

Tuvalu National Action Plan

to reduce releases of
Unintentional Persistent Organic Pollutants
2018-2022

28 June 2018

Acronyms

BAT	Best Available Techniques
BEP	Best Environmental Practices
DE	Department of Environment
DWM	Department of Waste Management
EU	European Union
KRAs	Key Result Areas
mg TEQ	Milligrams of Toxic Equivalents
NIP	National Implementation Plan
ODS.....	Ozone Depleting Substances
PacWaste ..	Pacific Hazardous Waste Management Project
PICs.....	Pacific island countries
POPs	Persistent Organic Pollutants
PPE	Personal Protective Equipment
SPREP	Secretariat of the Pacific Regional Environment Programme
TANGO.....	Tuvalu Association of Non Governmental Organisations
UN	United Nations
uPOPs	Unintentional Persistent Organic Pollutants

Contents

- Acronyms ii**
- 1 Introduction 1**
 - Scope of the uPOPs Action Plan1
 - Description of the uPOPs2
- 2 Situational analysis 4**
 - Sources of uPOPs in Tuvalu.....4
 - uPOPs releases in Tuvalu5
 - Policy framework6
 - Legislative framework8
- 3 The Action Plan 10**
 - Goal10
 - Key Result Areas.....10
 - Activities10
 - Implementation Plan.....15
 - Key Performance Indicators19
- References 20**
- Appendix A: Assessment of uPOPs releases in Tuvalu 21**
- Appendix B: Regional uPOPs Action Plan activities 27**
- Appendix C: Progress in implementing uPOPs activities under the 2008 Tuvalu NIP 31**
- Appendix D: Healthcare waste management recommendations 32**

1 Introduction

Persistent Organic Pollutants (POPs) are toxic chemicals that can travel long distances through air and water, and accumulate in the fatty tissues of humans and other animals. These POPs do not degrade quickly over time, and consequently, potentially expose people to serious health issues including cancer, birth defects and immune system impairments. As a result of anthropogenic releases of POPs to the environment since the 1940s, POPs are now widely distributed over large regions, including the Pacific Islands.

To address the global environmental threat of POPs, the Stockholm Convention on POPs was adopted in May 2001 and entered into force on 17 May 2004. The Stockholm Convention commits Parties to reducing, and where feasible, eliminating the production and environmental releases of POPs. Tuvalu acceded to the Stockholm Convention on 19th January 2004 and became a Party on 17th May 2004. For more information on the Stockholm Convention, please visit <http://chm.pops.int/>.

When the Stockholm Convention first entered into force in 2004 it regulated 12 POPs; it now currently regulates 28 POPs. Of these, 7 are classified as unintentionally produced POPs (uPOPs), which are unintentionally formed and released during thermal processes involving organic matter and chlorine because of incomplete combustion or chemical reactions.

As a Party to the Stockholm Convention, the Government of Tuvalu is required to develop, and endeavour to put into practice, a National Implementation Plan (NIP) setting out how the Government will implement the Stockholm Convention. Tuvalu developed its first NIP addressing the 12 POPs in 2008, and in 2017 commenced the process to review and update the NIP to include the additional POPs. The NIP must include a series of costed Action Plans that address management of the POPs relevant to Tuvalu.

This National Action Plan to Reduce the Formation and Release of Unintentional POPs (uPOPs Action Plan) is one of the Action Plans developed under the NIP and must be read in conjunction with the NIP. As the waste management sector has been identified as a main source of uPOPs releases in Tuvalu, this uPOPs Action Plan includes activities related to improved waste management and it therefore complements the Tuvalu Integrated Waste Policy and Action Plan 2017-2026.

The uPOPs Action Plan was developed under the Pacific POPs Release Reduction Project, funded through the Global Environment Facility–Pacific Alliance for Sustainability (GEF-PAS). The Pacific POPs Release Reduction Project aims to reduce Persistent Organic Pollutants (POPs) in the Pacific region through the improved management of solid and hazardous waste. The project is co-funded by *l'Agence Française de Développement* (AFD). It is executed by the Secretariat of the Pacific Regional Environment Programme (SPREP) and implemented by the United Nations Environment Programme (UNEP) and the Food and Agriculture Organization (FAO). For more information, please visit www.sprep.org/stopthepops.

Scope of the uPOPs Action Plan

This uPOPs Action Plan addresses the following seven uPOPs which are currently listed under Annex C of the Stockholm Convention:

- Hexachlorobenzene (HCB)
- Hexachlorobutadiene (HCBd)
- Pentachlorobenzene (PeCB)
- Polychlorinated biphenyls (PCBs)
- Polychlorinated dibenzo-p-dioxins (PCDDs or dioxins)
- Polychlorinated di-benzofurans (PCDFs or furans)
- Polychlorinated naphthalenes (PCNs)

It should be noted that dioxins and furans are indicative of the presence of other uPOPs and are considered to constitute a sufficient basis for identifying and prioritizing sources of all uPOPs, and for devising control measures

for all Annex C POPs (UNEP, 2013, p. 16). This means that efforts to address dioxins and furans under this uPOPs Action Plans, will be deemed sufficient to address all Annex C POPs.

The uPOPs Action Plan includes measures to reduce or eliminate releases from unintentional production as required under Article 5 of the Convention. Specifically, the uPOPs Action Plan:

- assesses current and projected releases of uPOPs from several sources; and the national legislative and policy framework for managing releases from these sources
- identifies strategies to address unintentional releases of POPs, including promoting awareness, education and training around those strategies
- facilitates a five-yearly review of the effectiveness of the strategies (to be reported to the Stockholm Convention Secretariat)
- promotes available, feasible and practical measures to achieve realistic and meaningful reduction or source elimination
- promotes the development, and where appropriate the use of substitute or modified materials, products and processes to prevent the generation of uPOPs
- promotes the use of best available techniques and best environmental practices for uPOPs sources.

Description of the uPOPs¹

Hexachlorobenzene (HCB)

HCB has been used as a pesticide to protect the seeds of onions and grains against fungus, in wood preservation, and in the production of fireworks, ammunition, rubber, aluminium and dyes (Department of the Environment, 2014). In high doses, HCB is lethal to some animals and, at lower concentrations, can adversely affect their reproductive success. HCB has been found in food of all types (UNEP, 2008).

Hexachlorobutadiene (HCBd)

HCBd was used for a variety of purposes including as a pesticide, fungicide, a solvent, heat transfer fluid, and hydraulic fluid. It is unintentionally formed as the by-product of several chemical processes, and during incineration of wastes containing high chlorine content. The United States Environmental Protection Agency has classified HCBd as a possible human carcinogen (UNEP, 2008).

Pentachlorobenzene (PeCB)

PeCB was used in polychlorinated biphenyl (PCB) products, in dyestuff carriers, and as a fungicide and a flame retardant. It is also produced unintentionally during combustion, and in thermal and industrial processes. In the environment, PeCB is moderately toxic to humans and very toxic to aquatic organisms (UNEP, 2008).

Polychlorinated biphenyls (PCBs)

PCBs are used in industry as heat exchange fluids, in electric transformers and capacitors, and as additives in paint, carbonless copy paper, and plastics. There are 209 different types of PCBs, of which 13 are of concern. PCBs are toxic to fish and are linked to reproductive failure and suppression of the immune system in various wild animals. PCBs also suppress the human immune system and are listed as probable human carcinogens (UNEP, 2008).

Polychlorinated dibenzo-p-dioxins (PCDDs or dioxins)

Dioxins are produced unintentionally during incomplete combustion of healthcare waste, municipal waste, and hazardous waste, during paper manufacture using chlorine bleaching, and from automobile emissions, and peat, coal, and wood combustion, including forest fires. There are 75 different dioxins, of which seven are of concern. Dioxins are classified as possible human carcinogens and have been associated with several adverse effects in

¹ UNEP (2008). *All POPs listed in the Stockholm Convention*. Retrieved from <http://chm.pops.int/TheConvention/ThePOPs/AllPOPs/tabid/2509/Default.aspx>

humans, including immune and enzyme disorders and chloracne. Laboratory animals given dioxins suffered a variety of effects, including an increase in birth defects and stillbirths. Fish exposed to dioxins died shortly after the exposure ended. Food (particularly that sourced from animals) is the major source of exposure for humans (UNEP, 2008).

Polychlorinated di-benzofurans (PCDFs or furans)

Furans are produced unintentionally from many of the same processes that produce dioxins. They have been detected in emissions from waste incinerators and automobiles. Furans are structurally similar to dioxins and share many of their toxic effects, although they are typically much less toxic than dioxins. There are 135 different types, and their toxicity varies. Furans persist in the environment for long periods and are classified as possible human carcinogens. Food, particularly animal products, is the major source of exposure for humans. Furans have also been detected in breast-fed infants (UNEP, 2008).

Polychlorinated naphthalenes (PCNs)

PCNs include up to 75 different compounds and have been historically used as wood preservatives, paints and engine oils additives, heat exchange fluids, in capacitors and for cable insulation, and a range of other uses. While the use of PCN has ceased, they are also present in PCB formulations and more significantly, they are unintentionally produced during combustion processes. Many PCNs persist in the environment, and acute exposure causes chloracne. Chronic exposure increases the risk of liver disease and is suspected of increasing cancer risks (UNEP, 2008).

2 Situational analysis

Sources of uPOPs in Tuvalu

According to UNEP (2013), uPOPs may be formed and released from 10 source groups, not all of which are relevant to Tuvalu. Each source group has in turn, a number of potential source categories. The seven uPOPs source groups and their source categories relevant to Tuvalu are summarised in Table 1.

Table 1: uPOPs source groups and source categories relevant to Tuvalu

Source Group	Source category	Comments
Waste incineration	Quarantine waste	International ships' wastes are incinerated in wood-fired incinerator
	Healthcare waste (HCW)	HCW incinerator is out of order, but is likely to be repaired and put back into operation in the future
	Waste wood and biomass	The quarantine waste incinerator is fuelled by wood
Heat and power generation	Household heating and cooking with biomass	Anecdotal evidence suggests that about 20% of the population relies on biomass (wood) for cooking; Also, most of the population uses the traditional earth oven (umu) to prepare a weekly Sunday feast (To'onai)
Transport	4-Stroke engines	
	2-Stroke engines	
	Diesel engines	There are several vehicles and equipment with diesel engines. Also, electricity is generated using diesel generators
	Heavy fuel oil fired engines	
Open burning processes	Waste burning	Dump fires occur as does backyard waste burning on outer islands
	Accidental fires	There have been a few house fires in recent times
Miscellaneous	Drying of biomass	Burning wood to dry copra for coconut oil production
	Smoke houses	Training on the production of smoked fish was facilitated by the Fisheries Department in 2017 with the expectation that fishermen would diversify their fisheries products
	Tobacco smoking	38% of people over 15 years of age smoke tobacco products (WHO, 2017)
Disposal and landfill	Landfills and waste dumps	Each island has a waste dump
	Sewage and sewage treatment	There is currently no sewage treatment system, however, development of a reticulated sewerage network is listed as a priority in the National Strategy for Sustainable Development 2016–2020
	Open water dumping	Sewage is managed through on-site septic tank systems, however, new septic systems are usually constructed badly, and leach sewage directly into the ground and ultimately to the lagoon and ocean
	Composting	Green waste composting is actively promoted, however, the waste is often contaminated with municipal waste (plastics, metals, etc)
	Waste oil disposal	The collection of used oil on Funafuti (and export to Fiji for sound management) has recently commenced
Contaminated sites and hotspots	Waste incinerator sites	The locations of the quarantine waste and HCW incinerators are potentially contaminated sites
	Dredging of sediments	Dredged material from the lagoon on Funafuti has been used to reclaim land for construction in the downtown area
	Accidental fire sites	There have been several house fires in recent times
	Dumps of wastes/residues from other source categories	The Funafuti Dumpsite and dumpsites on the outer islands are potentially contaminated sites

uPOPs releases in Tuvalu

Current (2017) uPOPs emissions

The uPOPs emissions from the source groups and categories relevant to Tuvalu have been estimated in accordance with the methodologies outlined in the *Toolkit for Identification and Quantification of Releases of Dioxins, Furans and other uPOPs* (uPOPs Toolkit)². Estimates were made using available national data, expert judgement, and in some cases data from comparable countries or regions.

