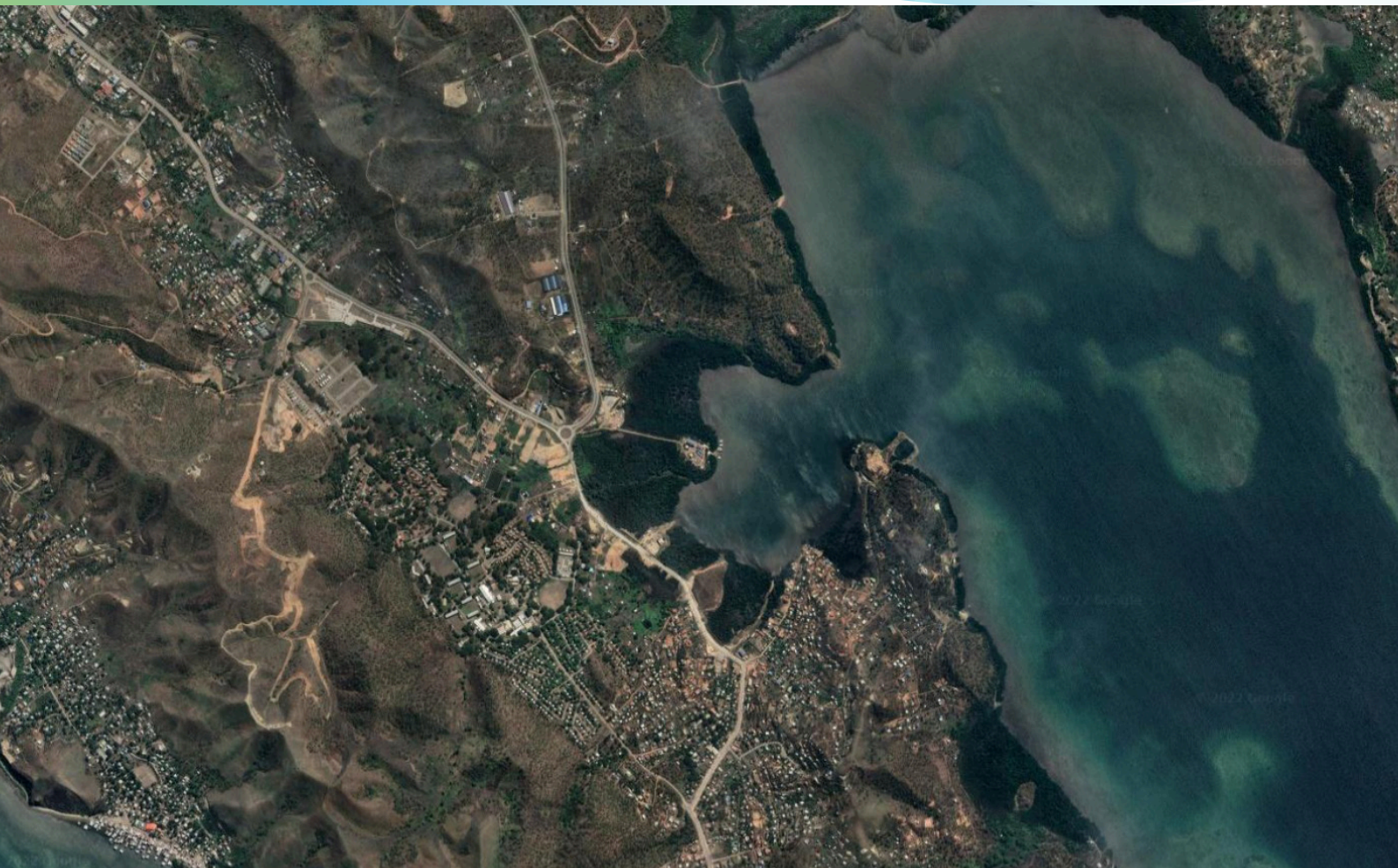




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Papua New Guinea International Waters Ridge to Reef Project

Tuna Bay Solid Waste Management Strategy, Port Moresby

February 2022



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Papua New Guinea International Waters Ridge to Reef Project

Tuna Bay Solid Waste Management Strategy, Port Moresby

February 2022

Prepared by
Paul Moiya Kia

Produced and published by
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Abbreviations

BBMCI	Bootless Bay Marine Conservation Initiative
CBO	Community Based Organisation
CEPA	Conservation and Environment Protection Authority
CPG	Central Provincial Government
GEF	Global Environment Facility
IWR2R	International Waters Ridge to Reef project
JICA	Japan International Cooperation Agency
MKA	Motu-Koita Assembly
MSW	Municipal Solid Waste
NCDC	National Capital District Commission
NFA	National Fisheries Authority
NGO	Non-Government Organisation
PNGIWR2R	Papua New Guinea International Waters Ridge to Reef project
R2R	Ridge to Reef
TPA	Tourism Promotion Authority
UNDP	United Nations Development Programme
WMS	Waste Management Strategy

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Executive Summary

The Tuna Bay Solid Waste Management Strategies and action plans recommended are based on a solid waste assessment study conducted in 2018 by the Conservation and Environment Protection Authority. The study highlighted the need to set up key waste management strategies and action plans in the absence of a National Waste Management Act to regulate waste generation and management practices within the existing laws administered by the Conservation and Environment Protection Authority Environment Act, 2000 and National Capital District Commission Waste Policy, 2014.

