EUROPEAN UNION

SPREP
Secretariat of the Pacific Regional Environment Programme

PacWastePlus
PACIFIC WASTE MANAGEMENT

This initiative is supported by **PacWastePlus**-a 72 month project funded by the European Union (**EU**) and implemented by the Secretariat of the Pacific Regional Environment Programme (**SPREP**) **to sustainably and cost effectively improve regional management of waste and pollution.**

Model National E-Waste Strategy & Guidelines

June 2025

This Waste data collation, analysis and reporting for the Cook Islands National Waste Audit Analysis Report was guided by the overarching Regional Waste Data Collection, Monitoring, and Reporting (DCMR) Framework for the Pacific Island Countries and Territories (PICT).

SPREP Library Cataloguing-in-Publication Data

Model national e-waste strategy & guidelines.
Apia, Samoa: SPREP, 2025.
103 p. 29 cm.
ISBN: 978-982-04-1397-9 (ecopy)

1. Recycling (Waste, etc.) – Government policy - Oceania.
2. Refuse and refuse disposal – Oceania.
3. Electronic waste – Management – Oceania.
I. Pacific Regional Environment Programme
(SPREP). II. Title.

363.72820961

Disclaimer: This publication was produced with the financial support of the European Union. Its contents are the sole responsibility of SPREP and do not necessarily reflect the views of the European Union. This document has been compiled in good faith, exercising all due care and attention. SPREP does not accept responsibility for inaccurate or incomplete information.

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Our vision: A resilient Pacific environment sustaining our livelihoods and natural heritage in harmony with our cultures.

About PacWastePlus

The impact of waste and pollution is taking its toll on the health of communities, degrading natural ecosystems, threatening food security, impeding resilience to climate change, and adversely impacting social and economic development of countries in the region. The PacWastePlus programme will generate improved economic, social, health, and environmental benefits by enhancing existing activities and building capacity and sustainability into waste management practices for all participating countries.

Countries participating in the PacWastePlus programme are: Cook Islands, Democratic Republic of Timor-Leste, Federated States of Micronesia, Fiji, Kiribati, Nauru, Niue, Palau, Papua New Guinea, Republic of Marshall Islands, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu.

KEY OBJECTIVES

Outcomes & Key Result Areas

The overall objective of PacWastePlus is "to generate improved economic, social, health and environmental benefits arising from stronger regional economic integration and the sustainable management of natural resources and the environment".

The specific objective is "to ensure the safe and sustainable management of waste with due regard for the conservation of biodiversity, health and wellbeing of Pacific Island communities and climate change mitigation and adaptation requirements".

Key Result Areas

- Improved data collection, information sharing, and education awareness
- Policy & Regulation - Policies and regulatory frameworks developed and implemented.
- Best Practices - Enhanced private sector engagement and infrastructure development implemented
- Human Capacity - Enhanced human capacity

How to Use This Document

This Model Strategy and Guideline should be tailored to develop a Model National National E-Waste Strategy & Guidelines that meets the requirements of your jurisdiction. Guidance is provided in the following ways:

Instructions to drafters	Instructions on use of the Model Strategy and Guideline will be provided in boxes like the example below. *Instructions are provided in dotted boxes throughout the Model Strategy and Guideline. It is intended that all dotted boxes be removed from the final policy, as they are provided for development purposes only.*
Specific text requiring modification to suit local context	Most text is expected to be suitable and relevant for use, specific areas where government consideration of language or inclusions is noted by grey highlighting and red text.
Guidance and considerations provided to assist tailoring of the Model Strategy and Guideline to local context.	Drafting guidance for specific issues will be provided in boxes like the example below: **Drafting Guidance:** **Specific Guidance is included in Guidance Boxes like this.**

When utilising this Model Strategy and Guideline to develop your specific Code, please note the following:

- This Model Strategy and Guideline is designed to assist Pacific Island Countries, and Timor-Leste to reflect the requirements of appropriate national Act and the Regulations, as they apply to managing the health and safety risks, and environmental risks posed by healthcare waste.
- The Model Strategy and Guideline should be tailored to the individual legislative framework of the country seeking to adopt and implement the Strategy and Guideline. As such, this Model Strategy and Guideline is designed to provide base information, that is easily tailored to specific circumstances and legislation used in Country.
- This document contains all critical elements needed to produce a National E-Waste Strategy & Guidelines. However, depending on circumstances, some of the Strategy and Guideline sections may not be needed. In those situations, those sections should be excised from the final document adopted. Depending on circumstances there may be additional information, restrictions, or controls that some jurisdictions wish to add to the Model Strategy and Guideline prior to adoption.

The following table provides details for the use and modification of each section of the Model Strategy and Guideline.

<table>
<tr><td>PART 1: Background</td><td rowspan="5">Each Part is designed to assist in navigating challenging areas of healthcare waste management regulation; offers consistent standards; is easily adapted to fit the diverse needs of PICTs.

The Model Strategy and Guideline provides the basis for a complete listing of appropriate best practices for healthcare waste management. In some jurisdictions these practices may not be appropriate and/or attainable due to a lack of experienced personnel or resources to undertake the practice set out in these parts. In some jurisdictions these practices may be superseded by more detailed practices. It is the intention for drafters to review and modify as needed for their specific circumstance.</td></tr>
<tr><td>PART 2: Current State of Play</td></tr>
<tr><td>PART 3: Strategy</td></tr>
<tr><td>PART 4: Strategy Implementation</td></tr>
<tr><td>Part 5: Monitoring, Evaluation and Review</td></tr>
<tr><td>Guideline 1</td><td rowspan="4">These sections are recommended to be included in their entirety (not withstanding local tailoring for contextual accuracy).</td></tr>
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<tr><td>Appendices</td></tr>
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1.0 Background

1.1 Summary

Drafting Guidance:
A summary should be provided here on the country's main challenges related to e-waste as well as an understanding of what the country wants to achieve. This section provides the opportunity to discuss the purpose of this strategy for the country.

1.2 Intent and Audience

The intent of the strategy and guidelines is to:

1. Provide guidance to the National Government to establish the regulatory and institutional framework to manage e-waste
2. Provide guidance on e-waste management systems for different levels of Government and the private sector
3. Provide guidance on identifying markets for various e-waste commodities and processes to be followed to enable export of materials in compliance with the necessary legislation and Multi Lateral Environmental Agreements (MEAs) governing these materials
4. Provide guidance on minimum standards for e-waste collection, processing, storage, minor dismantling, pre-processing, full processing, and export.

The intended audience includes central, provincial and local government officials, the private sector (including regulated parties) and communities. The proposed timeframe to implement this strategy is 5 years with suggested timing for each step included in the tables later in the document. It is noted these dates will be subject to change due to resourcing and relative priority.