The results of the assessment indicate that between 302 and 381 mg TEQ/year³ of dioxins and furans are released in Tuvalu from several sources (Table 2). The most significant sources of emissions are waste incineration, heat and power generation, and open burning processes. A detailed description of the estimations and assumptions made for each source group is provided in Appendix A.

Table 2: Estimated releases of dioxins and furans in Tuvalu in 2017

Source Group	Source Group Description	Annual Releases (mg TEQ/a)				
		Air	Water	Land	Product	Residue
1	Waste Incineration	80.9	0.0	0.0	0.0	75.1
2	Ferrous and Non-Ferrous Metal Production	No relevant activity in Tuvalu				
3	Heat and Power Generation	48.0	0.0	0.0	0.0	5 - 84
4	Production of Mineral Products	0.0	0.0	0.0	0.0	0.0
5	Transportation	0.5	0.0	0.0	0.0	0.0
6	Open Burning Processes	12.0	0.0	0.3	0.0	0.0
7	Production of Chemicals and Consumer Goods	No relevant activity in Tuvalu				
8	Miscellaneous	0.0	0.0	0.0	0.0	3.8
9	Disposal	0.0	0.6	0.0	17.0	59.0
10	Identification of Potential Hot-Spots	-	-	-	-	-
1-10	Total	141.5	0.6	0.3	17.0	142.9 – 221.9
	Grand Total	302 – 381				

Projected uPOPs emissions

Tuvalu's uPOPs emissions are likely to decrease into the future based on forthcoming waste management projects. The most notable of these projects is the €6.8 million Sustainable Waste Management Program funded by the European Union, which will support implementation of Tuvalu's Integrated Waste Policy and Action Plan. Other activities currently being implemented or forecasted will also reduce future uPOPs emissions as summarised in Table 3.

Table 3: Qualitative assessment of projected uPOPs emissions in Tuvalu

Source Group	Source Group Description	Likely future trends in uPOPs emissions
1	Waste Incineration	Decrease in uPOPs emissions likely due to improvement of healthcare waste treatment techniques under the SPREP/EU PacWaste Plus Project and the EU Sustainable Waste Management Program
2	Ferrous and Non-Ferrous Metal Production	Not currently relevant to Tuvalu and no future uPOPs emissions anticipated from this source

² UNEP. (2013). Toolkit for identification and quantification of releases of dioxins, furans and other unintentional POPs under Article 5 of the Stockholm Convention, January 2013. Geneva, Switzerland: UNEP Chemicals.

³ uPOPs emissions are expressed as a single number with units of 'grams of Toxic Equivalents' (g TEQ). TEQ accounts for the different quantities and toxicity of the individual dioxins and furans compounds that may be in a mixture.

Source Group	Source Group Description	Likely future trends in uPOPs emissions
3	Heat and Power Generation	Decrease in uPOPs emissions likely due to the installation of biogas digesters under the EU/GIZ Sustainable Community-Based Biogas Scheme, which will provide a fuel substitute for domestic firewood, kerosene and liquefied petroleum gas. Further decreases also likely if the Government achieves its target under the National Energy Policy and the <i>Enetise Tutumau 2012-2020</i> (Master Plan for Renewable Electricity and Energy Efficiency in Tuvalu) to generate 100% of its electricity requirements from renewable sources by 2020.
4	Production of Mineral Products	Not currently relevant to Tuvalu and no future uPOPs emissions anticipated from this source
5	Transportation	The Tuvalu National Energy Policy 2009 calls for promoting public awareness about good transport management practices such as vehicle tuning and fuel conservation measures. If implemented, these measures will reduce uPOPs emissions.
6	Open Burning Processes	Decrease in uPOPs emissions likely due to improvements in waste management anticipated under the EU Sustainable Waste Management Program
7	Production of Chemicals and Consumer Goods	Not currently relevant to Tuvalu and no future uPOPs emissions anticipated from this source
8	Miscellaneous	Increase in uPOPs emissions possible due to recent trainings by the Fisheries Department on smoked fish production and the expected uptake in the practice by fishermen
9	Disposal	Decrease in uPOPs emissions likely due to improvements in solid, liquid and hazardous waste management anticipated under the EU Sustainable Waste Management Program
10	Identification of Potential Hot-Spots	No change anticipated in potential hot-spots, however, existing hot-spots anticipated to be identified and recorded.

Policy framework

The policy framework for uPOPs management includes the following regional and national policies:

- Cleaner Pacific 2025: Pacific Regional Waste and Pollution Management Strategy 2016–2025
- Regional uPOPs Action Plan
- Te Kakeega III National Strategy for Sustainable Development 2016 to 2020
- National Implementation Plan for the Stockholm Convention on POPs
- National Environment Management Strategy 2015-2020
- Tuvalu National Integrated Waste Policy and Action Plan

Cleaner Pacific 2025

Cleaner Pacific 2025: Pacific Regional Waste and Pollution Management Strategy 2016–2025 is the Pacific region's long-term strategy for integrated sustainable waste and pollution management. It provides a strategic management framework to address the threats that waste, chemicals and pollutants pose to sustainable development in the region. Cleaner Pacific 2025 recognises uPOPs as a regional priority issue and includes several strategic actions to reduce uPOPs emissions, including:

- Inclusion of data on uPOPs releases in regional and national data collection activities (Strategic Action 1)
- Development and enforcement of national policies, strategies and legislation to address uPOPs emissions (Strategic Action 2)
- Implementation of best practice occupational health and safety measures including awareness of health impacts of uPOPs (Strategic Action 4)
- Implementation of organic waste recycling activities that reduce backyard burning and disposal of organic waste at dumps and landfills and reduces uPOPs emissions (Strategic Action 6)
- Improved access to national waste collection services to reduce the need for backyard burning and thus reduce uPOPs emissions (Strategic Action 8)

- Improved availability and sound operation of waste and chemicals management infrastructure to, inter alia, reduce uPOPs releases (Strategic Action 9).

Regional uPOPs Action Plan

The draft Pacific Regional Action Plan to Reduce Unintentional Persistent Organic Pollutants (Regional uPOPs Action Plan) provides a 5-year strategic basis for Pacific Island Countries to reduce emissions of uPOPs and comply with obligations under the Stockholm Convention. It identifies practical, implementable activities that can readily be adopted by countries. A copy of the Regional uPOPs Action Plan activities is provided at Appendix B.

Te Kakeega III

Te Kakeega III National Strategy for Sustainable Development 2016 to 2020 (TKIII) is Tuvalu's national sustainable development strategy for the period 2016 to 2020. It envisions *a more protected, secure and prosperous Tuvalu; healthier people who are more engaged in national, regional and international forums; and a government fully committed to honouring Tuvalu's international commitments and respecting its partnerships*. To achieve this vision, 11 goals in 11 priority sectors are identified in TKIII.

The TKIII framework supports action on uPOPs through several strategies and activities (Table 4), which are primarily based around better management of solid waste, sewage, and liquid waste. If the development milestones stipulated in TKIII are achieved, then it is expected that uPOPs emissions will be reduced compared to the 2017 baseline.

Table 4: Strategies and activities of Te Kakeega III relevant to uPOPs

Goal	Milestones
Strategic Area 5: Falekaupule and Island Development	
Provide quality services and create more opportunities for development	<ul style="list-style-type: none"> ▪ Adopt and ratify UN waste convention and implement its provisions, especially training ▪ Conduct a survey to determine hazardous and medical waste ▪ Waste survey to obtain data for planning ▪ Study how to improve Funafuti dumpsite ▪ Set up waste database ▪ Study alternative ways to dispose of waste (e.g. waste to energy) ▪ Feasibility study on a transfer and recycling station for Funafuti ▪ External transfer and recycling station in outer islands ▪ Implement Funafuti dumpsite study ▪ Implement the Tuvalu Integrated Solid Waste Plan ▪ Write a National Waste Policy and seek Cabinet approval to guide future waste disposal
Strategic Area 9: Infrastructure and Support services	
Provide efficient, high quality infrastructure and support services	<ul style="list-style-type: none"> ▪ Identify land for waste disposal in outer islands ▪ Expand/improve waste disposal systems ▪ Design a reticulated Funafuti sewerage system
Strategic Area 11: Migration and Urbanisation	
Mitigate the adverse impacts of internal migration and urbanisation and capitalise on opportunities offered by migration and urbanisation	<ul style="list-style-type: none"> ▪ Improve solid and liquid waste collection/disposal ▪ Strengthen environmental management controls on Funafuti to control/reduce liquid waste seepage from densely populated areas

National Implementation Plan for the Stockholm Convention on POPs

Tuvalu's National Implementation Plan (NIP) for the Stockholm Convention, addressing the original 12 POPs, was first developed in July 2008. It included several activities to reduce uPOPs emissions. The progress of implementing these activities as at 2018 is summarised in Appendix C.

The process to review and update the NIP to include the new POPs commenced in late 2017 and was still ongoing at the time this uPOPs Action Plan was prepared. It must be noted that although the uPOPs Action Plan and the NIP update are being prepared under different projects, the uPOPs Action Plan constitutes an action plan under the NIP in accordance with Article 5 of the Stockholm Convention. To ensure good integration between the updated NIP and the uPOPs Action Plan, the National Consultant updating the NIP (Alan Resture) has been consulted.

National Environment Management Strategy 2015-2020

The National Environment Management Strategy 2015–2020 sets a policy platform to support long-term planning and action on priority national environmental issues. It identifies policy goals and strategies that fall under four thematic areas: Environmental Governance; Island Biodiversity Conservation and Management; Waste Management and Pollution Control; and Environment Awareness and Education. The strategies under the Waste Management and Pollution Control theme are all relevant to this uPOPs Action Plan, and some have already been implemented. The strategies are:

- Development of waste management policies, plans and legislation
- Effective and efficient enforcement of environment laws
- Upgrading of Tuvalu dumpsites
- Acquisition of garbage trucks and pollution control equipment
- Rehabilitation of borrow pits
- Formal and informal education on waste management and pollution control
- Community programmes on waste minimisation, composting and 3Rs
- Radio programmes and TV footage documentary on waste management and pollution control
- Train-the-trainers programme for waste management and pollution control practitioners
- Identification of investment opportunities from bilateral, multilateral, and international agencies for waste management and pollution control.