The key waste management strategies and action plans proposed for the project area are:

1. Education programmes on waste management – introducing waste management practices as an education curriculum in PNG.

Education holds the key to unlocking the human mindset to adapt to any new concepts. The concept of proper waste disposal and management is an evolving socio-economic concept that must be introduced by way of educational programmes to the residents and all stakeholders. A well-informed educated population will take responsibility to manage waste within the project area effectively.

2. Regular public awareness programmes on clean-up campaigns through all forms of media directed towards proper waste disposal practices at Tuna Bay area and within the city.
3. Regulatory authorities namely, Conservation and Environment Protection Authority (CEPA), National Capital District Commission (NCDC), Central Provincial Government (CPG) and Motu-Koita Assembly (MKA), are strongly recommended to enact new sets of legal policy statements and guidelines specific to Waste Management at project level to regulate and manage waste generation by all stakeholders to protect and preserve the fragile marine ecosystems of the yellow fin tuna fish species spawning grounds.
4. CEPA to form and head an inter-government committee with technical advice from international agencies to draft National Waste Management Strategies, policies, and regulations to be enacted into an Act of law to complement the existing Environment Act 2000, NCDC Waste Policy 2014 and other existing municipal waste regulations in PNG.

The key strategies and action plans proposed at the project level are to be used to guide the drafting of a National Waste Management Act.

1 Introduction

The Tuna Bay International Waters Ridge to Reef (IWR2R) Papua New Guinea Project is funded by the Global Environment Facility (GEF) and is managed by the Conservation and Environment Protection Authority (CEPA) of Papua New Guinea.

The project site is located southeast of Port Moresby City in a small circular bay with a narrow opening into the Bootless Bay Marine Conservation Initiative (BBMCI) project area supported by the Japan International Cooperation Agency (JICA). The two project areas lie adjacent, sharing common marine ecosystems with the shorelines forested with differing densities of mangroves. These two projects are to become the first Marine Protected Areas in PNG under the Marine Protected Areas Act 2015.

The bay estuarine marine ecosystem covers an estimated combined area of 200 hectares of land and sea. This ecosystem is seasonally visited by large schools of yellow fin tuna for spawning together with mackerel, trevally and rainbow runner fish species that are caught by local fishermen to sell at the local markets to generate cash income to sustain their living.

The spawning area is critically important for science, environment, and the traditional custodians of the land; thus, it must be protected. The Motu-Koita people living in Pari and Taurama villages recognise the bay area as a significant site of cultural heritage for the Hiri Trading between the Gulf and Motu-Koita people throughout the 18th and 19th centuries.

The fragile marine ecosystem is facing environmental degradation from natural climatic changes and man-made waste pollution. The increase in waste generation is directly proportional to the increase in population and development in the Taurama bay area. Waste pollution must be regulated with appropriate regulations and practices to mitigate waste output effectively and efficiently at the project level. In the absence of specific legislation, empowering appropriate authorities to enforce collection and proper waste disposal management of all types of waste, a National Waste Management Act must be enacted.

Key strategic waste management practices are proposed with action plans and responsibilities of stakeholders on how best to control the waste generation by local Tuna Bay residents, settlers, business houses and the public in the vicinity of the project area within the existing legal framework.

2 Background Information

Senson Mark (2018) of the Conservation and Environment Protection Authority (CEPA) conducted a case study of solid waste assessment as part of the International Waters Ridge to Reef Papua New Guinea Project (Figure1) to evaluate waste generation, composition, and management practices. The CEPA technical report “Solid Waste Assessment Report for the Tuna Bay International Waters Ridge to Reef PNG Project” highlighted the urgent need to legislate and enact a waste control system associated with PNG’s rapid modernisation and the subsequent waste generation of all types. The challenges faced by responsible authorities at the national, provincial, and local levels are exacerbated by an ever-increasing demand for modern goods that end up as waste at the end of their useful lives, as well as a population that has little experience in managing such waste moving into towns and cities in search of a better lifestyle.

Waste management in towns and cities, including Port Moresby, is a major issue for local authorities who are trying to figure out how to sort and dispose of waste. Except for tier 3 permit conditions for resource developers in the extractive industries sectors, responsible authorities such as the Conservation and Environment Protection Authority lack the specific legal mandate to regulate such activities.