1.3 Interaction of strategy and guideline framework

These guides provide practitioner guidance to implement the strategy. Three guidelines have been developed. Each guideline has a distinct focus and a different audience and supports the implementation of the E-Waste Strategy.

Guideline 1 – provide guidance to the National Government to establish the regulatory and institutional framework to manage e-waste and provide guidance on e-waste management systems. This guideline focuses on establishing a statutory foundation for improved e-waste management over three distinct phases.

Guideline 2 – provide guidance on minimum standards for e-waste collection, processing, storage, minor dismantling, pre-processing, full processing, and export.

Guideline 3 – provide guidance on identifying markets for various e-waste commodities and processes to be followed to enable export of materials in compliance with the necessary legislation and MEAs governing these materials.

1.4 Scope and categorisation

The scope of this strategy is set out below. Each product type has a unique profile relevant to the implementation of this strategy (these differences are explored in the guidelines). Addressing the difference categories will need to be phased over time.

The final list of categories has been chosen to align with the EU Directive on waste electrical and electronic equipment (WEEE).

- **Temperature exchange equipment** e.g. fridges, freezers, air conditioning, heat pumps
- **Equipment containing screens with surface area larger than 100 cm^2** e.g. screens, monitors, monitors, laptops, LCD photo frames
- **Lamps** e.g. fluorescent lamps/bulbs, LEDs
- **Large equipment with any dimension more than 50 cm** e.g. washing machines, dryers, dishwashers, stoves, large printers and copiers
- **Small equipment with no dimension more than 50 cm** e.g. microwaves, vacuum cleaners, kettles, hairdryers, toasters, irons, clocks and watches, calculators, cameras
- **Small IT and telecommunication equipment** e.g. mobile phones, GPS, routers, personal computers, printers, telephones
- **Batteries**

2.0 Current state of play

2.1 Existing legislation

These next few sections require country specific information to include legislation, relevance of legislation to e-waste and implementing agency.

Addressing e-waste is likely to start with legal interventions nested in existing legislation, with a view to develop dedicated waste legislation in the future.

Table 2-1. Primary legislation addressing waste management

Legislation	Purpose and relevance to e-waste	Implementing agency/ies

2.1.1 Relevant Regulations (Secondary Legislation)

Table 2-2 lists regulation that could impact on the project noting key clauses and summarising powers. Existing regulations could be expanded or may provide a design basis for a regulatory instrument to address e-waste or a model for administrative responsibilities at least. Further information on legislative vehicles can be sourced from the 2020 stocktake of legislation.

Table 2-2. Relevant secondary legislation

Legislation	Purpose and relevance to e-waste

2.2 Existing institutional arrangements

This section requires country specific information to include the local ministries that have the responsibility to address e-waste and enforce specific e-waste policies and regulations.

2.3 How e-waste is managed at present

This section requires country specific information and data on e-waste management in country.

The term e-waste can refer to a broad range of items and the definition varies globally – for example, some regions consider larger household appliances (whiteware) e-waste due to the electrical components within them; other regions do not.

A review of international e-waste classification systems, including the UK Government[9], and the Partnership on Measuring ICT for Development, was conducted, which then fed into the development of a list of e-waste categories and examples of the types of products within them for the purposes of this project.

These often consider the types of hazardous materials within electronic products and categorise them accordingly (e.g. temperature exchange equipment contains coolants; display devices and lamps can contain heavy metals).

2.4 Feedback from stakeholders

If consultations are undertaken, this is the section to discuss any feedback.

Development of this strategy was informed by surveys and interviews with stakeholders including members of the regulated community. The survey respondents comprised waste management organisations (both formal and informal), government offices (who may act as regulators for potential upcoming changes), private sector (such as importers of e-products) and generators of e-waste.

Our findings suggest that while there are limited recycling facilities domestically, all our survey respondents collect and sort many types of e-waste, across them covering all e-waste categories. A small number carry out dismantling and repair/re-use or stockpile in some way. Most, however, export the collected waste where it is typically sent for recycling in overseas markets (such as Singapore, Thailand, Malaysia, Australia, India).

Despite this, most respondents who generate e-waste sent their items to landfill, and there were low levels of awareness of alternative disposal options.

This situation does align with most survey respondents' perception of the current challenges with e-waste management – an issue that was highlighted by many of the importers, waste handlers and regulators was a need for higher public awareness/education, while they collectively indicated that a *lack* of processing or collection facilities as one of the lowest scorings issues (i.e. not an issue – there is not a lack of facilities). Waste generators themselves recognised that they did not know where to take e-waste and noted a lack of information/guidance.

Importers, waste handlers and regulators all also recognised a lack of guidance for good practice or any regulation/clear rules. All waste handlers were willing to participate in any industry reform and improvement, such as the introduction of permits or formal processes.

An issue that was particularly divisive across all surveys, with some respondents believing it to be a major issue while others indicating that it was not a problem at all, was that of theft/illegal activity (e.g. theft of parts/materials that have a financial value and can be resold from storage locations).

The stakeholder feedback identified a range of jurisdiction-specific risks are present which the strategy and its implementation seek to address or mitigate, shown in Table 2-3.

Table 2-3. Risks addressed by strategy

Constraint/risk area	Implications for e-waste management	Strategy response
Limited infrastructure	A lack of infrastructure to collect or manage e-waste constrains the effectiveness of any regulatory or voluntary interventions and causes broader impacts such as dumping in temporary locations.	Provision of infrastructure is recommended in the strategy and action plan
Limited resourcing (this may need splitting into categories)	lacks core critical resources at all stages of the e-waste management process.	The introduction of an ADRF seeks to overcome some of these resourcing challenges by raising funding for responsible management of the products that attract the fee/s. Guidelines highlight other opportunities to improve resourcing, including via licensing fees.
Transboundary dumping	Pressure from incoming e-waste imports from other jurisdictions is poorly understood but is considered in the 'horizons risks' section.	Developing a more robust domestic framework for e-waste management will provide a foundation to detect this type of risk.
Limited regulatory framework with limited basis for further interventions	Present legislative instruments provide limited basis for further interventions (e.g., insufficiently broad regulation making power). Legislation change will be required to implement this strategy.	The phased nature of the strategy supports moving forward at an achievable pace noting resource restrictions and competing priorities and suggests development of legislation with broader scope

Constraint/risk area	Implications for e-waste management	Strategy response
Limited institutions and nascent implementation	There is limited funding for the establishment of policy and regulatory systems. A financial instrument raising revenue to be ring-fenced (i.e. dedicated for a particular purpose instead of general expenditure) relies on robust accounting mechanisms within government or whatever entity administers fee collection and its deployment.	The phased nature of the strategy supports moving forward at an achievable pace noting resource restrictions and competing priorities and the time it takes to develop sufficient administrative infrastructure.
Limited awareness	Considerable education and engagement will be needed to establish public awareness of the risks of e-waste and the opportunities for improvement.	Education and engagement to support increased awareness is present at each recommended step in the action plan.
Theft/corruption	Instructure developed in support of improved e-waste management will need to be subject to anti-crime protections include security for locations to reduce theft and promote public safety. Theft may also occur via corruption. Instituting safeguards against corruption provides confidence that any fees will support the outcomes they are intended to, increasing stakeholder buy-in for its presence and perpetuation over time.	The Strategy reinforces the importance of crime prevention is achieving improved outcomes for e-waste particularly where new infrastructure, access to economically valuable commodities exist or where there is potential for maladministration of finances.