National Integrated Waste Policy and Action Plan

The Tuvalu National Integrated Waste Policy and Action Plan (Waste Policy) sets a vision for “*a cleaner and healthier Tuvalu for today and the future generation*”. This vision is underpinned by a mission “*to develop implement and strengthen appropriate waste strategies through concerted efforts of the Government, stakeholders and communities in order to improve the environment and the health of the people of Tuvalu*”.

The Waste Policy recognises that practices—which contribute to uPOPs releases—such as burning of green waste, and improper disposal of hazardous and liquid wastes still occur. As the Waste Policy is centred on improving the management of wastes in Tuvalu, it contains many activities which have a direct or indirect link to reducing uPOPs emissions. These activities will not be duplicated in this uPOPs Action Plan; rather, the uPOPs Action Plan will identify additional activities where necessary to strengthen and complement efforts under the Waste Policy and provide better environmental outcomes.

Legislative framework

uPOPs are released from several activities across different sectors including waste management, transport, and domestic cooking. This section (Table 5) summarises the legislation addressing uPOPs prevention and reduction from the waste management sector, which has been shown to be the main source of uPOPs emissions in Tuvalu. The legislation examined were:

- Waste Operations and Services Act 2009

- Environment Protection Act
- Environment Protection (Litter and Waste Control) Regulations 2013

In summary, the legislation examined include adequate measures (e.g. prohibition on open burning), which if enforced, would contribute to reducing uPOPs emissions in Tuvalu. Details of the relevant uPOPs reduction measures are summarised in Table 5.

Table 5: Legislative framework for reduction uPOPs emissions in Tuvalu

Section	Description
Waste Operations and Services Act 2009: This act defines the roles and responsibilities for waste management, and makes provisions for waste management planning, collection and disposal of solid wastes, and other related operations and services in designated areas of Tuvalu. It is administered by DWM (formerly SWAT)	
12, 13	Requires landfill sites, waste dumps and waste disposal facilities not operated by the Kaupules and DWM to be licensed, and to provide data relating to their operations if requested by DWM or the Minister
24	Requires the Kaupules and DWM to provide annual work programme and budget details to the Minister
25, 28	Enables Kaupules and DWM to make and impose rules, operating procedures, guidelines and codes of practice for waste management
28	Requires Kaupules and DWM to promote waste recycling
32	Prescribes a maximum penalty of \$1,000 for the unauthorised lighting of a fire at a dumpsite
10, 11	Enables regulations to be made for several matters including: waste levies; deposits on goods to support end-of-life management; and lifecycle management (import, export, etc) of things which may become wastes
Environment Protection Act: This act is administered by the Department of Environment and is the principal act concerning the protection and management of Tuvalu's environment	
14	Enables Minister to convene a National Environment Forum to consider nationally important environment matters, disseminate relevant information, and provide the general community with the opportunity to participate in development and implementation of environment related policies, programmes and activities
14, 15	Enables the Minister to convene a National Environment Council to provide advice and serve as the competent authority or implementing authority for any relevant international convention
21-23	Enables regulation to be developed for a range of waste management and pollution control matters
28	Requires all government departments and agencies to assist with implementation and enforcement of relevant international conventions in accordance with a Ministerial request or National Environment Council decision
Environment Protection (Litter and Waste Control) Regulations 2013: This is the main regulation that controls litter and illegal dumping in Tuvalu. It is administered by the Department of Environment and includes several provisions which are directed at reducing uPOPs releases	
5	Prohibits burning of litter and other wastes in a way that breaches a Kaupule by-law, causes nuisance, or causes fire to spread; and prohibits dumping of litter and waste including near water sources, on beaches and foreshores, and in the sea and mangroves
6	Prohibits landfill disposal of electrical and electronic goods, white goods, and any thing restricted under the Waste Operations and Services Act 2009, except at an authorised dumping site
7	Prohibits intentional burning of waste that contains plastics, any hazardous waste or substance, or that creates an unintentional POP
7	Prohibits unauthorised lighting of a fire at an authorised dumpsite
8	Defines all POPs to be "prescribed wastes" and requires persons to disclose prescribed wastes when dumping at a landfill, and to store, transport and safely dispose of prescribed wastes in accordance with the law and any international waste-related convention applying in Tuvalu

3 The Action Plan

Goal

The goal statement describes the outcome expected to be achieved at the end of the Action Plan period. The goal of this uPOPs Action Plan is to **reduce, and where possible prevent the formation, release and adverse impacts of uPOPs emissions in Tuvalu.**

Key Result Areas

Key Result Areas (KRAs) describe the thematic areas that must be addressed to achieve the goal. Seven KRAs have been identified for the uPOPs Action Plan:

KRA1: Strengthen the national policy & legislative framework

KRA2: Reduce human exposure to uPOPs

KRA3: Increase adoption of best practices in the waste management sector

KRA4: Improve domestic cooking practices

KRA5: Reduce uPOPs emissions from the transport sector

KRA6: Improve coordination among stakeholders

KRA7: Ensure timely implementation, monitoring and reporting under the uPOPs Action Plan

Activities

KRA1: Strengthen the national policy and legislative framework

The existing legislative framework pertaining to uPOPs prevention in the waste management sector is reasonably strong as it prohibits open burning, lighting of dump fires, and landfill disposal of electrical and electronic waste, and requires compliance with the waste and chemical conventions to which Tuvalu is a Party. A lot of awareness raising has been conducted on Funafuti on the open burning ban and on waste collection arrangements, resulting in a lot fewer residents burning their waste. However, community awareness and enforcement of the existing laws continues to be a challenge, particularly on the outer islands. Similar education efforts need to be undertaken in the outer islands, and in time, stronger enforcement actions need to be taken against those who refuse to comply with the law that they have been made aware of. The activities to strengthen the national policy and legislative framework are:

- 1.1 Increase awareness of existing laws in the outer islands.**
- 1.2 Introduce a “penalty infringement system”** under the Waste Operations and Services Act, and Environment Protection Act, to discourage unlawful behaviour and give people the option of resolving their matters by paying a fixed penalty rather than going to court.
- 1.3 Develop and implement a training program for authorised enforcement officers** to increase their knowledge and awareness of the relevant laws and to provide them with the tools and skills necessary to effectively enforce the laws. This will involve development and delivery of training materials and training programs. The relevant enforcement agencies (e.g. Department of Environment, Department of Waste Management, and the Police Department) should also make enforcement training a mandatory induction activity for new staff and require existing staff to undergo annual refresher training.
- 1.4 Develop and implement an awareness program for the judiciary** (Attorney General/Public Prosecutor, judges) to increase their understanding of the environmental consequences of non-compliance with the domestic laws and the associated implications for non-compliance with Tuvalu's obligations as a Party to the Stockholm Convention.

KRA2: Reduce human exposure to uPOPs

Although Tuvalu has been a Party to the Stockholm Convention since 2004, there is limited national understanding and awareness of what uPOPs are, how humans and animals become exposed to these chemicals, and the associated potential health impacts. This is particularly true in the work place, where there is little to no use of personal protective equipment (PPE) by those exposed to uPOPs emissions (e.g. waste management staff responding to a dump fire). Legislation providing protection for worker's health and safety is very limited and rarely enforced, for example:

- Section 12(5) of the *Waste Operations and Services Act 2009* requires licences issued to private waste operators to require the licensee to comply with all legal requirements applying, inter alia, to the health and safety of workers in the workplace. Designated waste management operators (Kaupules and DWM) are excluded from this requirement.
- Section 5(4) of the *Employment Act* empowers the Commissioner or Health Officer to require any employer to take steps to remedy defects observed in any matter at any place of employment, which may constitute a threat to the health or safety of the worker.

The specific activities to reduce human exposure to uPOPs in the workplace and in the home are:

- 2.1 Conduct uPOPs information sessions with relevant employers and employees.** The aim of these sessions should be to raise awareness about uPOPs and practical steps that can be taken to reduce exposure to uPOPs, including the use of PPEs. Further guidance on practical best practice measures is available in the Stockholm Convention Secretariat's *Guidelines on Best Available Techniques and Provisional Guidance on Best Environmental Practices Relevant to Article 5 And Annex C of the Stockholm Convention on Persistent Organic Pollutants* (Stockholm Convention BAT/BEP Guidelines).⁴
- 2.2 Develop, distribute, and raise awareness of guidelines on selection and use of PPE in the waste management sector.** The guideline should, at a minimum, cover landfill workers and those involved in incineration and burning of healthcare waste and quarantine waste. It should include general guidance on selecting PPE and specific recommendations of suitable PPE for different working environments and risks.
- 2.3 Require all employers, including the DWM and Kaupules to provide relevant employees with PPE and appropriate training.** For the private sector, this requirement can be a condition of the waste management licence. All employers have a duty of care to ensure the welfare of their workers.
- 2.4 Promote well-balanced, low-fat diets with adequate amounts of fruits and vegetables.** Given that uPOPs accumulate in the fatty tissues of animals (e.g. pigs), promoting a low-fat diet is one way of avoiding exposure to uPOPs in food.
- 2.5 Implement a national ongoing anti-smoking campaign, including anti-smoking awareness programmes in schools.** Tobacco leaves naturally contain both organic carbon and chloride ions, and consequently, smoking of cigarettes and cigars produces dioxins. As a consequence, smokers are likely to have a measurably elevated dioxin intake compared to non-smokers, and also place themselves at significant health risk from the many other toxic and carcinogenic components present in cigarette smoke.
- 2.6 Progressively introduce higher national tobacco taxes.**
- 2.7 Establish smoke-free environments (e.g. in schools, government offices and facilities, and public areas).**

KRA3: Increase adoption of best practices in the waste management sector

Based on the results of the uPOPs inventory, the waste management sector is Tuvalu's main source of uPOPs emissions. While waste management practices are gradually improving with the implementation of recent donor-funded projects, there is still room for further improvement. For example, open burning of healthcare waste and

⁴ Available at: <http://chm.pops.int/Implementation/BATandBEP/BATBEPGuidelinesArticle5/tabid/187/Default.aspx>

backyard waste still occurs, the quarantine waste incinerator is rudimentary and does little to reduce formation and release of uPOPs, and there is limited understanding of the application of BAT/BEP to the waste sector. Future donor-funded projects will help to address some of these issues.