Port Moresby City's population is estimated to be around 400,000 in 2019, with an average annual increase of 18,734 from 2019 to 2020 (worldpopulationreview.com/png). The city's population growth has pushed development to the outskirts, including the Tuna Bay area. The upsurge in settlement surrounding the project area causes alteration to the pristine marine ecosystem. Waste generation rises in lockstep with population growth, economic development, and rising demand for modern goods. Basic waste management practices are lacking in the general population, making it difficult to dispose of waste in a regulated structure for proper disposal by appropriate authorities. At the project level, authorities such as CEPA, the National Capital District Commission (NCDC) and Motu-Koita Assembly (MKA) lack specific waste management laws to regulate waste and punish offenders. There is an immediate need to establish a National Waste Management law to cover all municipal and industrial waste in cities, towns, extractive resources, and infrastructure development industries, commercial activities, radioactive waste materials, recycle-waste materials, medical waste with an array of domestic household waste to be implemented by CEPA and appropriate statutory regulatory agencies across all sectors in PNG.

3 Case Study – Tuna Bay Solid Waste Assessment

In conducting the solid waste assessment along the Tuna Bay area, different methods were employed to assess the solid waste output. For the assessment of solid waste, five sites were selected with each site covering an area approximately 78.5 square metres. All types of waste within a 5-metre radius of the selected sites were collected, sorted out, counted, and weighed (refer to Table 2).

Under the household waste assessment, ten households were selected (Figure 1). Nine of the ten households were interviewed to have a fair understanding of how the residents deal with different types of waste and how these are being disposed of. Random interviews with community members on the issue of waste management practices and their perceptions on the PNG–IWR2R conservation project were also conducted.

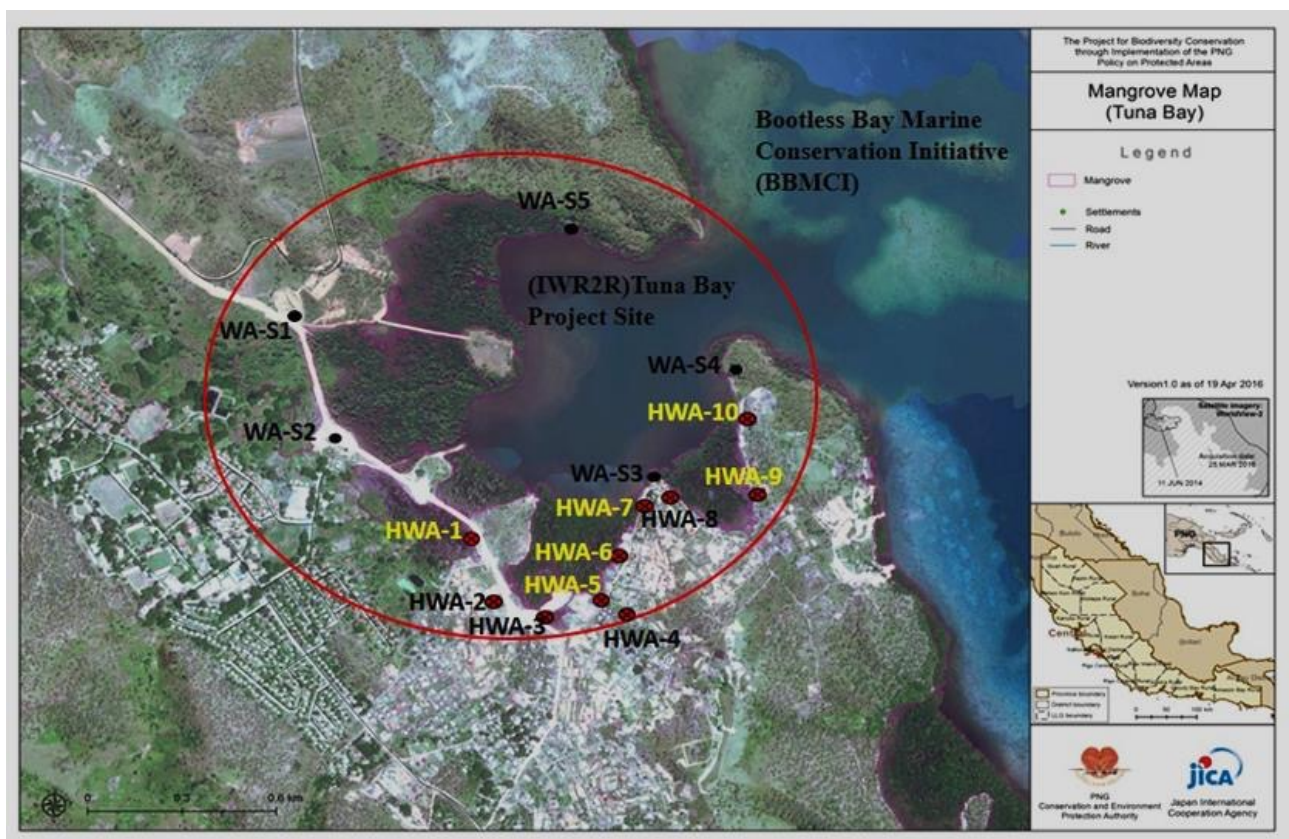


Figure 1. Location of Tuna Bay International Waters Ridge to Reef (IWR2R) Project Area. Solid Waste Assessment (WAS1-55), Household Waste Assessment (HWA1-10) sites and the adjacent Bootless Bay Marine Conservation Initiative (BMMCI), (adapted and modified from CEPA/JICA, 2014).

