inputs been supplied?

All the planned inputs have been tremendously great in terms of policy advice and financial contribution. However, technical, and scientific timely assistance could have been improved to enable more frequent repeated monitoring and testing of water quality in selected sites in Funafuti lagoon away from the point and non-point sources of pollution. Such pollution sources are specifically linked to municipal waste from human and animal waste including leaking septic tanks and piggeries.

Consequently, the project moderately completed the majority of project activities (21 out of 30) and in turn delivered the majority of project outputs.

2. **Outputs:** To what extent have the planned outputs been produced?

The planned outputs from inception to the end of the project and including the extension period were not all produced as expected. There was a prediction for a high success rate of outputs to be produced but

² Amount spent divided by amount budgeted/planned multiply by 100.

³ Grant or In-kind

⁴ Total cash and monetized in-kind contributions.

following the mid-term review in 2019, the initial logframe was reviewed and priority outputs and activities were realigned. The majority of project outputs (at least eight out of 12) were completed and delivered.

The following project outputs were not delivered because of operational challenges, particularly the impact of the COVID-19 pandemic and capacity limitations in-country.

- Domestic pig waste managed, and environmental impact contained
- Tuvalu Waste Management Network TOR endorsed & operational
- Low-cost waste management systems with sustainable options for financing provided

3. **Objectives:** To what extent have the outputs contributed to achieving the project objectives? If not achieved, what is/are the reason/s for non-achievements and how this can be remedied? Provide 2-3 sentences describing the status of whether the objectives will be achieved or not. If not, what do you recommend as remedial measure/s?

The objectives of the project were partly achieved or have been ranked as “moderately satisfactory” for reasons explained in the progress of project inputs and outputs outlined earlier. This rating is influenced by several factors including managerial and technical constraints. This is particularly related to experiences in the construction and demonstration of DLT piggeries plus regular monitoring of selected sites for water quality and other relevant indicators.

4. **Sustainability** of the project results: To what extent will the intended results of the activity be sustainable? What are the sustainability elements (such as technical, policy, financial, etc.) that have been considered? Provide 2-3 sentences describing your efforts of securing and sustaining the project results.

There are already signs of sustainability in the project now that the Funafuti commercial DLT piggery is already advanced in its design and development, along with communities in several outer islands also expressing interest. However, it remains essential that the government particularly the relevant agencies of waste, environment, fisheries, and local governments, to continue collaborating through training and planning of using project results to inform ongoing efforts of mainstreaming ridge to reef and community to cabinet approaches in integrated coastal management and planning.

5. **Risks/Assumptions/Conditions:** To what extent were the previously identified conditions, assumptions and accompanying risks addressed? Indicate whether the original risks and assumptions are still valid and whether the conditions were honoured and/or dealt with?

Context	Specify the identified Conditions, Assumptions and Risks	Provide your assessment in this column
Conditions	The political will of the government to remain committed to the embracement of the integration of water, land, and coastal management.	The changing status of support of the Government of Tuvalu to the eco sanitation component has impacted the goals of the ICM and IWRM.
Assumptions	Integrated coastal management is recognized as being multi-sector involves the whole community	The involvement of government agencies is a vital aspect of all projects. Given the authority needed for the implementation of most projects, it is vital for all projects to get involved with government agencies.
Risks	Communities and wider stakeholders are willing to participate in Policy development and demonstration projects.	Given the importance of projects that the government approved to implement, communities do have the obligation to utilise the anticipated benefits from these projects.

In ranking the risk that the project may encounter based on the lower table is on the substantial risk. This means that there is a probability of between.

High Risk (H)	There is a probability of greater than 75% that assumptions may fail to hold or materialize, and/or the project may face high risks.
Substantial Risk (S)	There is a probability of between 51% and 75% that assumptions may fail to hold and/or the project may face substantial risks.
Modest Risk (M)	There is a probability of between 26% and 50% that assumptions may fail to hold or materialize, and/ or the project may face only modest risks.
Low Risk (L)	There is a probability of up to 25% that assumptions may fail to hold or materialize, and/ or the project may face only modest risks.

6. Overall Implementation Progress Rating

Upon the scaling provided below on the implementation progress rating, the Tuvalu IW can be rated as Satisfactory since most of its components have been implemented successfully. Given the support from the RPCU and the Implementing agency, their contribution in terms of advice and technical support provided a pathway to the successful achievement of the implementation of the components of the project.