Reductions in uPOPs emissions can be achieved through greater implementation of BAT and BEP measures. The specific activities to encourage adoption of best practices are as follows:

- 3.1 Prepare a national BAT/BEP guideline based on the Stockholm Convention's BAT/BEP Guidelines.** The Convention's guidelines are very extensive and consist of over 600 pages of guidance. Navigating such a large document is very difficult, particularly as only part of the material is relevant to Tuvalu. This activity will involve the engagement of a consultant to prepare a much shorter version of the guidelines with information directly relevant to Tuvalu, which will more likely be read and implemented.
- 3.2 Implement a 5-year national composting campaign.** This activity complements the Integrated Waste Policy and Action Plan goal of implementing at least 3 composting programmes by 2026. It recognises that a sustained long-term effort is required to cause meaningful behaviour change. The composting campaign should seek to: raise awareness of composting as an alternative to open burning and its link to reducing uPOPs production; promote practical forms of composting (e.g. backyard, community, and worm farm composting); and involve all stakeholders (e.g. through local competitions to design posters and compost bins, and public recognition for individuals and communities consistently engaging in good practices, demonstration of good techniques).
- 3.3 Complete implementation of the EU/SPREP PacWaste Project recommendations on healthcare waste management.** The recommendations (see details in Appendix D) are outlined in the 2014 report, *Baseline Study for the Pacific Hazardous Waste Management Project – Healthcare Waste – Tuvalu*. The recommendations are still relevant and include the following:
 - (1) Develop a waste management framework consisting of a Healthcare Waste Management Plan for Princess Margaret Hospital, appointment of an officer for development and implementation of the Plan, and establishment of a waste management committee.
 - (2) Procure and make available consumables for segregation and storage, including colour-coded waste bins and plastic liners in sufficient quantities, colour-coded wheelie bins to act as in-ward storage and internal transport trolleys, and signage and posters to explain and promote the colour-coded segregation system.
 - (3) Provide a sustainable training program consisting of a structured waste management education/awareness program developed and delivered to all stakeholders.
 - (4) Improve the treatment infrastructure. Since the PacWaste recommendations were made in 2014, a new high-temperature incinerator was installed under the EU/SPREP PacWaste Project but is now non-operational. The incinerator should be repaired, and a maintenance support contract should be put in place.
 - (5) Procure and make available PPE consumables, including overalls, protective clothing, gloves and eye protection for all waste handlers, as well as face masks and noise protection for incinerator staff.
 - (6) Upgrade the healthcare waste storage area, to meet minimum standards for storage, which includes a suitably designed, fenced, and lockable area that is isolated from patients and the public.
- 3.4 Replace the quarantine waste incinerator** with a suitable replacement that meets BAT/BEP guidelines, or alternatively, arrange for quarantine waste to be incinerated at the repaired healthcare waste incinerator. Pooling resources from the Department of Health and the Department of Agriculture to operate and maintain a single incinerator for healthcare waste and quarantine waste could be more cost-effective; At the same time, operating two high-temperature incinerators would provide some redundancy that would enable both waste streams to be properly incinerated in one incinerator if the other incinerator were to malfunction or be undergoing repairs. The specific approach for Tuvalu requires further consultations and discussions.
- 3.5 Develop a contingency plan for treatment of healthcare and quarantine waste.** This should be a brief plan that stipulates how healthcare waste and quarantine waste must be treated if high-temperature

incineration is not possible (e.g. due to incinerator failure). Where open burning is the only viable option to minimise infection and biosecurity risks, then the contingency plan may include for example, guidelines around open burning of the waste to minimise the formation and release of uPOPs (e.g. limit burning to small, actively turned, well-ventilated fires, rather than poorly ventilated dumps or containers). Techniques to reduce uPOPs from open burning are provided in Stockholm Convention BAT/BEP Guidelines.⁵

- 3.6 Develop and implement practical guidelines on safe management of hazardous wastes and chemicals.** This activity will complement existing programs that are being developed to divert used lubricant oils, hazardous waste, scrap metal and other materials from the Funafuti Dumpsite into temporary storage. The guidelines developed in this activity should, among other things, cover the entire chemical lifecycle and should include information on the intended use, toxicity, management and disposal of chemicals imported into Tuvalu.

KRA4: Improve domestic cooking practices

There is very little data available on domestic cooking practices in Tuvalu, however, stakeholders consulted estimate that approximately 20% of the Tuvaluan population (mostly in the outer islands) depend on traditional fuels (wood, coconut shells/husks) for cooking. It is assumed that at least some portion of existing cook stoves may be inefficient, and some cooking may be done in poorly ventilated areas. Women, who traditionally prepare the daily meals, and children are most at risk. Traditional cooking practices also include the preparation of a weekly Sunday lunch (To'onai) using a traditional earth oven (umu).

The Ministry of Public Utilities and Infrastructure is currently implementing a Sustainable Community-Based Biogas Scheme funded by the EU/GIZ to provide domestic energy and improve livelihoods. The project includes the installation of 40 small-scale biogas digesters on the 7 outer islands to provide a fuel substitute for domestic firewood, kerosene and liquefied petroleum gas (LPG). Implementation of the project will improve domestic cooking practices and reduce uPOPs emissions from domestic cooking. Activities under this uPOPs Action Plan to improve domestic cooking practices and reduce uPOPs emissions are as follows:

- 4.1 Prepare a factsheet of improved cooking appliances/practices and conduct household & community awareness sessions.** Improved stoves that burn fuel (biomass) more efficiently, and alternative appliances (such as solar cooking) will reduce releases of uPOPs, improve indoor air quality, and potentially save fuel compared to older stoves. Improved practices include increasing ventilation in the cooking area. Further guidance on BAT/BEP for domestic cooking practices is provided in Section VI.C of the Stockholm Convention BAT/BEP Guidelines.⁶ Awareness sessions could include preparation and dissemination of fact sheets on improved cooking methods (e.g. how to ensure good ventilation and maintain cooking equipment).
- 4.2 Provide incentives to encourage people to upgrade to improved cooking appliances.** Incentives could include, for example, a discount for trading in old stoves, or a Government subsidy on new stoves.
- 4.3 Evaluate the success of current community-based biogas projects and replicate if appropriate.** The EU/GIZ Project which will install 40 biogas digesters in the outer islands will reduce the uPOPs emissions and indoor air pollution associated with domestic cooking with biomass. This activity seeks to expand installation of biogas digesters on outer islands and further reduce reliance on cooking with biomass.
- 4.4. Identify and train island 'champions' in BAT/BEP for domestic cooking** (e.g. maintenance of stoves, use of suitable biomass), and provide ongoing technical and financial support to enable champions to educate communities on these techniques.
- 4.5 Raise awareness of health and agriculture staff on good domestic cooking practices.** This will enable staff to share information with relevant communities whilst implementing their health and agriculture-related programmes and activities in outer islands.

⁵ Available at: <http://chm.pops.int/Implementation/BATandBEP/BATBEPGuidelinesArticle5/tabid/187/Default.aspx>

⁶ Available at: <http://chm.pops.int/Implementation/BATandBEP/BATBEPGuidelinesArticle5/tabid/187/Default.aspx>

KRA5: Reduce uPOPs emissions from the transport sector

uPOPs emissions from the transportation sector are less than 1% of the total uPOPs emissions estimated for Tuvalu. Nonetheless, there are simple measures that can be implemented to help reduce emissions and raise awareness of uPOPs. Anecdotally, every Tuvaluan family owns at least one vehicle (often a motorbike), therefore, the transportation sector provides another platform for reaching all Tuvaluans.

- 5.1 Provide tax incentives that favour importation of vehicles and engines that emit lower levels of uPOPs**, including fuel efficient vehicles with catalytic converters, and 4-stroke motorbikes and outboard engines, rather than the more polluting 2-stroke motorbikes and outboard engines.
- 5.2 Raise awareness of mechanics and vehicle owners on good vehicle maintenance practices**, and the importance of such practices to minimise the formation and release of uPOPs. Poorly maintained vehicles burn fuel less efficiently and completely and thus contribute to more uPOPs emissions.
- 5.3 Designate a vehicle-free day (or week) on Tuvalu.** On this day (or week), residents would be encouraged to use alternatives including walking and bicycles. This day (or week) could also mark the culmination of a year of activities including a '10,000 steps a day competition', with prizes for persons who accumulate the most 'steps' as measured using pedometers or mobile phone application. While this activity may have little meaningful impact on uPOPs emissions from the transportation sector, it will provide a platform for raising awareness around uPOPs emissions and other related issues including health.

KRA6: Improve coordination among stakeholders

As uPOPs are formed and released from activities across several sectors, coordination and collaboration amongst all stakeholders is essential. Several Committees have been formed for various purposes including the Waste Levy Committee, the Used Lubricant Oil Committee, the Ozone Depleting Substances (ODS) Steering Committee, and the Environmental Stakeholder Committee. Consideration should be given to whether the various committees can be streamlined. In addition, section 15 of the Environment Protection Act enables the Minister to establish a National Environment Council to provide advice and serve as the competent authority or implementing authority for relevant international conventions. The activities to improve coordination among stakeholders are described below:

- 6.1 Establish the National Environment Council under section 15 of the Environment Protection Act** as the national entity responsible for coordinating all waste and chemicals management issues in Tuvalu, including implementation of relevant international environmental Conventions. The National Environment Council should be empowered to serve as the advisory committee for projects and programs, or to establish temporary committees for this purpose if necessary. Strategic coordination of interrelated projects and activities through a single entity will improve synergies, reduce potential duplication, and enhance sustainability of project outcomes. The National Environmental Council should include representation from relevant departments including finance, health, environment, labour, agriculture, energy, local government, fisheries, education, customs, the Attorney General's G's Office, Police, trade, private sector representatives and key organisations (i.e., non-governmental, civil society, and/or faith-based organisations).
- 6.2 Convene a regular National Environment Forum under section 14 of the Environment Protection Act.** The Forum would be a mechanism to consistently engage with the public and maintain public awareness of the Stockholm Convention and uPOPs.

KRA7: Ensure timely implementation, monitoring and reporting under the uPOPs Action Plan

Implementation, monitoring and reporting of activities under the Stockholm Convention continue to be challenges for Tuvalu. The majority of the activities of the previous NIP have not been implemented as planned for various reasons, including limited allocation of human and financial resources, and high staff turnover rate. Programme monitoring and reporting frameworks are also lacking, which makes collection of baseline data from different stakeholders difficult and time consuming and evaluation of progress almost impossible. Moreover, Tuvalu is failing in its reporting obligations as a Party to the Stockholm Convention. The following activities to ensure timely implementation, monitoring and reporting under the uPOPs Action Plan will also contribute to overall implementation of the Tuvalu NIP.

- 7.1 Integrate uPOPs Action Plan activities into the work plans and budgets of relevant departments.** This will help to ensure that the uPOPs Action Plan is mainstreamed into the work of relevant departments and not be seen as 'extra work'.
- 7.2 Develop and implement a data collection and analysis plan** to ensure collection of all the data required to meet reporting obligations under the Stockholm Convention (and other relevant conventions). A stakeholder workshop should be convened to identify the data needed, frequency of collection, data sources, roles and responsibilities for data collection, and approaches to data collection (e.g. require mandatory reporting by importers as part of business or waste licence conditions). The National Environment Council should oversee the development and implementation of the data collection plan to ensure the plan is embedded into the processes of the relevant stakeholders in the public and private sector.
- 7.3 Establish a central database for all waste, chemicals and environmental management data.** The Department of Environment is an appropriate host for the database, but provisions should be made to regularly backup the database in accordance with information management best practices.
- 7.4 Prepare and publish an annual report of progress under the uPOPs Action Plan.** The progress report will assist with overall reporting to the Stockholm Convention. Preparing an annual report can also be a catalyst for action, for example, if little to no progress is being reported year on year.

Implementation Plan

The 5-year implementation plan for the uPOPs Action Plan is summarised in Table 6.