3.0 Strategy

3.1 Alignment with national policy

This section requires country specific information to include the national policy framework that sets the national framework for all waste including specific e-waste policies and regulations.

The E-Waste Strategy is intended to sit below the Draft National Waste Policy as a dedicated connecting document. Critical key aims that this strategy contributes to include:

- Good waste management governance
- Well established sustainable waste management systems
- Waste is used as a Resource for other Beneficial Products.
- Reduce Risks of Chemicals and Hazardous Wastes.
- Informed citizens with Pro-Environmental Behaviours

3.2 Objectives

To achieve the above aims over the next five years, the strategy and associated documents will:

- Enhance governance and effectiveness of e-waste management systems through implementing fit for purpose legislation and financial instruments, supported by regulatory capability building
- Explore markets for e-waste commodities and ensuring compliance is fulfilled with necessary legislation and MEAs governing these materials to ensure sustainability and responsible investment
- Support successful facility establishment and management of e-waste processing infrastructure through public private partnerships with strong roots in community-based governance
- Ensure safe and environmentally sound collection, processing, processing, storage, minor dismantling, pre-processing, full-processing and export of e-waste through education and introduction of regulatory requirements

3.3 Achieving the strategy

Note that this section assumes the development of an Advance Recovery Fee and Deposit scheme. If that is not the case, then this section can be deleted.

The management of e-waste will be improved via three primary interventions:

Community engagement - Increased public awareness of the environmental and health related risks and impacts of e-waste and how to avoid or mitigation them.

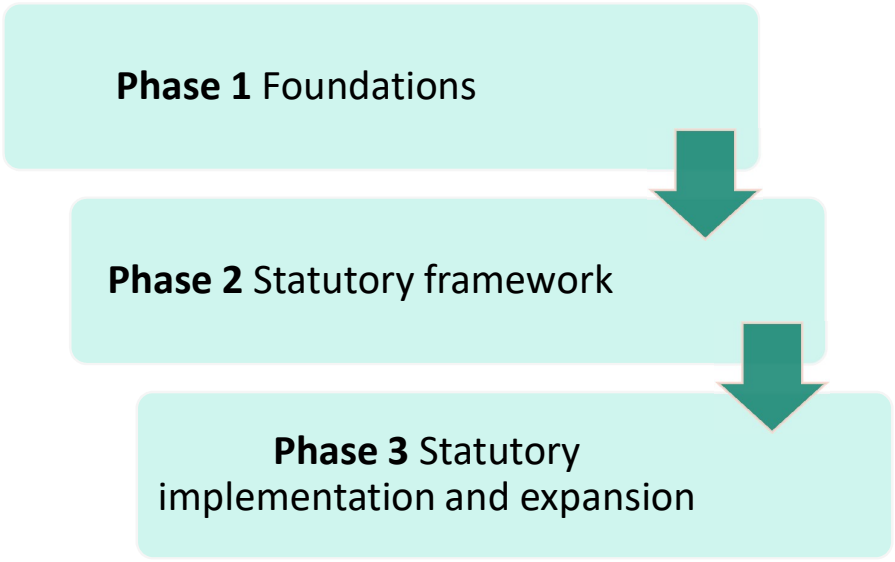
Legislative reform - The development of an Advance Recovery Fee and Deposit scheme (ARFD) administered by the government (including enabling legislation).

Infrastructure / best practice implementation - The development of infrastructure and networks to support the implementation of the Advance Recovery Fee and Deposit scheme (ARFD) in relation to e-waste.

To make significant progress towards achieving the three interventions, a range of strategic areas require sustained commitment and resourcing. It will be necessary to:

- Analyse and develop the basis for education and engagement activities and then implement those campaigns and other initiatives
- Develop legislative and regulatory instruments to support the management of e-waste
- Determine the funding model for government interventions both for the initial setup and ongoing administration
- Determine optimal distribution of roles and responsibilities
- Identify compliance aspects of relevant markets and market requirements / constraints (including international obligations)
- Enable or support the establishment of facilities and other infrastructure to support improved e-waste management
- Support safe and effective dismantling and processing of e-waste
- Sustain long term efforts to build and maintain capacity and capability in core areas such as hazard management, facility maintenance and regulatory practice.

This will be undertaken in three key phases (see strategy implementation for detail) over five years to establish and roll into business as usual programmes at all levels of government.



4.0 Strategy implementation

The limited and informal nature of e-waste management places the environment and human health at considerable risk.

The phased approach proposed in this strategy recognises the operating limitations and anticipates five years to fully implement the strategy and roll the actions into business as usual work programmes (e.g. performance monitoring). To enable future and more ambitious interventions, where possible futureproofing will be included.

4.1 Foundations

Supporting improved government, private sector and community awareness of the hazards associated with e-waste and the need for improved safety will be a critical element of this project. Ensuring engagement strategies are fit for purpose (i.e. suited to local conditions) and undertaken consistently will help embed messages.

Further education and engagement will be needed to bring each of the work areas to fruition, including to encourage people to dispose responsibly of their e-waste when options to do so are available in their area.

4.2 Legislative reform

Existing legislation and regulatory instruments provide limited scope for the management of e-waste. A key workstream is the development of statutory instruments (potentially including mandatory codes of practice).

The development of the requisite legal basis for improved e-waste management should comprise:

- Clear determination of roles and responsibilities in the system, including scope for regulatory intervention
- An instrument or instruments that compel responsible management
- A legal basis to collect an advanced disposal fee to support the framework for implementation
- A fit for purpose suite of powers, duties and sanctions that are efficient and effective

4.3 Infrastructure/best practice implementation

The informal nature of most e-waste management creates environmental and safety concerns. Dedicated and fit for purpose infrastructure to manage collection and processing, in addition to supporting infrastructure for onward stages (e.g. for containerisation) will support improved outcomes.