4 Data Analyses

The households surveyed within the area WAS1-5 produced an average total of 35 kilograms (kg) of solid waste, which is dumped directly into the environment. The nine households surveyed (HWA1-10) generated a total of 1111 kg of unsorted waste per day (Table 2). During the survey period, a total of 1146 kg of solid waste was generated per day at the Tuna Bay IWR2R project site.

Table 1. Total unsorted Solid Waste generated per day (modified from Senson 2018 data).

Solid Waste Generation per day	Total Weight (kg)
Unsorted Solid Waste Disposal Assessment (WAS1-5)	35
Unsorted Household Solid Waste Assessment (HWA1-10)	1111
Total waste generation per day	1146

5 Tuna Bay Household Solid Waste Generation and Management Practices

The waste management practices in use are shown below in Table 3. Every two weeks, the NCDC waste management collects on average 7000 kg of unsorted household waste at a designated collection point for proper sanitary disposal at its Baruni waste treatment centre. A total of 8554 kg (Table 3) of unsorted waste is discarded directly into the environment every two weeks, with 1722 kg dumped directly into the sea.

Table 2. Total Waste generation and management practices in use at Tuna Bay project site (*modified from Senson 2018*)

Household Waste Management		Daily (HWA1-10) 1111 kg	Comment
1	NCDC collection	500 kg	NCDC collects 7000 kg (500 x 14) every two weeks from its collection points for proper sanitary disposal.
*The remaining 611 kg of daily waste not collected by NCDC plus 35 kg waste from survey sites 1-5, a total of 646 kg waste is disposed directly into the surrounding environment daily.			
2	Bury, Pit		244x14=3,416 kg
3	Burn		244x14=3,416kg
4	Dumped into sea		123x14=1,722kg
5	Dumped into surrounding environment (WAS1-5)		35x14=490kg
Total unprocessed waste disposed into surrounding environment every two weeks			9044kg

According to the NCDC Waste Policy (2014), the current waste management practices are loosely regulated and require amendments to accommodate the growing types of waste being generated. Groundwater pollution will eventually result from unregulated waste management practices such as burying in a pit without prior sanitary processing. The contaminated groundwater will naturally seep into the marine ecosystems nearby.

Long-term improper waste management practices without proper regulation and administration by responsible authorities will result in harmful environmental pollution and irreversible damage to the fragile marine flora and fauna ecosystem at Tuna Bay, which is home to yellow fin tuna fish spawning grounds.

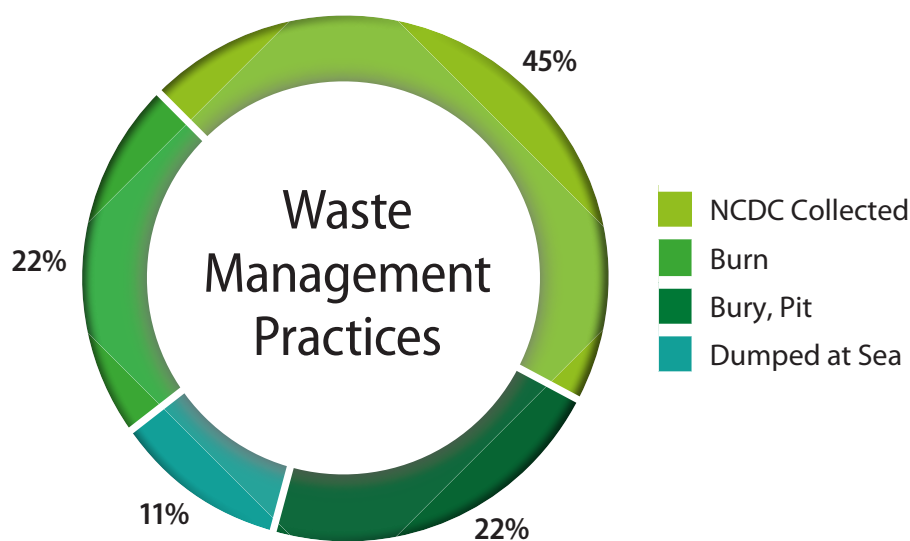


Figure 2. Waste management practices used by the surveyed households.