Table 6: Implementation plan

Activity	Lead Agencies	Timeframe					GoT commitment (USD)	External assistance needed (USD)	Cost Description or comments
		2018	2019	2020	2021	2022			
KRA1: Strengthen the national policy and legislative framework									
1.1 Increase awareness of existing laws in the outer islands	DE, DWM, Health							25,000	Travel, awareness materials
1.2 Introduce a penalty infringement system	DE						-	-	Using existing internal resources
1.3 Develop & implement a training program for enforcement officers	DE, DWM							10,000	External legal assistance
1.4 Develop and implement an awareness program for the judiciary	DE, DWM							10,000	External legal assistance
KRA2: Reduce human exposure to uPOPs									
2.1 Conduct uPOPs information sessions with relevant employers and employees (e.g. in waste management)	DWM, DE						-	-	Minimal costs for door-to-door sessions using existing staff
2.2 Develop, distribute, and raise awareness of guidelines on selection and use of PPE in the waste management sector	DWM							5,000	Guideline preparation and printing costs
2.3 Require all employers, including the DWM and Kaupules to provide relevant employees with PPE and appropriate training	Labour Department						-	-	Cost of supplying PPE to be borne by employer
2.4 Promote well-balanced, low-fat diets with adequate amounts of fruits and vegetables	Health							10,000	Awareness and promotional materials
2.5 Implement a national ongoing anti-smoking campaign, including anti-smoking awareness programs in schools	Health							15,000	Awareness materials
2.6 Progressively introduce higher national tobacco taxes	Finance, Health							-	
2.7 Establish smoke-free environments (e.g. schools, government offices and facilities, public areas)	Health							1,000	Signage
KRA3: Increase adoption of best practices in the waste sector									
3.1 Prepare a national BAT/BEP guideline based on the Convention's BAT/BEP Guidelines	DE							5,000	Desktop consultancy
3.2 Implement a 5-year national composting campaign	DWM							100,000	Awareness materials, workshops, composting equipment, travel
3.3 Complete implementation of the PacWaste Project recommendations on healthcare waste management (Appendix D)	Health							PacWaste Plus	Funding anticipated under PacWaste Plus Project
3.4 Replace the quarantine waste incinerator, or treat quarantine waste at the healthcare waste incinerator once operational	Agriculture, Health								Incinerator purchase & installation, training, spare parts

Activity	Lead Agencies	Timeframe					GoT commitment (USD)	External assistance needed (USD)	Cost Description or comments
		2018	2019	2020	2021	2022			
3.5 Develop a contingency plan for treatment of healthcare & quarantine waste	Health, Agriculture							1,500	Workshop meeting/consultation costs
3.6 Develop and implement practical guidelines on safe management of hazardous wastes and chemicals	DWM, DE							5,000	Consultant's costs
KRA4: Improve domestic cooking practices									
4.1 Prepare a factsheet of improved cooking appliances/practices and conduct household & community awareness sessions	TANGO, DE								Consider use of
4.2 Provide incentives to encourage people to upgrade to improved cooking appliances	DE, DWM, Private sector								
4.3 Evaluate the success of current community-based biogas projects and replicate if appropriate	MPUI							400,000	40 Biogas digesters purchase & installation, training, etc (based on EU/GIZ project costing)
4.4 Identify & train island 'champions' in BAT/BEP for domestic cooking	TANGO, DE								
4.5 Raise awareness of health and agriculture staff on good domestic cooking practices	DE, TANGO							2,000	Local training/workshop
KRA5: Reduce uPOPs emissions from the transport sector									
5.1 Provide tax incentives that favour importation of vehicles and engines that emit lower levels of uPOPs	Transport, Finance							3,000	Stakeholder consultations
5.2 Raise awareness of mechanics and vehicle owners on good vehicle maintenance practices	Transport							15,000	Workshops, appropriate expert
5.3 Designate a vehicle-free day (or week) on Tuvalu	Transport							10,000	Promotional materials, prizes
KRA6: Improve coordination among stakeholders									
6.1 Establish the National Environment Council under section 15 of the Environment Protection Act	Environment Minister						-	-	Done internally at minimal cost
6.2 Convene a regular (e.g. annual) National Environment Forum under section 14 of the Environment Protection Act	Environment Minister							40,000	Preparatory meetings, venue hire, promotional materials, catering

Activity	Lead Agencies	Timeframe					GoT commitment (USD)	External assistance needed (USD)	Cost Description or comments
		2018	2019	2020	2021	2022			
KRA7: Ensure implementation, monitoring & reporting of the uPOPs Action Plan									
7.1 Integrate uPOPs Action Plan activities into work plans and budgets of relevant departments	All lead agencies						-	-	Done internally at minimal cost
7.2 Develop and implement a data collection and analysis plan	DE							1,000	Stakeholder workshops, printing
7.3 Establish a central database for waste, chemicals & environmental data	DE, DWM							8,000	Local/Government IT expert, hardware (storage drive)
7.4 Prepare & publish an annual progress report of the Action Plan	DE, DWM						5,000	-	Editing, printing & e-publishing
Total							5,000	665,500	
Grand Total							670,500		

Key Performance Indicators

The key performance indicators in Table 7 have been identified for the uPOPs Action Plan. Performance against these indicators should be measured and reported against on an annual basis.

Table 7: Key performance indicators for the uPOPs Action Plan

Indicator	2017 Baseline	2022 Target	Sources of verification
Goals/Outcomes			
uPOPs emissions (g-TEQ)		10% Reduction	Estimation of uPOPs emissions
Key Result Areas			
Penalty infringement system developed and enforced under the Waste Operations and Services Act, and the Environment Protection Act	No	Yes	Amended Waste Operations and Services Act Amended Environment Protection Act
Number of authorised enforcement officers trained	0	5	Training records, interviews with enforcement officers
Number of members of the judiciary participating in an awareness program	0	5	
Number of employers providing training and PPE to employees	To be established	To be set after baseline established	Interviews with employers and employees; importation statistics for PPE
Percentage reduction in tobacco importation		2% reduction per annum	Trade statistics
Local BAT/BEP Guideline available	0	1	Published BAT/BEP Guideline
Number of households engaged in composting programs	To be established	To be set after baseline established	
Quantity of waste composted/mulched	~ 2,265m ³ /year	25% increase	Composting program records
Number of households that have adopted improved cooking appliances/practices	0	At least 10 households per island	Household interviews/inspections
Number of dump fires	4	0 over 5 years	Dumpsite records, media reports
Tax incentive in place for importation of fuel efficient vehicles & 4-stroke motorbikes & engines	No	Yes	
Number of awareness sessions conducted on vehicle maintenance	0	1	Awareness raising materials, workshop records
Number of vehicle-free day campaigns conducted	0	At least one	
National Environment Council established and overseeing relevant waste/chemicals/ environmental projects	No	Yes	Terms of Reference, Council meeting minutes
National Environment Forum convened annually	No	Yes, starting in 2019	Media reports, Records of forum proceedings
Database on waste and chemicals established and kept updated	No	Yes	Interrogation of the database
Number of annual progress reports on the uPOPs Action Plan published	0	5	

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Appendix A: Assessment of uPOPs releases in Tuvalu

Source Group 1: Waste incineration

Quarantine waste incineration

In Tuvalu, quarantine wastes consist only of ships' wastes, as airline wastes are not offloaded in Tuvalu. Ships' wastes are currently incinerated in a simple, batch-fed, wood-fired incinerator without an air pollution control system. In the absence of local records, the amount of quarantine waste generated is estimated as 21 tonnes based on the following assumptions:

- 75 international vessels called into Funafuti Port in 2017 (same as in 2010⁷)
- Each vessel was a non-cruise ship vessel with an average crew of 28 persons, each generating 2kg of waste every day⁸ for 5 days.

uPOPs emissions also arise from burning the solid fuel (wood, coconut shells/husks, etc) that fuels the quarantine waste incinerator. If each kilogram of waste requires 3.5 kilogram of solid fuel, incinerating 21 tonnes of quarantine waste annually would require 73.5 tonnes of solid fuel.⁹ The resulting uPOPs emissions from incinerating quarantine waste in the wood fired incinerator are summarised in Table A1.

Healthcare waste incineration

Healthcare waste was previously incinerated in a high-temperature incinerator installed under the PacWaste Project, however the incinerator is currently not operational, and the waste is burnt at the Funafuti dumpsite. Consequently, uPOPs emissions associated with healthcare waste disposal is addressed under 'open burning processes'.

Table A1: uPOPs emissions for Source Group 1: Waste incineration

Source Category	Activity rate (tonnes/year)	Annual release (mg TEQ/year, unless stated otherwise)					
		Air	Water	Land	Product	Fly ash	Bottom Ash
Quarantine waste	21	73.5	0	0	0	0	1,575
Waste wood/biomass	73.5	7.35	0	0	0	73.5	0
Total for Source Group 1	-	80.850	0	0	0	73.500	1.575

Source Group 2: Ferrous and non-ferrous metal production

There are no activities from this source group currently occurring in Tuvalu.

⁷ ADB, 2014, *Country Operations Business Plan: Tuvalu 2015-2017*. Retrieved from <https://www.adb.org/sites/default/files/institutional-document/82048/cobp-tuv-2015-2017.pdf>.

⁸ Delfosse, S., McGarry, J, and Morin, T, 2010, *Ship generated waste disposal in the wider Caribbean region*. Retrieved from https://web.wpi.edu/Pubs/E-project/Available/E-project-121610-185147/unrestricted/Team5_USCG1_IQP_FINAL.pdf.

⁹ Batterman, S. (2004). *Assessment of small-scale incinerators for health care waste. Report prepared for the Protection of the Human Environment*. World Health Organization. Retrieved from http://www.who.int/water_sanitation_health/medicalwaste/en/smincinerators.pdf, (page 15).

Source Group 3: Heat and power generation

Fossil fuel power plants

The heat and power generation source group defined by the uPOPs Toolkit includes power plants that generate electricity using steam generators. However, electricity in Tuvalu is produced by diesel generators. Emissions from electricity generation in Tuvalu are therefore considered in Source Group 5: Transport under diesel engines.

Household heating and cooking with biomass

Biomass has been historically used for domestic cooking and copra drying. However, the copra industry has declined significantly, and copra is no longer exported. Domestic cooking with biomass is believed to be the main contributor of uPOPs in this source group.

Biomass used for cooking includes mainly coconut husks and shells, with some mangrove and other types of wood used where available (IRENA, 2013). For the purposes of the uPOPs Toolkit, this is considered as contaminated wood'. The total biomass energy used for domestic cooking as reported in 2005 was 31,350GJ (Hemstock, 2008). Unfortunately, updated data on domestic biomass use in Tuvalu is not available. At least one source suggests that as at the first quarter of 2014 approximately 40% of the population still utilised biomass for cooking (PRIF, 2016), however anecdotal evidence strongly suggests that only 20% of the population currently rely on biomass for cooking.

Cultural cooking practices also include the preparation of a weekly Sunday feast (To'onai) using a traditional earth oven (umu), which involves the burning of biomass to preheat stones that are then used to cook the food. This cultural practice is widespread even among those that use electric and LPG stoves, and anecdotal evidence suggest that every family/household on Tuvalu has an umu.