A range of products are included in the scope of the strategy and ensuring sorting and segregation addresses safety issues and other practical constraints will be important.

Guidance documents will set out key considerations for what infrastructure will be required and design elements of greatest importance. Once infrastructure is developed, guidance will support its ongoing management and process coordination.

The next sections set out in detail what each phase entails.

In the tables below, the responsible agency/Ministry will be required.

Table 4-1. Phase 1 Action Plan

Task No.	Key task	Explanation	Responsibility	Activity description and Guidance	Timeframe
1.1	Immediate engagement	Support immediate improvements to safety through education		Utilising support from PacWastePlus, confirm and roll out the training associated with the development of the strategy.	Q1 & Q2 2025
				Implement National Education and Awareness Plan activities to increase awareness and knowledge of proper e-waste management	Q1 2025 and ongoing as per plan
1.2	Consider roles and responsibilities	A wide range of government agencies, levels of government, private sector participants and the community sector have a role and interest in the improved management of e-waste. It will be necessary to clearly delineate responsibilities through the implementation of the strategy.		Commence consultation processes with responsible entities to confirm responsibilities and communicate elements of Guidelines suitable for their use in fulfilling their functions.	Commence in Q1 2025 until appropriate decisions made
1.3	Baseline analysis	Comprehensive baseline analysis to determine how e-waste is currently managed across the country to support awareness and engagement activities		Develop e-waste audit protocol (considering the PRIF regionalised waste audit methodology)	Q1 2025
				Seek donor support to implement e-waste audit to inform the strategy activities and quantify the volume of the issue to be managed.	Q2 and Q3 2025

Task No.	Key task	Explanation	Responsibility	Activity description and Guidance	Timeframe
				Implement e-waste audit and analysis	Q3 and Q4 2025
1.4	Awareness and engagement (campaign)	Awareness raising and public engagement on issue of e-waste and how to manage it including via social media		Implement National Education and Awareness Plan activities to increase awareness and knowledge of proper e-waste management	Q1 2025 and ongoing as per plan
1.5	Code/s of Practice	Develop of Codes of Practice for E-Waste management and/or Technical Standards for E-waste in line with section 133A of the EA2000		Utilising guidance included in: Guideline: Export and Markets Guideline: Collection & Handling Seek donor and industry support to develop appropriate Codes of Practice to manage and ensure compliance with Best Practice e-waste management	Q2, Q3, and Q4 2025
1.6	Trials of collection/sorting	Initial models for collection, takeback and drop-off trialled for effectiveness		Utilising the Guidelines on Collection and Handling, design and implement systems to ensure the safe and environmentally sound collection and management of e-waste (noting this system will need to be reviewed and updated based on any Legislative or Regulatory change that may be implemented through Phases 2 and 3 of the Strategy implementation.	Q3 and Q4 2025 (dependent on budget and ability to implement based on confirmed Roles and Responsibilities

Task No.	Key task	Explanation	Responsibility	Activity description and Guidance	Timeframe
1.7	Market assessment (including compliance requirements)	E-waste creates economic opportunities where it is possible to safely extract commodities from the waste for onward processing or for manufacturing. Investing in the development of a system needs to be supported by accurate identification of markets and market requirements. Assess compliance aspects of markets including action required to implement relevant MEAs with respect of waste export.		Review PacWastePlus Market Assessment, and other research documents that provide information on e-waste markets suitable for the type and volume of e-waste generated (informed by Audit outcomes	Q2 2025
				Seek donor support to undertake appropriate market assessment that can determine the scope of products able to be moved, the level of pre-processing, or processing required to generate market interest, quantify costs associated, or value derived from sending products to market that will assist with necessary economic modelling to support a sustainable financing system for e-waste.	Q2 and Q3 2025
				Complete the Market assessment	Q1 2026
1.8	Monitoring framework	Develop the basis for the monitoring framework		System stewardship/outcomes monitoring	Q3 and Q4 2025
				Compliance monitoring	
				Agency effectiveness	

Task No.	Key task	Explanation	Responsibility	Activity description and Guidance	Timeframe
1.9	Stakeholder support	Provide opportunities to educate about new approaches and support regulated parties and the community to seek information and have questions clarified		Provide support on an as needed such as supporting regulated parties to provide input into draft regulations and codes	Q2-4 2025 and ongoing
2.0	Regulated parties	Ensure evolving obligations are recognised, incorporated into business models and noncompliance is quickly addressed		Compliance with new obligations and participation in opportunities for feedback	Q2-4 2025 and ongoing

Table 4-2. Phase 2 Action Plan

Task No.	Key task	Explanation	Responsibility	Activity description and Guidance	Timeframe
2.1	Education and engagement	Public awareness campaign ongoing		Update and continue implementation of the National Education and Awareness Plan activities to increase awareness and knowledge of proper e-waste management	Ongoing as per plan
2.2	Policy consultation and development	Undertake necessary engagement and consultation to inform regulations development		Undertake formal consultation on legislative proposals	2026-2028
		Determine roles and responsibilities		Determine roles and responsibilities for government and other parties with delegated functions	
		Develop legislative framework		Develop and draft core legislation	
		Determining the financial model for the system		Consider financial model for the system including sources of funding for establishment and operations	
2.3	Infrastructure development	Facility development and improvement		Augmentation of facilities and establishment of networks for collection (introduce voluntary evaluation/reporting)	2025-2027
2.4	Development of administrative infrastructure to support system	Working with Central and Local Governments, develop the necessary administrative structure to implement management and compliance regime (e.g. IT systems)		Establish governance and management structures	2025-2027
				Set up information management systems	

Task No.	Key task	Explanation	Responsibility	Activity description and Guidance	Timeframe
2.5	Establish regulatory function	Develop and establish the regulatory structures and function to support statutory implementation		Establishment of the team and function	2025-2027
				Develop operational framework including compliance strategy	
				Operationalise compliance monitoring by local authorities including enforcement	
2.6	Monitoring framework	Update monitoring framework including collection targets		Review the monitoring framework at regular intervals to ensure it is fit for purpose	2027
2.7	Stakeholder support	Support the stewardship of new approaches and include changes and additional information to members and associated parties	Business stakeholders (e.g. Chamber of Commerce)	Work with government agencies and regulated parties to help support the effective implementation of the strategy	2026 and ongoing
2.8	Regulated parties	Ensure obligations are incorporated into business models and noncompliance is quickly addressed	Importers and exporters and other consumers affected	Maintaining compliance with new obligations and participation in opportunities for feedback	2026 and ongoing

Table 4-3. Phase 3 Action Plan (shaded areas discretionary depending on further decisions/analysis)