6 Tuna Bay Solid Waste Data Generation Projection 2030

Based on the waste generation trend and composition data from this study, a total of 5,019,480 tons of unsorted waste is expected to be generated by 2030. Waste management at the NCDC will have processed 2,190,000 tons (Table 4). Over the same period 2,829,480 tons of waste will have been dumped directly into the environment without proper sanitary processing. Other waste-generating factors such as population growth, consumer trends, and industrial/commercial development progress within the area are not considered in this projection.

Table 3. Tuna Bay annual waste generation projection, 2018–2030.

Year	2018	2030
Annual Waste Disposal projection	kg	kg
NCDC collection and processing	182,500	2,190,000
Total waste disposed direct into environment	235,790	2,829,480
Waste bury in pit	89,060	1,068,720
Waste burn off	89,060	1,068,720
Waste dumped at sea	44,895	538,740
Waste at surveyed sites (WAS1-5)	12,775	153,300

According to the NCDC Waste Policy (2014), the current waste management practices are loosely regulated and require amendments to accommodate the growing types of waste being generated. Groundwater pollution will eventually result from unregulated waste management practices such as burying in a pit without prior sanitary processing. The contaminated groundwater will naturally seep into the marine ecosystems nearby.

Long-term improper waste management practices without proper regulation and administration by responsible authorities will result in harmful environmental pollution and irreversible damage to the fragile marine flora and fauna ecosystem at Tuna Bay, which is home to yellow fin tuna fish spawning grounds.

7 National Capital District Commission Waste Management Policy

Under the NCDC Waste Policy 2014, the NCDC has the authority to regulate and implement all municipal waste generated within the city of Port Moresby. The NCDC waste management covers the Tuna Bay project area and collects municipal waste for sanitary processing at its Baruni waste processing centre every two weeks from selected collection sites.

The local level government of MKA is a stakeholder partner. The project area is situated on traditional Motu-Koita land and sea boundaries. It is recommended that the NCDC, MKA, and CEPA draft and amend legislation to account for all types of waste that will be generated in this project site. These statutes could serve as the foundation for enacting a National Waste Management Act.

8 Previous Waste Management Studies of Port Moresby, National Capital District

PNG is expected to generate over 20 million tons of municipal solid waste between 2012 and 2030, according to a UNDP country snapshot report (Woodruff 2014). The city of Port Moresby is estimated to generate 135 tons of household municipal solid waste per day or over 50,000 tons per year. By 2030, the city of Port Moresby expects to generate 900,000 tons of unsorted waste.

The Tuna Bay solid waste assessment data projects an average of 5 million tons of unsorted waste generated from 2018 to 2030. A detailed waste assessment study is required to be carried out by CEPA and stakeholders for all centres and specific project sites in PNG.

Table 4. Waste data comparison.

Year	Waste Projection (tons)			Data Source
	PNG	Port Moresby	Tuna bay	
2012–2030	20 million	900,000	NA	Woodruff 2014
2018–2030	NA	NA	5 million	Senson 2018

Data Not available (NA)

9 National Waste Management Plan

Papua New Guinea does not have in place a national waste management plan. The national data on Municipal Solid Waste is erratic as there are no ledgers or records of daily waste collection and disposal held by any municipal authorities except for NCDC. However, the NCDC waste data is quantitative and lacks credibility for an accurate waste generation and composition assessment.

Studies by Senson (2018), Woodruff (2014) and Wangi (2013) highlighted the need for national waste management legislation to be enacted. CEPA and NCDC must enact specific by-laws to administer and regulate waste effectively and efficiently as soon as practical.



Figure 3 Unsorted solid waste at NCDC designated collection station near roadside at Mangomain Urban village, East Boroko, NCDC (Photo by Kia, P.M, 2019)

10 Tuna Bay IWR2R Project Key Waste Management Strategies and Action Plans

The Tuna Bay Waste Management Strategy propose four key action plans at the project level as vital components to managing waste.

The four key actions are:

- i. Education,
- ii. Public awareness,
- iii. Develop By-Law for the Project that includes Waste Management and
- iv. National Waste Management Policy and Act to complement the Environment Act, 2000.

The waste management strategy will help regulate proper waste management at the project level and are to be implemented by NCD and Motu-Koita Assembly. The strategy will be used as a general guide to eventually incorporate a broader scope National Waste Management Policy and eventually an Act to be administered by CEPA.

Scoping shall include all industrial and domestic waste covering development industries in constructions and logistic freights/haulage (sea, air, and land); extractive, downstream industries, spillage, bush fires, end-user product responsibilities, consumables, and recycled waste materials.

10.1 Education Programmes on Waste Management

The concept of proper waste disposal and management necessitates educating the local populations within the Tuna Bay project area. Below are some education programme methods that have been proposed.

Table 5. Waste management education and execution programs.