Highly Satisfactory (HS)	Implementation of all components is in substantial compliance with the original/formally revised implementation plan for the project. The project can be presented as "good practice".
Satisfactory (S)	Implementation of most components is in substantial compliance with the original/formally revised plan except for only a few that are subject to remedial action.
Moderately Satisfactory (MS)	Implementation of some components is in substantial compliance with the original/formally revised plan with some components requiring remedial action.
Moderately Unsatisfactory (U)	Implementation of some components is not in substantial compliance with the original/formally revised plan with most components requiring remedial action.
Unsatisfactory (U)	Implementation of most components is not in substantial compliance with the original/formally revised plan.
Highly Unsatisfactory (HU)	Implementation of none of the components is in substantial compliance with the original/formally revised plan.

Project Contributions to the Regional IW R2R Program Outputs and Outcomes

This Chapter provides snapshots of the national project contributions to the Regional Ridge to Reef program components such as:

1. National demonstration to support R2R ICM/IWRM approaches for island resilience and sustainability. Specifically, an account of the status of:
 - 1.1 Successful pilot projects testing innovative solutions involving ICM, IWRM and CCA (linked to the STAR via a larger Pacific R2R network).

The Tuvalu IWR2R project has the intention to implement two approaches namely: DLP and CT with the hope to reduce municipal waste pollution in the coastal waters and into the aquifer. During the testing, difficulties were encountered. As an adaptive management strategy, the project management team revisited the targets and adjustments were done for the project to achieve the intended outcomes. The revised target is 536 TN kg/yr of municipal waste pollution for surface water and 11 TN kg/yr for aquifers.

The project carried out fieldwork to assess the quality of water from point and non-point sources, mainly for the Funafuti lagoon. The measured average levels of pollution for municipal waste pollution were measured at 0.075 TN mg/L, which was below the default guess value of 0.10 TN mg/L. Only one site far exceeds the threshold level, which was measured at 0.44 mg/L. There was no follow up field work to establish the reduction of municipal waste pollution as well as pollution reduction in aquifers. The project experienced operational challenges including a short time remaining to monitor and evaluate water quality in Funafuti lagoon.

At the end of the project implementation, one semi-commercial sized DLT pigpen (equivalent to 4 standard size pig pens) was operational, which provides an estimated 164 TN kg/yr of municipal waste pollution as opposed to the target of 536 TN kg/yr. This is due to the limited number of DLT piggeries established under the project. It was expected that around 24 pig pens would need to be converted to DLT to meet the reduction target. However, only one semi-commercial sized piggery was established, which approximates about four standard size piggeries. Pollution reduction to the aquifer is calculated at 48 TN kg/yr.

Despite the limited scientific/quantitative data, the demonstration pig pen provided a qualitative indication that the process is viable in the Funafuti context. The dry litter technology was successfully demonstrated, showing the conversion of pig waste to valuable compost, rather than washing it away into the groundwater and the lagoon. Importantly, the demonstration helped alleviate concerns relating to odour and negative perceptions surrounding the idea of working with pig waste. The results were useful contributions in diagnostic stakeholder consultations that led to proper decisions in resource management and governance and helped mobilise resources for financing, investment planning and promotion in Tuvalu.

1.2 National Diagnostic analysis for ICM conducted for prioritizing and scaling up key ICM/IWRM reforms and investments.

Tuvalu IW R2R in the Science to Policy continuum (Theory of change), carried out the pilot testing of appropriate stress reduction measures. The undertaking did mobilize the resources for funding in an appropriate manner. Given there were challenges encountered, the ground team continued the piloting since it is envisaged that it has enormous, expected benefits that will reflect the concept of the Theory of Change.

1.3 Multi-stakeholder leader roundtable networks established for strengthened 'community to cabinet' ICM/IWRM.

The approach of the Ridge to Reef of local leaders and local government engagement participating in multi-stakeholder dialogues, meetings and round table networks is a remarkable one. In the context of Tuvalu with a small population, communities with leaders working together in decision making are not new and conform to traditions, thereby adding value to project implementation and achieving outcomes.

2. Island-based investments in human capital and knowledge to strengthen national and local capacities for R2R ICM/IWRM approaches, incorporating climate change adaptation

1.1 National and local capacity for ICM and IWRM implementation build to enable best practices in integrating land, water, forest and coastal management and climate change adaptation.