Task No.	Key task	Explanation	Responsibility	Activity description and Guidance	Timeframe
3.1	Education and engagement	Public awareness campaign ongoing with transitional effort to introduce new statutory regime		Update and continue implementation of the National Education and Awareness Plan activities to increase awareness and knowledge of proper e-waste management	Ongoing as per plan
3.2	Licensing system development	Development of licensing system for waste collectors etc.		Analyse and consult on need for licensing system to be put in place depending on choices made about scope of regulatory framework	As required (subject to further analysis and decision making)
				Design licensing system to provide a line of sight through the e-waste value chain (e.g. collectors)	
3.3	Capability building	Developing an effective system of e-waste management in Papua New Guinea will rely on initial and ongoing capacity and capability building. This will be supported by the production of training materials.		Develop training materials to support government staff to pass on their knowledge to other stakeholders and future staff going forward.	Ongoing
				Implement ongoing training and capacity building programme for the implementation of the legislative and compliance system of e-waste	2028
3.4	Implement Advanced Disposal Fee system for e-waste	Develop the concept for an appropriate Advance Recovery Fee and Deposit system to provide sustainable financing for the	Scheme administrator	Utilising the SPREP 21-Step Pathway and associated resources, and ARFD Feasibility Study, develop ARFD concept	TBA
				Seek donor support to develop ARFD scheme	TBA

Task No.	Key task	Explanation	Responsibility	Activity description and Guidance	Timeframe
		environmentally sound management of e-waste		Undertake government legislative processes for design, consultation, and adoption of new legislation	TBA
				Implement the ARFD scheme including elements of: Register liable parties (importers and manufacturers) Collect scheme fees from liable parties Procure and stand up collection, dismantling and processing network Ongoing monitoring and data collection Education and communications to support ARFD	TBA
3.5	Implement regulatory function/s	Ongoing implementation of regulatory role		Support ongoing development of regulatory maturity through agency effectiveness monitoring and continuous improvement	Ongoing
3.6	Stewardship and monitoring	Administer monitoring framework and review/augment over time		Implement stewardship function to track effectiveness of the system at regular intervals	Ongoing
3.7	Stakeholder support	Provide reinforcing messaging about the importance of effective e-waste management	Business stakeholders	Work with government agencies and regulated parties to help support the effective implementation of the strategy	2026 and ongoing
3.8	Regulated parties	Ensure obligations are incorporated into business models and noncompliance is quickly addressed	Importers and exporters and other consumers affected	Maintaining compliance with new obligations and participation in opportunities for feedback	2026 and ongoing

5.0 Monitoring, Evaluation and Review

5.1 **Monitoring** framework

The purpose of the strategy is to guide the improved management of e-waste. Tracking progress through the initial period of change (~10 years across three phases) will promote support and buy-in by enabling achievements and improvements to be highlighted.

The strategy requires regular review and refinement and a five-year timeframe for this cycle is suggested. Annual reviews of in-scheme targets within the monitoring framework will ensure they are fit for purpose as the context evolves. Monitoring responsibilities may change over time.

As state above in the Action Plan, the responsible agency/Ministryfor monitoring will be required.

Table 5-1. Specific actions for monitoring framework

Specific action	Indicator	Aim/target	Responsibility for monitoring
Awareness and engagement activities	Social media and other engagement metrics	TBA (set for each task)	
Develop statutory instruments for e-waste	Public consultation undertaken on draft legislation	By 2028	
	Legislation passed into effect.	2030	
Develop regulatory and administrative framework for the collection and administration of an advanced disposal fee to apply to imported items within the definition of e-waste	Public consultation undertaken on draft legislation	2028	
Compliance with regulatory requirements	Compliance rates with licensing requirements	Targets set annually in operational compliance plans	Central, provincial and local government (depending on enforcement role)
	Compliance rates with fee payment		
	Compliance rates [other]		
	Formal enforcement action taken	TBA	Agency/ies with specific enforcement powers
Establish a performance monitoring framework and review cycle	Collection rates for different materials	Various	

Guideline 1

6.0 Overview

6.1 Outline of Guideline 1

This document addresses the development of the regulatory and institutional frameworks for management of e-waste and the associated guidance to different levels of government for the phases of the E-Waste Strategy. Sections 6.1.1 - 6.1.3 clearly link to the tasks set out in the Draft E-Waste Strategy.

The limited and informal nature of e-waste management places the environment and human health at considerable risk.

The phased approach proposed in the strategy recognises the operating limitations and anticipates several years to fully implement the strategy. To enable future and more ambitious interventions, where possible futureproofing will be included.

The timeline for implementation of the strategy is staged to allow for development of political and community support, acquire necessary capacity and capability and engage all relevant parties that will have responsibilities under the scheme. This Guideline supports the operationalisation of the policy and regulatory elements of the three phases set out in the tables in the E-Waste Strategy under the relevant headings.

6.1.1 Phase 1 Summary – Foundations

Supporting improved government, private sector and community awareness of the hazards associated with e-waste and the need for improved safety will be a critical element of this project. Ensuring engagement strategies are fit for purpose (i.e. suited to local conditions) and undertaken consistently will help embed messages.

Further education and engagement will be needed to bring each of the work areas to fruition, including to encourage people to dispose responsibly of their e-waste when options to do so are available in their area. Communications will be required to support the implementation of the advanced disposal fee, should one be adopted, particularly in response to how the ringfencing will be managed. Ensuring clear hypothecation will support public buy-in for its payment. Consultation and further research to support the subsequent phase will also be required.

Key tasks addressed in this guideline include:

- Education and engagement
- Research and analysis
- Consultation
- Policy development (including monitoring framework)

6.1.2 Phase 2 Summary – Legislative Reform

Existing legislation and regulatory instruments provide limited scope for the management of e-waste. A key workstream is the development of statutory instruments (potentially including mandatory codes of practice).

The development of the requisite legal basis for improved e-waste management should comprise:

- Clear determination of roles and responsibilities in the system, including scope for regulatory intervention
- An instrument or instruments that compel responsible management
- A legal basis to collect an advanced disposal fee to support the framework for implementation
- A fit for purpose suite of powers, duties and sanctions that are efficient and effective

Key tasks addressed in this guideline include:

- Education and engagement should be ongoing as per plan)
- Policy consultation and development
- Administrative infrastructure development

6.1.3 Phase 3 Summary – Infrastructure and Best Practice

The informal nature of most e-waste management creates environmental and safety concerns. Dedicated and fit for purpose infrastructure to manage collection and processing, in addition to supporting infrastructure for onward stages (e.g. for containerisation) will support improved outcomes.