In the absence of updated data, the rounded estimate from 2005 (32,000GJ) is used. Any decline in biomass cooking as a result of more people switching to electric or LPG stoves since 2005, is assumed to be offset by an increase in umu cooking due to population growth since 2005. Based on the uPOPs Toolkit, 32,000GJ (32 Terajoules) of biomass releases 0.048 g/TEQ to air (Table A2).

The ash generated from cooking with biomass depends on several factors including the minerals present in the wood and any soil and other contamination. It is assumed that the main species used as fuelwood in Tuvalu are broad-leaved trees. The Food and Agriculture Organization suggest that the ash content for broad-leaved biomass can range from 0.3% to 5% on a dry weight basis, and the calorific value can range from 19–20MJ/kg of biomass. As a first approximation, the ash generation from domestic cooking is therefore estimated to range from approximately 5 tonnes¹⁰ to 84 tonnes¹¹.

Table A2: uPOPs emissions for Source Group 3: Heat and power generation

Source Category	Activity rate (Terajoules/ year)	Annual release (mg TEQ/year, unless stated otherwise)					
		Air	Water	Land	Product	Residue	Ash
Household heating and cooking - biomass	32	48	0	0	0	5 - 84	5–84 tonnes

Source Group 4: Production of mineral products

There are no activities from this source group currently occurring in Tuvalu.

¹⁰ (32TJ x 1,000,000) MJ ÷ 20 MJ/kg x 0.3% = 4,800 kg = approx. 5 tonnes

¹¹ (32TJ x 1,000,000) MJ ÷ 19 MJ/kg x 5.0% = 84,211kg = approx. 84 tonnes

Source Group 5: Transport

According to the Tuvalu Household Income and Expenditure Survey 2010, there were 1,935 motor bikes and outboard motors (90% of all transportation), and 204 cars and trucks (10% of all transportation) on Tuvalu.

In the absence of specific data, it is assumed that 80% of the imported petrol is burnt in 2-stroke engines (e.g. motorbikes, outboard motors), whilst 20% of imported petrol is burnt in 4-stroke engines (cars, trucks, and a few motorbikes and outboard motors), and all diesel imported is burnt in a diesel engine whether for transport, shipping, or electricity generation. These assumptions (Table A3) have been used in the uPOPs Toolkit to derive uPOPs emissions to air of 0.487 mg TEQ/year.

Table A3: Tuvalu fuel imports and consumption

Fuel	Fuel imported in 2015 (litres) [see note 1]	Estimated fuel imports in 2017 [see note 2]	Fuel estimated to be consumed in...			
			2-stroke engines	4-stroke engines	Diesel engines	Heavy fuel oil engines
Gasoline	329,732 litres	359,000 litres (266 tonnes)	179,500 litres (133 tonnes) (50%)	179,500 litres (153 tonnes) (50%)	-	-
Diesel	1,503,527 litres	1,636,000 (1,391 tonnes)	-	-	1,636,000 litres (1,391 tonnes)	-
Heavy fuel oil	No data	No data	-	-	-	-

Notes: [1] Source: <http://prdrse4all.spc.int/data/content/tuvalu-2006-2014-petroleum-product-imports>

[2] Assuming that fuel imports grew at the same rate as GDP growth (2.9% per annum between 2015 and 2017). GDP growth rate taken from <https://www.adb.org/countries/tuvalu/economy>.

Table A4: uPOPs emissions for Source Group 5: Transport

Source Category	Activity rate (tonnes/year)	Annual release (mg TEQ/year, unless stated otherwise)				
		Air	Water	Land	Product	Residue
4-Stroke engines -unleaded gasoline without catalyst	153	0.0153	0	0	0	0
2-Stroke engines – unleaded fuel	133	0.333	0	0	0	0
Diesel engines	1,391	0.139	0	0	0	0
Total for Source Group 5	-	0.487	0	0	0	0

Source Group 6: Open burning processes

Healthcare waste burning

Approximately 110kg/week of healthcare waste from the Princess Margaret Hospital was reportedly burnt in 2014,¹² and this is assumed to be the same in 2017. Therefore, approximately 5.7 tonnes of healthcare waste are assumed to have been burnt at the Funafuti Dumpsite in 2017. The emission factors for healthcare waste burning are assumed to be similar to domestic waste, therefore the 5.7 tonnes of healthcare waste are added to the domestic waste estimated in the following section and used in the uPOPs Toolkit to estimate the emissions.

¹² ENVIRON Australia Pty Ltd. 2014. *Baseline study for the Pacific hazardous waste management project - Healthcare waste: Tuvalu*. Report prepared for SPREP.

Open burning of domestic waste

The national daily waste generation rate is taken to be 0.4 kg/person based loosely on information reported in the Tuvalu Integrated Waste Policy and Action Plan. Based on an estimated national population of 10,100, the total amount of domestic waste generated is estimated to be 1,475 tonnes/year. The waste collection system covers only the Funafuti population, which is approximately 57% of the total population. Of the remaining 43% of the population that lack access to a collection service, it is assumed that 20% practice open burning. Consequently, it is estimated that 20% (295 tonnes) of the total domestic waste generated is burnt.

The total amount of domestic waste and healthcare waste burnt in 2017 is therefore approximately 300 tonnes, which contributed uPOPs emissions of 12 mg TEQ/year (Table A5).

Fires at waste dumps

There is currently one authorised dumpsite on Funafuti established at the site of old borrow pits, which were excavated during World War II to construct the airstrip. Waste dumps are also located on each of the outer islands. In 2008, it was reported that Nukulaelae has a large site for burning waste (Government of Tuvalu and SPREP, 2016). Dumpsite fires may occur accidentally, or intentionally as a means of reducing pests, odours, and the waste volume. Unfortunately, sufficient data does not exist from Tuvalu, nor could any data be found for countries of similar socio-economic status to enable a reasonable estimation of uPOPs emissions from dump fires.

Table A5: uPOPs emissions for Source Group 6: Open burning processes

Source Category	Activity rate (tonnes/year)	Annual release (mg TEQ/year, unless stated otherwise)				
		Air	Water	Land	Product	Residue
Healthcare waste burning and open burning of domestic waste	300	12.0	0	0.3	0	0
Fires at waste dumps	No data	-	-	-	-	-
Total for Source Group 6	-	12.0	0	0.3	0	0

Source Group 7: Production and Use of Chemicals and Consumer Goods

There are no activities from this source group currently occurring in Tuvalu.

Source Group 8: Miscellaneous processes

Drying of biomass

Copra, which refers to dried coconut kernel from which coconut oil was traditionally extracted—was a key agricultural export of Tuvalu, before the collapse of the industry in the early 2000s due to falling world prices. There is still some domestic consumption of copra to make coconut oil. As at 2006, each of the outer islands had a Kaupule coconut oil production facility, which produced coconut oil for domestic consumption (Hemstock, 2008, p. 173). Based on a survey of practices on Funafuti and the outer islands in 2005, Hemstock (2008, p. 173) estimated that 192 tonnes of biomass were burnt each year to produce energy for copra drying/production. The extent of the practice in 2017 could not be verified and is thus assumed to be the same as in 2005. The resulting uPOPs emissions from burning 192 tonnes of moderately contaminated biomass (duet to the likely presence of sea salt) is 0.019 mg TEQ.

Tobacco smoking

Data on the importation of cigarettes and cigars into Tuvalu for 2015 and 2016 was sourced from the United Nations Commodity Trade (UN Comtrade) Statistics Database available at: <https://comtrade.un.org/data/> (see Table A6). Based on this data, it is estimated that approximately 7,000kg of Tobacco

Table A6: uPOPs emissions for Source Group 8: Miscellaneous processes

Description	Year of import			Assumptions
	2015 ⁽¹⁾	2016 ⁽¹⁾	2017 ⁽²⁾	
Cigarettes imported (kg)	4,702	6,926	7,000	
Cigars imported (kg)	-	-	-	
Cigarettes (million items)	4,702,000	6,926,000	7,000,000	1 cigarette = 1 gram
Cigars (million items)	-	-	-	1 cigar = 10 grams

(1) Source: United Nations Commodity Trade Statistics Database available at: <https://comtrade.un.org/data/>

(2) Estimate.

Table A7: uPOPs emissions for Source Group 8: Miscellaneous processes

Source Category	Activity rate (tonnes/year)	Annual release (mg TEQ/year, unless stated otherwise)				
		Air	Water	Land	Product	Residue
Drying of biomass – moderately contaminated fuel	192	0.019	0	0	0.019	3.840
Tobacco smoking -cigarettes (per million items)	7	0.001	0	0	0	0.001
Total for Source Group 8	-	0.020	0	0	0.019	3.841

Source Group 9: Disposal

This source group addresses non-thermal waste disposal processes which are the routes by which PCDD/PCDF already present in waste may be released. These processes are not sources of PCDD/PCDF formation and release per se. Processes in this group include waste disposal to land (landfills and dumpsites), sewage treatment, open water dumping, composting, and used oil management.

Waste dumps

Waste dumps, located on each of Tuvalu's nine islands, are basic non-engineered facilities, without any pollution control measures, and with little control over the types of wastes dumped. These dumpsites receive an estimated 80% (1,180 tonnes/year) of the 1,475 tonnes of domestic waste generated annually. The remaining 20% (295 tonnes) is assumed to be burnt as discussed under Source Group 6.

Sewage and sewage treatment

Funafuti has no sewage treatment system.

Open water dumping

Open water dumping is the practice of discharging untreated wastewater or other wastes directly into ground water, the lagoon or the ocean. In Tuvalu, this wastewater comes from urban communities on Funafuti and remote environments with no industries and includes sewage from on-site septic systems. New septic systems built by

private citizens are usually constructed badly, and leach sewage directly into the ground and ultimately the lagoon and ocean.¹³

There is no data available on the quantity of wastewater discharged into the environment. Wastewater quantities have been estimated by assuming that 80% of the average daily waste consumption becomes wastewater.¹⁴ Based on an average water consumption of 40 litres per person per day,¹⁵ and a population of 10,100, wastewater production in Tuvalu is estimated to be about 118,000 m³/year. Due to the issues highlighted with septic systems, it is assumed that 80% (94,400m³) of the wastewater generated is essentially dumped. However, based on the uPOPs Toolkit, this amount of open water dumping does not create any significant uPOPs emissions.

Composting

The presence of dioxins and furans in compost in Tuvalu may be due to feedstocks contaminated by dioxins/furans, such as residues from backyard burning, or other wastes. On Funafuti, partially segregated green waste is generally left beside waste bins for collection by DWM. Based on 2016 estimates, approximately 2,265m³/year of green waste is collected on Funafuti and composted. Composted material is sold to households as a soil conditioner and used by the Taiwan Agricultural Project site (Mainstream Economics and Policy, 2016). There is no information relating to backyard composting.

It is assumed that there has been no appreciable increase in green waste composted since 2016. The density of the green waste is assumed to be 150 kg/m³, which means that the estimated tonnage of green waste composted in 2017 is approximately 340 tonnes. The resulting uPOPs emissions are shown in Table A8.