The continuation of the project manager in the post graduate training course is a significant contribution to the project and in particular the enhancement of R2R ICM/IWRM management capacities. This includes the IW project manager Mr. Pesega Lifuka and the staff of the Tuvalu R2R STAR staff, Mr. Lamese, Mr. Feagaiga Penivao and the former STAR Manager Mr. Mataio Tekinene.

1.2 Incentive structures for retention of local R2R expertise and inter-governmental dialogue on human resource needs for ICM/IWRM initiated.

In relation to 2.1, it is a bonus to the capacity building activities conducted by this project. Following their closures, the staff of both IW and STAR R2R projects and R2R graduates continue to work in areas of integrated ecosystem or nature-based coastal management in the country. The project manager is believed to have been absorbed into the Department of Waste Management to continue supporting the design and rollout of the Saugavaka Project. Likewise working to attain some of the targets of the Department of Waste Management. Others who were trained in water quality testing continue with monitoring work of Funafuti lagoon through the Departments of Fisheries and Environment, and MPA monitoring work of the Funafuti Kaupule.

3. Mainstreaming of R2R ICM/IWRM approaches into national development planning

1.1 National and regional strategic action frameworks for ICM/IWRM endorsed nationally and regionally.

The IWRM incorporated a Water Policy in 2011 which was passed through Parliament. An output of the IWRM is an indicator of a successful impact in creating change in the livelihoods of the people (see details in the Annex). The results from both IW and STAR R2R projects contributed to policy discussion and drafting of relevant high-level policy and legislative frameworks – Te Kaniva: National Climate Change Policy 2012-2021, Te Kete: National Development Strategy 2021-2030,

In relation to the Ridge to Reef Science to Policy continuum (Theory of Change) adopted in Tuvalu was the piloting and testing of appropriate stress reduction measures. It was not possible to construct an adequate number of DLT piggeries that would reduce municipal waste pollution from 1616 TN kg/yr to an initial target of 1422, which was later revised to a new target of 536 TN kg/yr. The corresponding new target for the reduction in pollution in aquifers is 11 TN kg/yr. The actual field work and surveys were performed once for the municipal waste pollution and nothing for aquifers. The results were useful contributions to diagnostic stakeholders' consultations that have led to proper decisions in resource management and governance. This identified specific intervention served the purpose of mobilizing the resource for financing, investment planning and promotion in Tuvalu. The approach encountered challenges and yet it managed to lead to proper decisions in resource management and governance.

The Inter-Ministerial Committee which is also the Development Coordinating Committee of the Government of Tuvalu played a critical part throughout the trajectory of the Project. This includes the implementation of all activities that support the goals of the Tuvalu R2R agreements and strategic action framework on land, water, forests, and coastal management.

1.2 Coordinate approaches for R2R integrated land, water, forests and coastal management and climate change adaptation

The NPSC of the Tuvalu IW is under the Department of Waste Management with the Director as the Chairman of the Steering Committee. With this as a coordinating body of the R2R IW, the facilitating efforts of the DCC which is the committee above the NPSC could give the ok to a request from the NPSC. And with the above setting, the DCC has the capacity to mainstream the R2R approaches based on any recommendation from the NPSC.

The Inter-Ministerial Committees have been great empowerment to the progress of the national project interventions or activities. Since all the Permanent Secretaries of all Ministries sit on this committee, the passing of knowledge and retrieving of information is easily obtained and delivered. In the requests for assistance regarding R2R matters or otherwise from different departments, they are easily retrieved and communicated at this level.

Project contributions to the GEF Focal Areas, SDGs including Special Themes

This Chapter provides snapshots of the contribution of the national demonstration project contributions to the GEF Focal Areas such as International Waters, Biodiversity Conservation, Land Degradation, Sustainable Forest Management, and Climate Change Adaptation. Provide response only to the appropriate GEF Focal area/s where your project contributes to. Delete those that are not applicable or relevant.

GEF Focal Areas

1. International Waters

Describe the project contribution towards achieving collaborative management of transboundary water systems and implementation of the full range of policy, legal, and institutional reforms and investments contributing to sustainable use and maintenance of ecosystem services. The aim here is to illustrate how the project contributes to eliminating or reducing threats to international waters through catalysed multi-state cooperation to address concerns of transboundary water systems with a special impact on conjunctive management of fresh and groundwater resources, rebuilding marine fish stocks and protecting coastal habitats. Based on your national demonstration projects, make an inference, and ascertain the link between the measures for reducing stress and nutrient pollution to the rivers and coastal ecosystems, improved catchment planning and management, etc.