A range of products are included in the scope of the strategy and ensuring sorting and segregation addresses safety issues and other practical constraints will be important.

Once infrastructure is developed, Guidelines 2 and 3 will support its ongoing management and process coordination. Key tasks addressed in this guideline include:

- Education and engagement (including capability building)
- Policy development (including licensing system, ARFD)
- Implement regulatory function (including stewardship and monitoring)

The next sections expand on the requirements of each phase as necessary.

7.0 Implementing Phase 1

7.1 Education and engagement

Education and engagement about the hazards of e-waste, ways to reduce the risk posed through dismantling and to eventually educate the public and regulated parties about statutory obligations is a key role for central and local authorities. Key tasks include

- Utilising support from PacWastePlus, confirm and roll out the training associated with the development of the strategy (Task 1.1) – to be delivered alongside this guideline
- Implement education and awareness activities to increase awareness and knowledge of proper e-waste management (Task 1.1 and 1.4)

Developing a clear and coherent education and engagement plan in CEPA that supports the three different phases and the involvement of a wide range of parties would ensure consistency and the ability to evolve language over time as public awareness increases.

In addition to the presentation of the Strategy and Guidelines, implement an education and awareness programme to provide visibility and clarity to different parties, in addition to a shared language that would support development of public and political support for interventions.

7.1.1 Education and Awareness Program

A core aim of the strategy is to increase public awareness of the environmental and health related risks and impacts of e-waste and how to avoid or mitigate them. Feedback from stakeholders reflected in the E-Waste Strategy noted considerable concerns with a lack of awareness about the hazards of e-waste and ways to manage them.

The country is committed to developing an education and awareness program to support a series of education programmes and campaigns to be delivered in a variety of ways including by social media. Key considerations for the development of such a plan include:

- The people and organisations most likely to encounter e-waste
- The mode of communication most likely to reach relevant stakeholders and communities
- The simplicity and clarity of messages that support easy understanding despite language barriers
- Clear information provided in a timely way, including how to engage with initiatives such as trials

Further support and guidance can be found in the PacWastePlus resources for developing education and awareness plans - Model Regional Education and Awareness Plan – Pacific Waste Plus

7.2 Research and analysis

Establishing a solid evidence base will support policy consultation and development and help identify key target areas for improvement in the short term.

Key tasks include:

- Develop e-waste audit protocol (considering the PRIF regionalised waste audit methodology) (Task 1.3)
- Seek donor support to implement e-waste audit to inform the strategy activities and quantify the scale of the issue to be managed. (Task 1.3)
- Implement e-waste audit and analysis (Task 1.3)

Further information on waste audit practices and a common methodology can be found here: https://library.sprep.org/content/waste-audit-methodology-common-approach

Further analysis on the nature and state of e-waste management across the country will be necessary to support the development of legislation proposals. Markets, including restrictions on those markets are evolving rapidly – **see Guideline 3 for more information** – and the basis for state action needs to be regularly reviewed based on empirical data.

7.3 Consultation

Ensuring responsible parties including other agencies are aware of the intentions and have an ability to participate in their design will improve buy in.

Commence consultation processes with responsible entities to consider responsibilities and communicate elements of Guidelines suitable for their use in fulfilling their functions (Task 1.2)

CEPA will have the lead role in the design of the system and likely the governance lead even if any aspect of the framework for e-waste is externalised to a third party.

Consultation on implementing the Strategy would be best directed at:

- Other central government agencies
- Local and provincial government agencies
- Community groups and leaders
- The private sector, including existing waste companies and contractors
- The general public

In carrying out consultation, officials should be cognisant of potential conflicts of interest for existing players and ensure consultation is held within appropriate limits to avoid risks of regulatory capture.

Consideration of synergies and opportunities for collaboration through the process can support faster and more effective implementation, such as through building community support for safety initiatives etc. Ensuring the relevant stakeholders are consulted will achieve improved buy-in and feedback loops and mechanisms over time will maintain support (see Monitoring).

Further support and guidance on stakeholder engagement can be found here: https://library.sprep.org/content/guide-developing-project-engagement-plans-stakeholder-education-and-awareness

7.4 Policy development (including monitoring framework)

Establishing the core components of a policy framework can start early through engagement with existing activities and seeking opportunities for near term improvements (such as the development of codes of practice to guide specific activities).

Utilising Guidelines 2 & 3, seek donor and industry support to develop appropriate Codes of Practice to manage and ensure compliance with Best Practice e-waste management (Task 1.5)

Establish monitoring framework including collection targets (Task 1.8)

7.4.1 Development of a code of practice

Initial products such as a Code of Practice can assist in regularising practice and improving consistency ahead of statutory interventions. Further analysis and consultation would be required to develop a Code of Practice.

Codes of Practice may be voluntary or mandatory (including through incorporation by reference). See guidance on best practice in **Guideline 2** which could provide the basis of a Code of Practice for e-waste dismantling for example.

7.4.2 Establishing a monitoring framework

Establishment of a monitoring framework early can support goal setting and provide a context in which to particularise roles and responsibilities in a transparent way. A range of types of monitoring are required to support public confidence in the system for the management of e-waste. These include

- Monitoring of the effectiveness of the system for the management of e-waste (stewardship)
- Monitoring the compliance of regulated parties (compliance monitoring)
- Monitoring the effectiveness of the agency in discharging its regulatory role (agency effectiveness monitoring)

E-waste regulation provides an opportunity to set clear and enforceable targets that can be reviewed and 'ramped up' over time. See **Guideline 2** for further information on the value of performance targets at a system level.

7.4.2.1 Stewardship and outcomes

Developing a framework for regulatory stewardship aims to ensure the different components of a regulatory system (and associated structures) are working effectively and to maintain the system including via amendments to ensure it remains effective over time. Regulatory systems exist in a complex context that is changing all the time and as such, regulatory stewardship is an ongoing commitment. Considering how a system might be monitored is a core element of legislative design that can form part of early consultation and agenda-setting.

Examples of targets and how to set them are included in the E-Waste Strategy (section "Monitoring framework") and could initially comprise progress on the actions in the Strategy. As activities progress, further elements can be added to track outcomes and milestones.

7.4.2.2 Compliance monitoring

Establishing a monitoring framework for performance of regulated party's links to the compliance measures set out in the E-Waste Strategy. Selecting metrics should consider what measures best reflect the behaviour

change desired by the statutory or non-statutory activities and how we would know they are being successful. Examples include

- Compliance rates with licensing requirements
- Compliance rates with fee payment
- Compliance rates [other]
- Formal enforcement action taken (# notices)

Compliance metrics chosen may be partially constrained by availability of record keeping systems. Having an initial understanding of the type of compliance metrics will support the development of a robust regulatory system with sufficient powers to require information to service those metrics.