Used oil management

For the uPOPs Action Plan, used oils are defined as any petroleum-based, synthetic, or plant- or animal-based oil that has been used. Used oils streams include industrial oil (e.g. hydraulic oil, engine lubricant, cutting oil); garage or workshop oil; and transformer oil. Used oils have been found to be contaminated with dioxins, furans and PCBs, and their improper disposal may result in contamination of land or water. This uPOPs Action Plan recognises the importance of safe management of used oil in accordance with BAT/BEP.

Table A8: uPOPs emissions for Source Group 9: Disposal

Source Category	Activity rate (tonnes/year)	Annual release (mg TEQ/year, unless stated otherwise)				
		Air	Water	Land	Product	Residue
Waste dumps – mixed wastes	1,180	0	0.59	0	0	59
Open water dumping	94,400m ³	0	0.019	0	0	0
Composting	340	0	0	0	16.988	0
Total for Source Group 9	-	0	0.609	0	16.988	59

¹³ Department of Planning and Budget. (2016). *The implementation of the Istanbul Programme of Action (IPOA) 2011-2020 – Tuvalu midterm review report*. Retrieved from <http://www.ipoareview.org/wp-content/uploads/2016/04/REPORT-TUVALU.pdf> (page 10).

¹⁴ von Sperling, M., and Chernicharo, C.A.L. (2005). *Biological wastewater treatment in warm climate regions*. Retrieved from <https://www.iwapublishing.com/sites/default/files/ebooks/9781780402734.pdf>, (page 24).

¹⁵ UNDP. (2014). *Water is life: Offering hope in Tuvalu in times of drought*. Retrieved from <https://stories.undp.org/pacc-tuvalu>.

Appendix B: Regional uPOPs Action Plan activities

Table B1: Activities in the Regional uPOPs Action Plan

Objectives	Expected Outcomes	Activities	Lead Agency	Priority	
1. To establish nationally-agreed policy, strategic, and reporting frameworks for long-term prevention and management of uPOPs.	Enforceable legislation adopted in each PIC.	Implement and enforce a nation-wide ban on open burning (including burning in the agricultural sector and on landfills), in consultation with relevant sectors (e.g., agriculture).	PICs (environmental protection department/ agency)	Short-term	
		Prescribe rules for open burning in low-density and remote communities (where a total ban on burning may not be realistic) in accordance with BAT/BEP guidance issued by the Stockholm Convention	PICs (waste management department/ agency)	Short-term	
		Prepare and implement ongoing campaigns to raise public awareness of community obligations under relevant regulations and rules.	PICs (environmental protection department/ agency, waste management department/ agency)	Short-term	
		Update regulations (e.g., customs, pesticides, or waste regulations) in consultation with relevant stakeholders, to ban the importation of POPs regulated under the Stockholm Convention.	PICs (department/agency responsible for environmental protection, customs, agriculture, and/or waste management)	Medium-term	
		Conduct national training for enforcement officers on the enforcement of applicable legislation and rules.	PICs (Attorney General's Office, environmental protection department/ agency)	Medium-term	
	Coordination, monitoring and reporting framework for uPOPs management established.		Convene a national multi-stakeholder group (using existing forums such as National Environmental Committees, or Heads of Departments Meetings) to promote uPOPs-related initiatives in relevant sectors (e.g., agriculture and transportation).	PICs (environmental protection department/ agency)	Ongoing
			Update, endorse and implement national waste management strategies, ensuring that a waste minimisation model (e.g., 3R+Return or another appropriate model) is included.	PICs (waste management department/agency)	Short-term
			Prepare a regional data reporting template for waste incineration, in line with BEP guidance (e.g., waste quantities, combustion time and temperature, appearance of ash, and ash disposal location).	SPREP	Short-term
			Require the operators of all healthcare and quarantine waste incinerators to maintain and submit records of key incineration parameters utilising the regional (or other appropriate) template.	PICs (environmental protection department/ agency)	Ongoing
			Prepare a regional survey template to be integrated into national census questionnaires to gather information on activities that contribute to uPOPs (e.g., number of households that: rely on wood fires for cooking; practice open burning; and practice composting).	SPREP	Medium-term
			Integrate the regional survey template into national census questionnaires, and ensure the collected data is analysed and reported.	PICs (census bureau, waste management department/agency)	Medium-term
			Prepare an annual report on the implementation of this <i>Action Plan</i> .	SPREP	Ongoing

Objectives	Expected Outcomes	Activities	Lead Agency	Priority
2. To reduce human exposure to uPOPs.	Reduction in occupational exposure to uPOPs.	Prepare a regional code of practice or guidance on appropriate personal protective equipment (PPE) for workers in the waste sector.	SPREP	Short-term
		Enforce the use of appropriate PPE for the waste management sector (healthcare waste incineration, quarantine waste incineration, and landfill operations), in accordance with national laws, or the regional code of practice.	PICs (labour department/agency)	Ongoing
		Document safe work procedures for waste incinerator and landfill workers and ensure provision of training on the procedures for new workers, and regular (e.g., annual) refresher training.	PICs (healthcare facilities)	Ongoing
		Develop and implement an occupational health surveillance programme for waste management workers and waste pickers.	PICs (health ministry/ departments, waste management facilities)	Medium-term
		Implement a registration and management system for waste pickers—where a ban is impractical or would cause economic hardship—and restrict reclamation activities to the designated area. The system should include provision of a suitable level of training in acceptable reclamation techniques, and supply of suitable PPE.	PICs (landfill operator, waste management department/agency)	Short-term
3. To reduce uPOPs emissions from waste incineration.	Better source segregation of healthcare waste	Implement and enforce a colour-coded healthcare waste segregation system in all hospitals and healthcare centres, which should include the provision of structured training on healthcare waste segregation and incineration BEP to all members of staff.	PICs (health department/agency)	Short-term
		Provide signage to all hospitals and healthcare facilities to promote and explain the segregation system.	PICs (healthcare facilities, health ministry/department)	Short-term
		Conduct regular inspections to verify compliance with segregation and incineration procedures.	PICs (health department/agency, environmental protection department/agency)	Short-term
	Improvement in healthcare and quarantine waste incineration techniques	Develop and disseminate a regional code of practice for waste incinerators (including a simple BAT/BEP checklist) based on related Stockholm Convention guidance and other appropriate guidance.	SPREP	Medium-term
		Develop, adopt, and enforce a national code of practice for waste incinerators based on the regional code and/or other appropriate guidance and national requirements.	PICs (environmental protection department/agency)	Medium-term
		Develop or update, endorse, and implement healthcare waste management plans for each healthcare facility ensuring the inclusion of waste segregation and treatment in accordance with BAT/BEP.	PICs (healthcare facility)	Short-term
		Assess the waste management practices of healthcare and quarantine facilities (using the regional BAT/BEP checklist or other appropriate tools) to identify incinerators or practices not compliant with BAT/BEP, and to support decision-making on priorities for replacement/upgrading.	PICs (environmental protection department/agency, health/quarantine department/agency)	Ongoing
		Upgrade, improve or replace healthcare and quarantine waste incinerators ensuring adherence to BAT guidance, and rationalising operations between healthcare waste and quarantine waste where practical.	PICs (healthcare facilities, health department/agency, quarantine department/agency)	Ongoing

Objectives	Expected Outcomes	Activities	Lead Agency	Priority
4. To reduce uPOPs emissions from disposal/landfilling	Reduction in the disposal of hazardous substances to landfill.	Develop safe storage facilities for temporary storage of hazardous wastes and chemicals (e.g., e-waste) that would otherwise be disposed of to landfill. This should include posting appropriate signage/directions at waste disposal sites.	PICs (waste management department/agency)	Short-term
		Identify and action environmentally-sound disposal of stored hazardous wastes.	PICs (waste management department/agency)	Ongoing
		Issue regular public guidance on the safe storage and disposal of hazardous wastes and chemicals.	PICs (waste management department/agency)	Ongoing
		Provide a regular collection service (e.g., twice annually) for hazardous wastes and chemicals once storage facilities are operational.	PICs (waste management department/agency)	Ongoing
	Reduction in the disposal of organic wastes to landfill.	Designate an area on each landfill/dump (away from the main tipping face) for active or passive composting of green (vegetative) waste and market waste and divert incoming waste to this area.	PICs (landfill operator, waste management department/agency)	Short-term
		Require waste haulers to segregate organic waste (e.g., vegetative waste, market waste) and offer incentives for compliance (e.g. waiver of any tipping fees).	PICs (landfill operator, waste management department/agency)	Short-term
		Scale-up and expand existing backyard and community composting programmes at the rate of 2 communities each year.	PICs (waste management department/agency)	Ongoing
		Conduct a regional awareness campaign focused on increasing national participation in composting and other forms of organic waste management.	SPREP	Medium-term
		Conduct a National Compost Awareness Week to coincide with the International Compost Awareness Week currently observed annually by Australia, Canada, United Kingdom, and USA during the first full week of May. This could include poster competitions, schools and community competitions, demonstrations, workshops, and a range of other activities to encourage the different forms of composting and to highlight the dangers of open burning.	PICs (waste management department/agency)	Medium-term
		Develop a partnership and work programme with the Agriculture Working Group of the Pacific Islands Private Sector Organisation (PIPSO) or other relevant stakeholder, to promote organic waste recycling (composting, mulching, etc.) and increase the domestic market demand for the resulting products (compost, mulch, etc.).	PICs (waste management department/agency, agriculture department/agency)	Medium-term
	Improved waste disposal sites	Prepare and implement a landfill operating manual for each waste disposal site using currently available SPREP guidelines. Each manual should include procedures for data collection, waste inspection, and fire management, and training should be provided to landfill staff to implement the manual.	PICs (environmental protection department/agency)	Short-term
		Require the preparation and implementation of an Environmental Management Plan for every dump rehabilitation project, ensuring implementation of BAT and BEP to minimise release of potentially-contaminated leachate, dust and waste to the wider environment during construction works.	PICs (environmental protection department/agency)	Short-term
		Close temporary unregulated dumps, and close or improve existing authorised open dumps.	PICs (waste management department/agency)	Ongoing

Objectives	Expected Outcomes	Activities	Lead Agency	Priority
5. To reduce uPOPs emissions from open burning (including burning on landfills)	Reduction in number of instances of open burning in communities	Identify and maintain a record of areas susceptible to repeated open burning and ramp-up compliance monitoring of these 'hotspots'.	PICs (environmental protection department/ agency)	Ongoing
		Design and implement a social marketing programme in collaboration with NGOs and environmental groups to discourage open burning and encourage the public to report illegal open burning activities (e.g. using texts, pictures or video clips).	PICs (environmental protection department/ agency)	Medium-term
		Develop and implement an annual Best Kept Community programme to recognise community efforts in waste management, beautification and overall environmental protection. Reward good efforts with community improvement programmes rather than cash.	PICs (waste management department/ agency)	Medium-term
	Reduction in number of landfill fires	Designate an area in each landfill/dump (away from the main tipping face) for reclamation of recyclable materials and divert incoming waste to this area for an agreed period, before removing the residues to the main tipping face.	PICs (landfill operator, waste management department/agency)	Short-term
		Restrict public access to the tipping face where possible and adhere to landfill management best practices (such as no-smoking, frequent soil cover, waste inspection, litter pickup, and grounds maintenance).	PICs (landfill operator, waste management department/agency)	Short-term
	Increase in waste recycling rates.	Develop and implement "Clean Schools" and "Clean Campus" programmes to encourage adoption of waste reduction and recycling best practices in schools and educational institutions.	PICs (waste management department/ agency, educational institutions)	Short-term
		Design and implement a national container deposit programme to incentivise the recycling of targeted waste materials, including food and beverage containers.	PICs (waste management department/ agency)	Medium-term
		Design and implement extended producer responsibility programmes for used oil and E-waste.	PICs (waste management department/ agency)	Medium-term