Themes GEF Focal Areas 1. International Waters The transboundary waters management issues in Tuvalu particularly in the capital Funafuti have been identified are the key environmental threats to

1. Critical species and habitats are exposed to several forms of land-based pollution. This includes the following
 - Nutrients derived from sewage, soil erosion and fertilizers due to changing land-use practices and urbanization (contributing to the pollution);
 - Nutrient overloads particularly affect coral reef ecosystems, weakening the reef carbonate skeleton and smothering it;
2. Non-living resources, specifically the quality of both fresh and marine waters
 - Threat from land-based sources of pollution. These derive from sewage and poor sanitation practices, sediments (soil erosion, agriculture, forestry, poor land-use practices), urban run-off, agrochemicals, and solid waste. The problems identified in the capital of Tuvalu are similar to all the Pacific Countries. The issues of urbanization compound the problems with the increase of settlers from the outer islands. The Tuvalu IW Project in its log frame has the aim to protect coastal habitats from the increasing pollution from land-based activities. In doing so the Tuvalu R2R will focus on strengthening protected areas management, rehabilitation of degraded coastal and inland forests, demonstrating small scale low carbon energy and water technologies, and supporting integrated water resources management.

Accordingly, the following has been the proposed target to attain.

- o For the Municipal Waste Pollution Reduction • 536 kg/yr TN and 150 kg/yr P reduction through conversion of 50 wash-down pigpens to dry-litter systems in Tuvalu.
- o For the Pollution Reduction to Aquifer • 11 kg/ha/yr TN pollution reduction to groundwater system from the conversion of 50 piggeries to a dry-litter system in Tuvalu to attain the objectives of the IW, the engagement with the Town Council (Kaupule) is to formulate and implement and enforce by-laws and regulations that will change how people can manage the animal waste, particularly the pig waste.

Moreover, the engagement of the IW Project and the Funafuti Community formulated a project named the Saugavaka Piggery Project. It has the focus to use the dry litter concept and is housed under a solar panelled roof to accommodate all the needs of the communities in the capital.

Sustainable Development Goals (SDGs)

This section captures the plausible contribution of the national projects to the relevant Sustainable Development Goals, otherwise known as the Global Goals. The project is expected to contribute to 11 of the 17 SDGs. These are SDG 1 – No poverty, SDG 2 – Zero hunger, SDG 3 – Good health and well-being, SDG 4 – Quality education, SDG 5 – Gender equality, SDG 6 – Clean water and sanitation, SDG 12 – Responsible production and consumption, SDG 13 – Climate action, SDG 14 – Life below water, SDG 15 – Life on land, SDG 17 – Partnerships for the goals. Please use the table below to briefly (in 2-3 sentences) indicate your project’s contribution to the relevant SDGs. Please respond only to the appropriate SDG that your project is contributing to:

SDG	Project contributions
SDG 1 – No poverty	Anticipated benefits with regards to the innovative technology introduced were the compost as an output that will be the best input to the infertile soil. And reaching out to the community in terms of compost for gardening, people will have a sufficient balanced diet and a reduction in the poverty level will be seen.
SDG 2 – Zero hunger	This will be also reduced given the above is achieved.
SDG 3 – Good health and well-being	Good health and well-being The IW project with the Kaupule on the Piggery Farming will improve the cleanliness of the island and in particular settlement of Funafuti and its environment
SDG 4 – Quality education	The completion of post graduate courses will be a good quality education as an output.
SDG 5 – Gender equality	The project promotes equal opportunities for all stakeholders (men, women, elderly, and children) to participate.
SDG 6 – Clean water and sanitation	Given the intervention that was introduced, it will reduce the deterioration of wastewater impacting the water of the island. And reducing the wastewater will however increase the clean water that could be used by people in times of drought.
SDG 12 – Responsible production and consumption	
SDG 13 – Climate change	
SDG 14 – Life below water	The observed current issue in the capital is the alga bloom. If the intervention continues to function it reduces the concentrations of nutrients which will also give a better briefing space to the living organisms under water.
SDG 15 – Life on land	The unmanaged discharge form of animal waste is a nuisance to the public. If this intervention is introduced, it has the outlook of giving less pressure on the people and the environment.
SDG 17 – Partnerships for the goals	

Special Themes

1. Gender Mainstreaming

The participation of the Government Gender Department and the Tuvalu National Council of Women in the Tuvalu IW National Project Steering Committee compliments the opportunity to guide all the planned activities to be inclusive of all groups in the community. The Log Frame was the platform that was set to identify the women's participation in the project activities. Moreover, consultations carried out in the capital including the early school competitions cover the inclusiveness of all in the project activities. It was estimated that the women who participated in these project activities falls to around 100 women and 50 girls and women.