7.4.2.3 Agency effectiveness

Measuring the effectiveness of regulatory agencies requires sustained and clear monitoring frameworks that provide opportunities for continuous improvement. Operational recruitment, training and capability development should take account of the specific requirements of the e-waste management system and broader skills in regulatory management and delivery.

Wider accountability mechanisms in government should be considered alongside any specific regulatory responsibilities (e.g. obligations of government agencies to the Auditor-General).

7.5 Other tasks relevant to Phase 1 addressed in Guidelines 2 and 3

Trials of collection/sorting (Task 1.6) – see **Guideline 2**

Market assessment (including compliance requirements) (Task 1.7)– see **Guideline 3**

8.0 Implementing Phase 2

8.1 Policy consultation and development

Specific country regulations and legislation set the framework for this work. An understanding of country policies and regulations are critical to providing the information to complete this section.

Design and development of the formal legislative response to e-waste is a significant undertaking but will provide the powers and tools to bring about necessary behaviour change and reduce risk to the environment and human health. Proactive engagement with and development of a network of collection facilities is also critical and this is addressed further in: **Collection and Pre-Treatment of E-waste**.

Undertake formal consultation on legislative proposals (Task 2.2)

Determine roles and responsibilities (Task 2.2)

Develop and draft core legislation (Task 2.2)

Determining the financial model for the system (Task 2.2)

Note that activities pursuant to the National Education and Awareness Plan should be ongoing alongside this.

8.1.1 Formal consultation on legislation proposals

Consultation obligations for legislation proposals will be subject to in-country requirements regarding:

- Consultation requirements in any legislation to be amended to bring about the improved e-waste management system
- The need to incorporate the views of other agencies or dovetail effectively with existing regulatory roles, with respect to natural environment laws
- The need to consult with traditional owners where proposals affect their rights and interests
- The requirements of the newly minted Legislative Drafting Manual (released in 2024)

8.1.2 Determine roles and responsibilities

This section sets out the roles and responsibilities of core actors and how that might apply to e-waste. This section focuses primarily on legislative roles where parties are required to do something. A regulatory system will usually place some reliance on voluntary actions which are not set out here (e.g. NGOs running extra take back events etc). The key roles and responsibilities are set out for:

- Central government (the lead environment agency (most likely CEPA)
- Central government – other (allied roles for other agencies)
- Local and provincial government
- Other parties (product stewardship organisations, certifying bodies etc)

8.1.2.1 Central government – lead environment agency

Specific country regulations and legislation set the framework for this work. The lead environmental agency that has responsibility for e-waste should be defined here as well as their role.

Table 8-1. Governmental roles and responsibilities

Role/responsibility	What does the core legislation need to enable this
Policy justification and regulatory design	Core legislation to enable e-waste management may include agency reporting and obligations to consult, in addition to identifying the administering agency. This role may carry broader responsibilities within government.
Information, education and engagement	Engaging with regulated parties, other parts of government (local, provincial, national and international), aid organisations, the private sector and the wider community will provide critical visibility to the scheme (scope, reach, sequencing of different elements and any progress). Engagement must occur from inception to implementation and should be managed by a lead agency with others in collaboration. A coherent and shared approach to communications and engagement across government would ensure consistency and improve public awareness. Ensuring all stakeholders are made aware of the scheme generally and specifically is critical to successful implementation.
Operational compliance role	See section 8.3
System stewardship role	See section 7.4.2

8.1.2.2 Central government – other

Central government agencies that do not have specific environmental mandates may still play an important role in improving e-waste management.

Management of e-waste represents a small subset of the overall management of waste and of environmental matters more generally. Further, responsibilities in other areas of government may have important overlaps including, but not limited to:

- Health – the interplay of environment and human health has considerable overlaps, particularly when considering the pollution/contamination that may arise from poorly managed e-waste and the harm to individual persons from unsafe management
- Customs (imports and exports) and potential for future roles – for example collecting fees if sustainable financing elements are implemented
- Finance -elements of sustainable financing or management of fines or penalties for breaches of the legislation in addition to any general obligations for expenditure of public money in a regulatory context
- Trade – the impact of trade responsibilities on exports of e-waste (see further Guideline 3)

Developing and maintaining effective cooperative arrangements with other regulators nationally and offshore helps strengthen the integrity and effectiveness of the system.

Obligations such as information sharing and provisions for joint operations may also be required depending on institutional arrangements. Some powers may be required for other agencies, particularly where they may have a related regulatory role.

8.1.2.3 Local and provincial government (including NCDC)

Local government administers waste management services (e.g. service delivery, waste management, illegal dumping, enforcement). Section 39 of the Environment Act requires that Urban Local Level Governments (ULLGs) must develop waste management plans. Some run small scale community recycling initiatives often focused on management of organic waste (Draft Policy).

The nature and scale of these services vary nationally from limited and patchy to non-existent.

ULLGs also carry out existing permitting functions for e-waste processing and storage facilities. As system improvements occur (particularly the potential advent of dedicated legislation) this function may grow and change. There are likely near-term opportunities to improve the system via changes to planning approvals (e.g. update of new conditions or standards) which can be discussed during the policy design process. It is important to consider the implications of new functions for those existing to limit sunk investment in processes and avoid duplication.

8.1.2.4 Other parties

Roles and responsibilities are likely for agencies other than core national, provincial or local government organisations, which may include delegated authority. Examples include:

- Product stewardship organisations
- Facility managers
- Certification bodies

Accountability measures should be in place for any party particularly outside of government that is delegated a responsibility in this area. In general enforcement functions should remain the responsibility of regulatory agencies.

8.1.3 Develop and draft core legislation

Regardless of the specific interventions opted for, there are core components of a statutory regime to ensure it is implementable and effective. Ensuring these are fulsome and address the full span of the value chain (see Section 7.5) will support a functional system.

Table 8-2. Legislative components

Core component	How the legislation should provide for this
Scope	The scope of the regime determines its size and complexity. If different types of e-waste require different types of regulatory interventions in context, choices about the scope of the scheme, and any staging are highly relevant. The scope of e-waste is potentially very broad. If staging is to be contemplated, then it may be useful to provide for products to be added or taken from the scope via regulation making power. Another approach is to design introduction timelines to be embedded in legislation (i.e. regulatory responsibilities that are subject to delayed commencement). The scope of the scheme (depending on decisions taken) may need to account for the scope of regulated parties, particularly if requirements are to be phased in over time for them.
Regulatory powers	Powers to carry out the regulatory role are necessary to provide for including core processes such as delegations of responsibility to enforcement officers. Examples of key powers required for improved e-waste management include powers allowing the policy/regulatory agency to: • Set standards and requirements for operators, facilities and transport • Undertake compliance monitoring, auditing and enforcement • Summon information from regulated parties and others as appropriate, including prescribing form and timeframe • Require safety/hazard information • Recover costs or seek fees and charges for a related purpose in scope • Making decisions in emergencies • Enter land or require information for the purpose of determining compliance • Compel sharing of information onsite or during an incident (name, address etc) • Powers to issue statutory notices and undertake enforcement action If product stewardship is pursued, some powers (such as fee collection) may need to be delegated outside the core agency.