Education Programs		Execution Programs	Expected Outcome
1	Adult Education	Organize residences to attend waste disposal management training during scheduled times throughout the year	Educated Informed community with a sense of responsibility in waste management
2	Institutional lectures, Short courses	Conduct seminars, run short courses on waste disposal and management at all educational institutions /churches/community halls within the area	Educated population implementing proper waste disposal management practices uniformly.
3	*Introduce Waste Management syllabus-Elementary and Primary schools	Teaching children early to manage waste, a MUST one lesson per week program for all schools within project- (CEPA to liaise with Education department for approval & implementation)	An educated future population growing up with waste management practice as part of life

^{*3}The education concept can be trialled out at selected or all education institutions within the City of Port Moresby (Tuna Bay), NCD, and Central Province starting in 2020 academic year.

It is recommended that CEPA partner with the Education Department to introduce the waste management syllabus as a school curriculum to be taught in the PNG Education system in component 3 of the proposed education programme (Table 6). Education of future generations on proper waste management practices is a long-term strategy. They will grow up knowing how to properly dispose of waste, which will be ingrained in their daily lives.

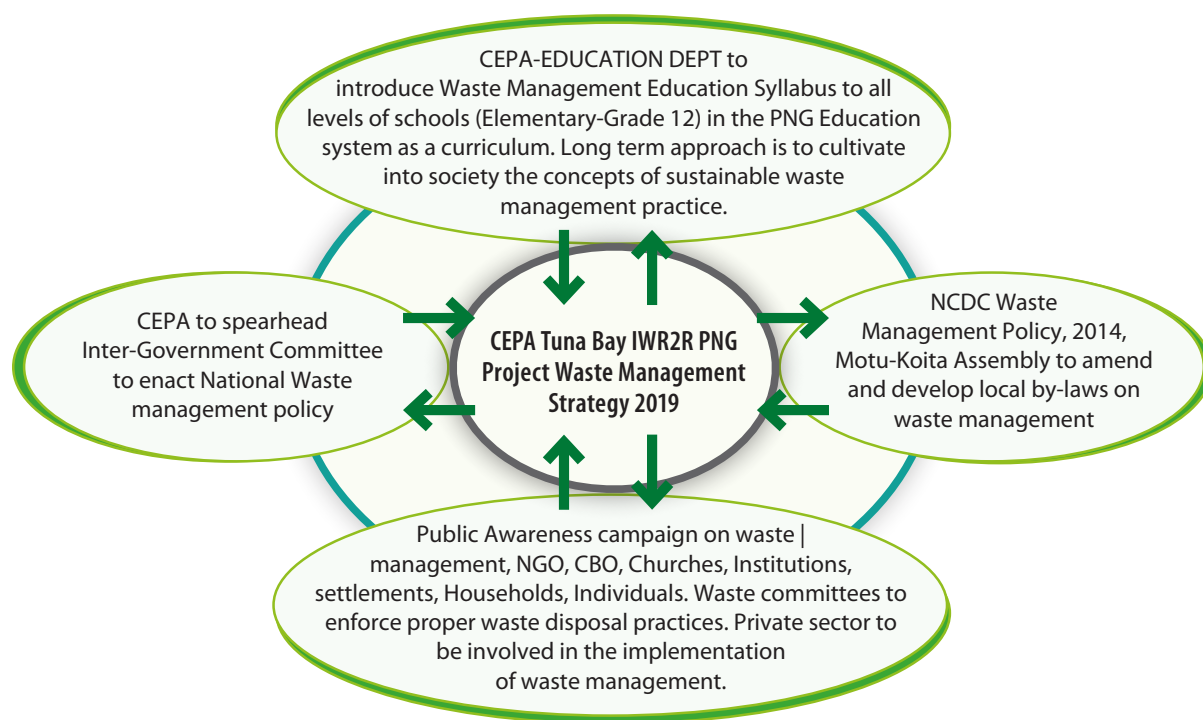


Figure 4. Relationship chart showing proposed important stakeholder partnership links in the Waste Management Strategy approach to be applied at Tuna Bay IWR2R PNG Project area, Port Moresby PNG.

The relationship chart (Figure 4) describes the link between the stakeholders and the waste education strategy that can be applied at the project level and trialled with the education department.

Table 6. Methods and stakeholder’s responsibilities in executing public awareness programmes.