Source: Draft Pacific Regional Action Plan to Reduce Unintentional Persistent Organic Pollutants

Acronyms: **BAT**–Best Available Techniques; **BEP**–Best Environmental Practices; **PICs**–Pacific Island Countries; **SPREP**–Secretariat of the Pacific Regional Environment Programme;

Appendix C: Progress in implementing uPOPs activities under the 2008 Tuvalu NIP

Activities	Key contributing agencies	Timeline	Performance indicators	Progress as at early 2018
Objective 1: Include methods to reduce uPOPs in related national policies including the National Solid Waste Management Strategy, vehicle Emissions Action Plan and the programme on medical wastes				
Lead Agencies: Department of Environment				
Provide information to the solid waste management officer on uPOPs, to develop village consultation for awareness and alternatives to burning	DE	Months 1-6	Consultation programme developed	No consultation programme was developed and no significant uPOPs awareness activities have been conducted
Work with the solid waste management officer to train rubbish collectors and landfill management on waste management	DE	Months 7-8	Training undertaken for waste staff	Between 2013 and 2016, 20 persons have been trained in management of solid and hazardous waste and chemicals, under the AFD Regional Solid Waste Management Initiative, and the UNEP/GEF PAS POPs Release Reduction Project.
Work with the solid waste management officer to complete collection of information on quarantine and medical waste volumes and management options	DE in consultation with Dept of Health	Months 4-5	Accurate volumes collected	Not completed. Some data is available for healthcare waste through a baseline survey conducted under the PacWaste Project in 2014.
Provide information on uPOPs and contribute to the finalisation of the system in Department of Primary and Preventative Health (Environmental Health Services) to consider best environmental practice for medical waste in Tuvalu	DE with Falekaupule/ Kaupule	Months 7-8	Information provided and included in the Environmental Health Services System	No progress
Assist Falekaupule/ Kaupule to issue resolution and/or enact bylaws to promote environmental, health and safety for dioxins and furans, through promoting safer waste burning	DE	Months 9-20	Resolution developed and enacted	National legislative framework includes provisions addressing uPOPs.
Coordinate with the Department of Education to integrate in the curricula and/or extra curricula activities regarding the environmental and health impacts of dioxins and furans and to promote safe burning	DE	Months 8-10	Safe burning taught in schools	No progress. The curricula include general environmental topics but nothing specifically addressing dioxins and furans and safe burning
Public awareness of economic and environmental costs of poor burning of vehicle fuel	DE and Department of Transport	Months 1-6	Increased awareness, fewer poor vehicles on the road	No progress.

Appendix D: Healthcare waste management recommendations

The following recommendations for healthcare waste management in Tuvalu have been extracted from a baseline study of the Princess Margaret.¹⁶

8.1 Implementation Priorities

8.1.1 Recommendation 1: Develop a Waste Management Framework

1. Develop a **Healthcare Waste Management Plan** specific to the Hospital and other healthcare services on other islands, including technical guidelines and procedures relating to waste management and if not already present, infection control.
2. Appoint an **officer responsible** for the development and implementation of the Healthcare Waste Management Plan

A **Healthcare Waste Management Plan**, specific to the Hospital outlining waste definitions and characterisation, segregation techniques, containment specifications and storage practices, collection and transport, treatment and disposal and emergency procedures should be developed as an overarching document to guide healthcare waste management processes and procedures at each healthcare facility.

The Management Plan should be developed in liaison with other stakeholders, to ensure policy and legislative needs are considered.

A responsible officer or **waste management officer** would be responsible for the day-to-day operations and monitoring of the waste management system. It is important that the waste management officer be adequately resourced to enable them to undertake their role as well as supported by hospital management to ensure that all staff recognise the importance of adopting waste management practices that are in accord with all requirements.

A **waste management committee** has representatives from a broad range of departments and meets at least twice per year. A clear set of objectives should be developed for this committee. It reports to the senior management of the hospital.

8.1.1.1 Short Term (0-6 months)

- Identify existing documents and systems that may have been used in the past
- Responsible officer and healthcare waste management committee established.
- Definitions of responsibilities and key accountabilities of responsible officers and Waste Management Committee developed for inclusion in Waste Management Plan.

8.1.1.2 Medium Term (6 months-1 year)

- Formulate a Draft Waste Management Plan drawing on the results of this 'Baseline Assessment' (i.e. present situation, quantities of waste generated, possibilities for

¹⁶ ENVIRON Pty Ltd. (2014). *Baseline study for the Pacific hazardous waste management project: Healthcare waste, Tuvalu*. Melbourne : ENVIRON Pty Ltd.

waste minimization, identification of treatment options, identification and evaluation of waste-treatment and disposal options, identification and evaluation of record keeping and documentation and estimations of costs relating to waste management)

- The draft discussion document would be prepared in consultation with hospital staff, and officials from the relevant government agencies.

8.1.1.3 Long Term (1year-3 years)

- Finalise the Waste Management Framework
- Continually improve the mandatory standards of healthcare waste management
- Implement a program to ensure waste audits are conducted of all waste materials/systems in all wards/departments on an annual basis and reports are provided to the waste management committee. Effective systems are in place to ensure that any non-conformances (with the hospital waste management strategy) are remedied.

8.1.2 Recommendation 2: Procurement of Consumables (Segregation & Storage)

Waste should be collected in accordance with the schedules specified in the Waste Management Plan (Recommendation One). The correct segregation of healthcare waste is the responsibility of the person who produces each waste item, whatever their position in the organisation. The healthcare facility is responsible for making sure there is a suitable segregation, transport and storage system, and that all staff adhere to the correct procedures. Labelling of waste containers is used to identify the source, record their type and quantities of waste produced in each area, and allow problems with waste segregation to be traced back to individual wards/departments.

8.1.2.1 Short Term (0-6 months)

- Procurement of in-hospital healthcare waste management consumables including:
 - Colour coded bins and bin liners
 - Classification and segregation signage as well as instructional posters to promote good healthcare waste management practices (all hospitals)
- Procurement plan developed to ensure the sustainable supply of healthcare waste management resources.

8.1.2.2 Medium Term (6 months-1 year)

As per short term above.

8.1.2.3 Long Term (1-3 years)

Consumables to be supplied from in-country health agency budgets.

8.1.3 Recommendation 3: Provision of a Sustainable Training Program

Development and delivery of a structured healthcare waste training program to all hospital personnel as well as personnel from other stakeholders (e.g., government health and environment agencies).

This could be facilitated/ delivered by SPREP staff, or outside trainers, or a combination of both, as no competent healthcare waste management training capability exists in Tuvalu.

Training should be coordinated with other countries' needs in the region.

All staff and contractors should attend a waste management training session. This is to be conducted during all induction programs in the first instance. For those staff and contractors currently employed on-site, they will be required to attend a dedicated training session so that they are fully aware of their roles and responsibilities in respect to waste management. Records shall be maintained of all staff and contractors attendance at a training session to ensure that all personnel attend.

8.1.3.1 Short Term (0-6 months)

- Identify potential trainers and build training skills
- Develop a budget for long term training delivery
- Identification and prioritization of employees that need to be trained
- Defining the specific learning objectives for each target audience
- Develop a detailed curriculum specifying the training plan for each session.

8.1.3.2 Medium Term (6 months-1 year)

- Explore incentives for training (e.g. training in collaboration with a health professional society or university that can award certificates or professional credentials)

8.1.3.3 Long Term (1 year-3 years)

- Continually improve the mandatory standards of healthcare waste management
- A continuing audit program be implemented to identify incorrect waste management practices and results of such audits communicated to staff in all wards/departments. Results from these audits and corrective actions to be reported to the facility waste management committee

8.1.4 Recommendation 4: Improved Treatment Infrastructure

Improve the current wood-fired low/ medium temperature incineration process by:

Option 1 – Commission and the ascertain the operating parameters for the donated wood fired/solar powered incinerator

Option 2 - Investigate the feasibility of the procurement of a new high temperature incinerator for Princess Margaret Hospital, located at the landfill, with maintenance support contract

(a) Short Term (0-6 months)

- Ensure sharps and other infectious wastes are burnt immediately when transported to the landfill
- The wood fired/solar powered incinerator should be commissioned as a matter of immediate priority. It is recommended to provide financial assistance to commission the incinerator at the landfill and to ensure that appropriate housing is also constructed for the incinerator to prevent public access and corrosion

(b) Medium Term (6 months-1 year)

- Accurately measure waste generation data to determine required capacity of any new infrastructure
- Investigate the feasibility of procurement of a new incinerator – this is likely to be a medium sized, two chamber, high temperature incinerator. Key considerations with such a purchase are: capacity, purchase cost, operating costs, ease of operation, durability and life span.
 - A critical aspect to purchase of an incinerator in the Tuvalu situation is the inclusion of a supplier support and maintenance contract.

(c) Long Term (1-3 years)

- Feasibility analysis withstanding, *start the process of procurement of a new high temperature incinerator or autoclave/ shredder* – one that is sized according to combined waste throughput
 - A critical aspect to purchase of infrastructure in the Pacific situation generally is the inclusion of a supplier support and maintenance contract.
 - Key considerations with such a purchase are: capacity, purchase cost, operating costs, ease of operation, durability and life span.
- Procure, install and commission new infrastructure, with supplier support and maintenance contract.
- Recording of waste treatment quantities and operating conditions (e.g. burn temperatures per batch)
- Maintain training of operators as required.

8.1.5 Recommendation 5: Procurement of Consumables (PPE)

All waste handlers are provided with and use appropriate PPE including overalls/protective clothing, gloves and eye protection. Incinerator staff are provided with additional PPE such as face masks and noise protection.

8.1.5.1 Short Term (0-6 months)

- Procurement of in-hospital healthcare waste management PPE including overalls/protective clothing, gloves and eye protection
- Incinerator staff are provided with additional PPE such as face masks and noise protection
- Procurement plan developed to ensure the sustainable supply of healthcare waste management resources.

8.1.5.2 Medium Term (6 months-1 year)

- A system is set up to monitor correct use of PPE.

8.1.5.3 Long Term (1-3 years)

Nil

8.1.6 Recommendation 7: Upgrade Storage Facility

The healthcare waste storage area should be locked, and isolated from patients and the public.

8.1.6.1 Short Term (0-6 months)

- Upgrade the storage area to include appropriate signage, fencing and a lockable door.

8.1.6.2 Medium Term (6 months-1 year)

- Procure a spill containment kit for the storage area.

8.1.6.3 Long Term (1-3 years)

- Implement an ongoing healthcare waste facilities audit program to monitor the suitability of central storage areas