2. Other markers – this is optional

Lessons Learned (Innovations and Catalytic Impacts)

At the outset, the thirteen (13) principles of the ridge to reef offer tremendous and useful guidance to stakeholders, particularly during project implementation. This covers both IW and STAR project implementation in Tuvalu, sharing the same platform for rolling out project works and more importantly demonstrating the programmatic approach to deliver on project outputs and outcomes. Unfortunately, and despite efforts to share one Steering Committee, it was proved difficult particularly having each project implemented under a different line ministry. Nonetheless, the IW and STAR R2R projects were implemented in parallel with a degree of collaboration and implementing joint activities to deliver respective outputs and goals.

At the last stage of this project, the Tuvalu International waters Ridge to Reef project managed to complete its lessons learned report. The report managed to include what were the challenges and likewise the remedial alternatives implemented to assist the progress of the undertakings. Generally, the following lessons learned below are published separately (see link in Annex 1). The lessons and experiences are directly linked to the importance of strengthening and building on partnerships, and domestic governance structures including traditional community leadership, timely sharing of learnings, and support for evidence or science-based approach to guide policies and decision making: -

Lesson 1: Formalise partnerships and build on existing local processes and strategies as the entry point for mainstreaming R2R.

Lesson 2: Invest in identifying, understanding, and communicating the project benefits from the perspective of the stakeholders

Lesson 3: Develop partnerships with other initiatives and agencies to address gaps in scientific knowledge and technical skills and access to equipment.

No doubt that the above lessons are pertinent drivers to improve the relevance of investment in integrating land, water, forest, and coastal management. As an atoll country with seemingly limited natural resources and opportunities, support for a whole-of-island integrated coastal management along the land-sea continuum is a priority. This Tuvalu IW R2R project results demonstrated the urgency of integrated programming that seeks to mainstream ridge to reef and community to cabinet approaches in future investments and ICM planning.

The Tuvalu IW R2R demonstration project's innovations and catalytic impacts support generally raised the level of awareness and understanding amongst communities. The project lessons learned also generate interest in exploring further emerging new technologies and measures that reduce nutrients offloads from human and animal waste, thereby contaminating/ polluting ground water lenses and aquifers, and surface waters in adjacent coastal marine areas and lagoons. Moreover, the project results and experiences prompted interest sub-nationally with communities and local institutions already planning with scaling-up efforts.

For instance, during project implementation, the Funafuti Town Council expressed interest and initiated plans to scale up and commercialize the dry-litter technology (DLT) piggery. This DLT piggery initiative aligns with Funafuti Malefatuga III Strategic Plan (ISP), particularly relating to infrastructure development including sustainable green urban development in the capital. In turn, these efforts also align with sustainable strategies set out under the National Development Strategy (NDS). With a focus on reducing municipal waste pollution and contamination of ground and service water, the

Tuvalu IW R2R project increased levels of awareness and catalytically influenced policy decisions nationally and sub-nationally replicating and scaling up DLT innovations.

The Tuvalu IW R2R demonstration project focuses on municipal waste pollution reduction with a specific activity of DLT piggery. At the end of the project, the project aimed to achieve a stress reduction revised target of 536 TN kg/yr and 150 TP kg/yr. Following the mid-term review in 2019, the logframe and work plans for participating countries were reviewed and revised. Tuvalu stress reduction revised figures outlined earlier were revised from the original target of 1,422 TN kg/yr.

To deliver on the above targets, stress reduction measures were initially planned to convert fifty (50) washdown Pig Pens (or piggeries) to Dry Litter Pig pens with the anticipated impacts below:

- Municipal Waste Pollution Reduction: 919 kg/yr TN and 503 kg/yr P reduction through conversion of 50 wash-down piggens to dry-litter systems in Tuvalu
- Pollution Reduction to Aquifer: 7.6 kg/ha/yr TN pollution reduction to groundwater system from the conversion of 50 piggeries to the dry-litter system in Tuvalu.