Stakeholders	Task	Execution Method
CEPA	Schedule annual public awareness programmes to fall in line with international environment programmes in PNG	(1) Erecting Billboards at selected strategic sites. (2) Distribution of pamphlets during awareness. (3) Media, TV, Radio, social media platforms
NCDC	Conduct awareness on regulation and Municipal Waste disposal and storage for collection, Enforce NCDC laws	Contract resident vendors/ rangers to work within the community
MKA	Councillors of each ward MUST set policy statements on waste disposal and management	Awareness by ward councillors to complement NCDC waste collection schedules
NGO, CBO, CHURCHS	Advocate local MKA (NCDC) waste policy statements at household levels	Members to practice proper waste disposal management strategy
NFA	Conduct awareness on its websites	Enforce regulation on illegal methods of harvesting seafood, Waste dumping into sea, dynamite fishing
TPA	Conduct awareness on its websites	Duty to enforce tourism operators to inform tourist not to dump waste or harvest marine flora and fauna
BSP	Go Green Campaign	Organise community to do clean up on regular basis/ schedule to fall in line with international environment days

10.2 Public Awareness Programmes

This strategy entails using coordinated Public Awareness campaigns on waste disposal and management programmes as a proactive educational tool within the existing legal framework while anticipating the enactment of a National Waste Management Policy to complement the Environment Act of 2000 and the NCDC Waste Policy 2014.

10.2.1 Action Strategies:

1. Emphasis must be placed on educating the entire population about the dangers of dumping waste directly into the sea, as well as dumping waste from mobile machinery on land, ships at sea, or from above. Other forms of unregulated waste management, such as burying and open-air burning, must be prohibited by legislation. All types of waste must be disposed of only at NCDC-approved waste collection sites.
2. The Tuna Bay community-based organisations, non-governmental organisations, church groups, local villagers, families, and individuals must all participate in the implementation of the waste management and awareness programmes. It is proposed that a community-based waste committee be formed and that meetings be held regularly to raise awareness. The committee delegates duties to families to carry out waste management awareness and practices. This is a community-based approach to dealing with proper waste disposal practices. Every individual in the community is responsible for managing their waste.

10.3 Local By-Laws on Waste Management

There are no waste management by-laws in place in the MKA to enforce and regulate waste at the ward level. MKA should work closely with the NCDC, the Central Provincial Government, and CEPA to draft a waste policy that will be implemented at the ward level and is consistent with the NCDC Waste Policy 2014 and the Environment Act of 2000.

The MKA Waste Policy Act must include the marine environment, nearshore to continental shelf flora and fauna. Laws enacted to regulate and control harvesting, clearing or any form of infrastructure development endangering the Tuna Bay estuarine Marine Mangroves population. This set of legislations can then be incorporated into the National Waste Management Act to be applied to PNG and may be relevant for other archipelagic Pacific nations involved with the IWR2R project.

10.4 National Waste Management Policy

Papua New Guinea does not have a National Waste Management Policy and or Act to complement the existing Environment Act 2000, Marine Time Zones Act 2015, PNG Protected Areas Bill 2016, and the NCDC Waste Policy 2014. Rapid economic development, industrialisation, population growth, and urbanisation trends in PNG's urban centres have resulted in rapid marketing systems and increased consumption behaviour, increasing the output of a variety of waste types.

The Environment Act of 2000 lacks specific legal provisions to address all types and forms of municipal and industrial waste generation and disposal. CEPA's current regulations limit the requirement for issuance of Environment Permits to tier 3 projects in the extractive industries, mining, petroleum, and gas sectors, as well as select manufacturing and infrastructure construction.

The proposed National Waste Management Act should enact laws covering hazardous heavy metals, industrial spillage, radioactive waste materials, combustible waste, construction, and demolition, Recycle, Reduce and Reuse, Extended Producer Responsibility (EPR) and sustainable waste conversion to resources and organic waste conversion to green energy generation.

The Environment Act 2000 must be reviewed and amended and portions of the act be incorporated into the NWM Act to include defined responsibilities such as the role of (a) the National Government to protect the environment and the health of its citizens from pollution, (b) the provincial and local level governments to enact policies to mitigate waste generation and pollution in accordance with the socio-economic and natural conditions of the local communities, (c) residents to cooperate in implementing waste control measures imposed by respective regulatory authorities; (d) industrial waste producers in taking responsibility for industrial waste disposal and clean-up. The disposal and clean up must be carried out under strict supervision from the State and its government arms.

11 Waste Management Responsibilities

Everyone, including stakeholders, state agencies, commercial and corporate entities, development partners, and manufacturers of goods and services, is responsible for waste management at the Tuna Bay IWR2R project site, NCDC and PNG as a whole.

CEPA is responsible for enforcing the Environment Act 2000 and overseeing waste management regulations in PNG. Other State agencies with cross-cutting responsibilities and key actions are shown in Table 8.