In the capital, there were about 560 pig pens on Funafuti Island. In this event, the proposed Municipal Pig Pen caters 1000 pig pens, 500 pens using Dry Litter Technology, and 500 using biogas with the roof of the building having solar panels. The Tuvalu IW R2R project worked on a sample of 20 piggeries or pig pens

The impact will be huge not only to the communities but also a great improvement to the physical environment. It is also envisaged that the social aspects of the community in the capital will also change not forgetting the economic factors derived from the undertaking. Therefore, the experience shares the projected benefits of the project as a success for the Tuvalu IW Ridge to Reef Project.

Tuvalu IW R2R project encountered operational challenges during project implementation, several of which were logistical related. For example, procurement challenges in recruitment and equipment purchase caused major delays. Timely submission of quality quarterly and annual reports delays the processing of cash advance requests, which in turn further delays project implementation. The project also experienced capacity issues and oversight support from the host agency and Steering Committee was generally lacking or inadequate.

The above challenges are useful lessons guiding future R2R investments and ICM planning in the country. Certainly, there are several plausible means to remedy these challenges, which may include the following suggestions: -

- i. Identify areas under current policies and legislations that support and encourage implementation of future R2R projects;
- ii. Identify influential persons and champions in targeted communities, groups and govt to assist and facilitate stakeholder consultations, etc.
- iii. Participation starts throughout the project life not just when you need help; and
- iv. Technology testing must be monitored, and data collected, analysed and results presented back to stakeholders

It is no secret that governance processes and structures are different in PICs, recognising certain commonalities regarding the arrangement of government line ministries by sectors and related cross-cutting priorities. It is important to engage with government agencies as they are crucial to engaging with when considering the proper authorities and the provisioning of advice. With the

support of all the stakeholders, particularly the private sector has also the potential to establish a network that will support the project. Moreover, the solution to the ridge to reef approach lies in a mixture of legislative action and enforcement and the development of improved technologies to deal with solid and liquid wastes.

In conclusion, the Tuvalu International Waters Ridge to Reef Project delivered a demonstration project that has helped catalyse change. The results and lessons suggest a need for reform of policy and planning at the national level, which includes priority policy on home gardens and farming that use compost containing animal/human waste. There have been failed attempts in the past for a broad update of dried-litter technology (DLT) using animal/human waste to support food security in the country. The Tuvalu IW R2R project demonstration offered another attempt with some level of success, particularly in local communities and the private sector. This needs government support to assist communities who wish to replicate and scale up such innovative technologies and measures. These efforts will reduce water contamination in aquifers and lagoons and support food and water security in the country.

The IW intervention was also observed as a contribution to the wider natural resource management and climate change adaptation and mitigation interventions. The significance of the IW R2R experience emphasizes the importance of initiating capital investment that not only captures coastal infrastructure within an integrated management framework but also formulates co-financed activities on water resource and wastewater management, coastal systems, and climate adaptation.