Table 7. Stakeholders' key responsibilities and actions

Stakeholders	Key Responsibilities	Key Actions
CEPA	Governing /regulator/administrator	Issue environmental permits
NCDC	Municipal Waste collection and management	Waste disposal management
MKA	Enact Waste Policy frame work/regulate/ administer at ward levels	Policy management, waste control within project area and other coastal regions within Motu-Koita region
NFA	Marine Resources management, Fisheries, Biodiversity	Permits, Maritime zones jurisdictions
TPA	Conduct awareness/educate tourists on Marine Protected Areas	Ensure no damage, disturbance done to marine ecosystem within BBMCI & Tuna Bay
Business Houses	End User Responsibilities (EPR), Disposal of household white goods	Setting up proper waste collections system working with NCDC, MKA
NGO, Churches	Education, Awareness	Organise members & communities in waste management programmes
Communities, Residents	Implementing proper waste management practices	Participation in scheduled clean-ups, quarterly clean ups

12 Discussion

The key waste management strategies and action plans proposed for the Tuna Bay International Waters Ridge to Reef (IWR2R) Programme can also be applied in principle to the adjacent Bootless Bay Marine Conservation Initiative (BBMCI) and other marine parks to be declared soon throughout the archipelagic State of PNG. The new waste management system is a new concept to the bulk of the rural-urban population in PNG. Many urban settlers lack basic waste management practices and are struggling to deal with the increasing variety of waste generation and disposal in the urban centres of PNG, causing environmental pollution.

CEPA, NCDC's waste management division, MKA, and other stakeholders are doing an excellent job of managing waste in Port Moresby and the surrounding large coastal Motu villages. They must continue to hold regular public awareness programmes, including in the Tuna Bay area, to educate residents on proper waste disposal practices.

The NCDC and all retail business partners must use clear labelled waste bins or boxes to collect recyclable waste materials such as PET bottles, newspapers, milk cartons, and food trays separately so that they can be converted into sustainable resources for reuse and recycling, resulting in waste reduction in society.

Domestic population growth and demand for industrial development progress have increased the consumption rate of materials exponentially at the Tuna Bay project site. When industrial and domestic home appliances, such as cell phones, radios, television accessories, refrigerators, washer-dryers, and air conditioners reach the end of their useful lives, they become a source of pollution. They become hazardous waste when improperly handled because they contain hazardous and rare metals.

At the project level, CEPA requests NCDC to designate land near Tuna Bay Area to be used as a waste collection substation and aerobic landfill dumpsite to increase the efficiency of waste collection and disposal.

The government of PNG, through CEPA, NCDC, Provincial Governments, and Local Level Governments, should consider constructing an incineration station to manage waste in the long term.

Dumping waste directly into the sea is dangerous to the fragile marine ecosystem. This practice in the Tuna Bay area must be totally banned through the enactment of a law. If this trend goes unregulated as is the current case, waste generation by 2030 is expected to reach 5 million tons annually.

CEPA is recommended to form and head an inter-governmental committee, seeking technical advice from international agencies to draft policy for the development a National Waste Management Act and Regulations to complement the existing Environment Act 2000, the NCDC Waste Policy 2014 and other existing municipal and industrial waste regulations in PNG.

The key strategies and action plans proposed at the project level are to be used as a guide to draft the National Waste Management Act. The local by-laws will complement and coexist within the proposed National Waste Management Act and the Environment Act 2000, which is to be administered by CEPA. The NCDC and all third-tier government levels, will be automatic implementers applying laws within their local by-laws to regulate waste management across PNG.

13 Recommendations

1. The Conservation and Environment Protection Authority (CEPA) should immediately set up a joint inter-government committee to draft National Waste Management policy guidelines towards development of the National Waste Management Act, with the aim of enactment by parliament before the national election in 2022.
2. Waste Management education syllabus must be introduced to all schools from elementary to higher secondary schools in PNG. CEPA to work with Education Department to introduce this new curriculum as soon as practically possible after passing the National Waste Management Act.
3. Proper waste management practices through scheduled public awareness campaigns for Tuna Bay IWR2R project are critically important and must be sufficiently funded by CEPA and partner stakeholders.
4. CEPA should request NCDC to identify and designate land area close to Tuna Bay Area to be used as a substation waste collection and aerobic landfill dump site to increase the efficiency of waste collection and disposal in the short term, and to construct permanent incinerators for long term waste management.
5. CEPA, NCDC, MKA are to enact laws to place responsibility for the disposal of home appliances to the retailers. The retailers collect and extend disposal responsibility to the producer of the items – a concept known as the Extended Producer Responsibility (EPR) – for proper disposal at end of life through recycling and recovery of rare and precious metals.
6. A consortium of partner stakeholders is recommended to fund the waste management education and awareness strategies. CEPA, NFA, TPA, NCDC, CPG, MKA, international donor agencies (GEF, UNDP, JICA) and commercial partners to appoint CEPA to manage funds to efficiently and effectively manage waste generation and disposal not only at IWR2R Tuna Bay Marine Protection Area and the adjacent Bootless Bay, but in other areas within PNG.
7. Develop an effective communication strategy that will include appropriate medium of awareness, producing pamphlets, audio-visual campaigns (i.e., television and radio programmes during prime-time segments), and short message services on mobile carrier networks (Digicel, Bmobile, Telikom). Production of short videos on waste management practices should be incorporated with education syllabus to be circulated on mobile telecommunication platforms throughout schools in PNG.

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