Annexes

Annexes	Title of the document
Annex 1	Tuvalu International Waters Ridge to Reef Project – Results and Lessons Learned Report https://www.pacific-r2r.org/sites/default/files/2022-05/Tuvalu%20IW%20R2R%20Lessons%20Learned.pdf
Annex 2	Technical Report: Water Quality Assessment of Fongafale Lagoon, Funafuti, Tuvalu. https://www.pacific-r2r.org/sites/default/files/2021-08/Tuvalu_Water%20Quality%20Assessment%20of%20Fogafale%20Lagoon.pdf
Annex 3	GEF Pacific Ridge to Reef Programme Tuvalu – National R2R Programme Document https://www.pacific-r2r.org/sites/default/files/2020-03/Tuvalu_0.pdf
Annex 4	Tuvalu Progress Report https://www.pacific-r2r.org/sites/default/files/2020-03/Project_Progress_Tuvalu.pdf
Annex 5	Pacific R2R Programme Workshop Most Significant Change Poster Story – GEF Pacific STAR R2R Project – Tuvalu: Well informed Decisions. https://www.pacific-r2r.org/sites/default/files/2020-03/MSC_Poster_Layout_Tuvalu_STAR.pdf
Annex 6	Pacific R2R Programme Workshop Most Significant Change Poster Story – GEF Pacific IW R2R Project – Tuvalu: Moving forward to a healthy environment and healthy families. https://www.pacific-r2r.org/sites/default/files/2020-03/MSC_Poster_Layout_Tuvalu_IW_2.pdf
Annex 7	GEF IW Experience Notes, IW: LEARN https://www.pacific-r2r.org/sites/default/files/2021-08/Tuvalu%20IWC%202018%20Experience%20Note.pdf
Annex 8	Assets External Transfer Form
Annex 9	Pacific IW R2R Regional Knowledge Exchange: Improved Domestic Pig Waste Management – Workshop Summary Report https://www.pacific-r2r.org/sites/default/files/2020-03/workshop-summary-report_0.pdf
Annex 10	Tuvalu IW R2R Project Logframe
Annex 11	Tuvalu IW R2R Project Multi-Year Costed Work Plan (MYCWP)
Annex 12	Contribution at the NSSD summit of Tuvalu – Transition from sectoral to integrated approaches relative to the conservation and sustainable use of environmental goods and services
Annex 13	Tuvalu R2R Groundwater investigations on Nanumea and Nukufetau atolls http://library.gem.spc.int/#/document/4226
Annex 14	Integrated Environment & Natural Resources Policy 2021-2023 https://www.pacific-r2r.org/sites/default/files/2021-07/Tuvalu%20Integrated%20environment%20policy-final_ed%20250820%20%281%29.pdf
Annex 15	Biodiversity Rapid Assessment Programme (BioRAP) report of Funafuti Atoll, Nukulaelae Atoll, Niutao Island and Vaitupu Island, Tuvalu, Tuvalu STAR R2R Project. https://www.pacific-r2r.org/sites/default/files/2021-07/Tuvalu%20BioRAP%20Report%20Final.pdf
Annex 16	Naikatini, A., (2021). Field Guide for the Biodiversity Rapid Assessment Program (BioRAP) of Funafuti Atoll, Nukulaelae Atoll, Niutao Island and Vaitupu Island, Tuvalu. – Technical Report. Ridge to Reef Unit, Department of Environment, Vaiaku, Tuvalu. https://www.pacific-r2r.org/sites/default/files/2021-07/Tuvalu%20R2R%20BioRAP%20Field%20Guide.pdf

Annex 17	Tuvalu Ridge to Reef Policy to Action Guide Note https://www.pacific-r2r.org/sites/default/files/2021-07/TuvR2R%20Policy2Action%20GUIDEnote%20%281%29.pdf
Annex 18	Falevatie User Manual
Annex 19	Tuvalu IWRM Project Final Report https://www.pacific-r2r.org/sites/default/files/2020-03/GEF-Pacific-IWRM-Final%20Report-Tuvalu.pdf
Annex 20	GEF Pacific IWRM Project Results Note – Integrated Sustainable Wastewater Management (Ecosan) for Tuvalu https://archive.iwlearn.net/pacific-iwrm.org/www.pacific-iwrm.org/rsc/Pacific-IWRM-Results-Note-Tuvalu-2013.pdf
Annex 21	Tuvalu IWR2R project website https://www.pacific-r2r.org/partners/member-countries/tuvalu
Annex 22	Tuvalu Results and Lessons Learned Report https://www.pacific-r2r.org/sites/default/files/2022-05/Tuvalu%20IW%20R2R%20Lessons%20Learned.pdf
Annex 23	Tuvalu Most Significant Change posters https://www.pacific-r2r.org/sites/default/files/2020-03/MSC_Poster_Layout_Tuvalu_IW_2.pdf https://www.pacific-r2r.org/sites/default/files/2020-03/MSC_Poster_Layout_Tuvalu_IW.pdf

News

<https://www.pacific-r2r.org/news/pacific-iw-r2r-regional-knowledge-exchange-improved-domestic-pig-waste-management>

<https://www.pacific-r2r.org/news/epa-hosts-dry-litter-piggery-program-workshop>

<https://www.pacific-r2r.org/news/building-consensus-environmental-governance-through-rapid-application-most-significant-change>

<https://www.pacific-r2r.org/news/milestone-graduation-pacific-environmentalists>

Video

GEF International Waters: Learning Exchange Resource Network (IWLEARN) Pig Waste Management Twinning Exchange with American Samoa Environmental Protection Agency and Pacific Ridge to Reef Regional International Waters Project (October, 2019)

<https://www.youtube.com/watch?v=PkeOXsh9qZc>