Core component	How the legislation should provide for this
Restrictions on regulated parties – basis in law	Ensuring there are adequate prohibitions on specific and associated behaviours supports the legislation to be successfully implemented. It should be clear which restrictions apply to which parties and in what circumstances. Ensuring design elements such as ease of detection and what proportionate sanctions might be for breaching the requirement are. Scaling requirements or otherwise varying them between different regulated parties may be required also for fairness/equity and to avoid distributional impacts (e.g. more limited reporting requirements for community led facilities compared with commercial).
Obligations of regulated parties – basis in law	Ensuring positive obligations (e.g., notification, reporting etc) are clearly set out and it is clear who they apply to. Positive obligations should relate to the specific scope of the legislation. There is usually a relationship between restrictions on behaviour and positive obligations. For example, in requiring some things to be done by regulated parties, it may be useful to restrict alternative behaviours also (e.g. in introducing product stewardship requirements also consider introducing an offence for operating outside the scheme).
Identification of duty holders	Ensuring duty holders are clearly identified in the law is fundamental to a functional system. This can be supported with statutory definitions of different duty holders and a codified process to bring a party under that definition. Examples of likely duty holders include importers and exporters, facilities, waste collectors and transporters etc. See further **Guideline 2**.
Standards	Requiring standards to be complied with can be an effective way to institute dynamic operating requirements for regulated parties. Examples of standards that could be established in the context of e-waste management include segregation and storage requirements – see Guideline 2 for further discussion on this. Enabling government (likely CEPA) to set standards would ensure the statutory framework could keep pace with technological change and processing techniques for e-waste. It is recommended such standards are set through a third-tier assurance process (such as an Order in Council or gazettal notice or equivalent).
International/transboundary matters	Management of e-waste is partly reliant on global markets. Supporting mechanisms may be required in the law – see **Guideline 3: Markets and Exports of E-waste**. Ensuring legislation design takes account of this dimension may improve implementation (e.g. interaction with trade laws).

Core component	How the legislation should provide for this
Operational policy	Development of operational policy to support the regulatory role is necessary. The design of the legislation should consider what matters may need to be determined at an operational level and whether they should be covered in the statutory instrument or as agency policy. Operational policy will guide the activities of regulators but also support regulated parties to understand the processes they must follow in conducting their activities and what kind of oversight to expect (e.g. documentation requirements for exports, as discussed in **Guideline 3 Markets and Exports of E-waste**.
Design and delivery of any required licensing and approvals	The statutory framework will likely need to provide for licenses or other permissions to be issued although this is subject to further decision making. The power to require licensing should be broad enough to capture all actors in the value chain. These requirements are additional to existing planning processes and should be carefully designed to interface cleanly and not overlap. Requirements for license systems include: • Duties to apply, to whom and on what basis • matters for consideration in processing a license • tiering and phasing of obligations • fees/cost recovery mechanisms • timing/longevity and renewals • license terms/standards (including incorporation by reference where appropriate of existing standards) • monitoring and audit powers • revocation/cancellation provisions will be required. • Reporting obligations and transparency requirements Linkages between standards and regulatory requirements and compliance with a license supports an integrated approach. Special permission mechanisms may be required for larger roles such as Scheme Operators of product stewardship programmes. These may require bespoke sections of legislation and specific monitoring and reporting processes outside the scope of these guidelines. Reporting requirements support stewardship of the legislation and may include the obligation for the agency to particularise the reasons for decisions, to publish processing times or otherwise report on the system.

Core component	How the legislation should provide for this
Information, education and guidance	Communications and engagement obligations are core and critical to any regulatory regime but are not generally codified in legislation. However, the duty to issue clear guidance can be set in the law to encourage the function to be taken seriously and prioritised. Once established, strategic focus on removing barriers to compliance and raising awareness about the benefits of compliance can be valuable aids in achieving behaviour change. Training and communication materials will also be required for regulated parties. These should be clear and easy to understand and targeted as appropriate.
Monitoring compliance and enforcement	Ensuring an effective monitoring and enforcement regime is set out in legislation will support behaviour change and ensure that free riders in a system are able to be addressed quickly and in a way that improves performance. All agencies with compliance and enforcement roles (including those who may have it by delegated authority) should be considered and in scope of the legislation. Critical components of an effective compliance regime in the law includes: • Sufficient powers of detection including powers of information acquisition and general and specific powers of entry (including the ability to seek a search warrant and undertake seizure proceedings) • A broad range of statutory notices for where a license applies (warning, suspension, revocation etc) and where it may or may not (warning, notice to stop or require something to be done, infringement fine, prosecution) • Cost recovery provisions that enable wrongdoers to pay a greater proportion of the costs of the regime than the wider community (including proceeds of crime provisions) • Monitoring and reporting obligations to ensure transparency
Dispute resolution	All statutory regimes require disputes resolution processes to support natural justice. A range may be required for e-waste but likely include a process to dispute decisions and fees (the courts may play this role). The responsibility of the lead agency will be to administer the extra-judicial aspects of this.

Core component	How the legislation should provide for this
Provisions to support bespoke mechanisms	The style of regulation will require supporting mechanisms. If a scheme is only partially provided for in law, it is unlikely to be effectively implemented. Ensuring the full scope of a regime can be implemented requires careful thought about implementation. Examples include: • A framework for licensing where one is available • A regulation making power for additional elements such as performance standards • Key choices about baselines and how to address legacy waste, for example will existing e-waste products such as those stockpiled (see **Guideline 3 Markets and Exports of E-waste**) fall in scope and thus be eligible for the recovery fee on disposal) and how will this be operationalised (e.g. amnesty events) • Mechanisms which bind parties related to their interactions in the system can support good outcomes (An example of a useful control is a requirement for a licensed/authorised operator to only receive and pass on to other authorised operators etc)
System performance and regulator evaluation.	Regular reporting on progress and outcomes helps maintain focus and increases public awareness and buy-in of the collective impact of the system. Setting clear objectives and reporting regulatory on progress towards them can be undertaken on both a statutory (required by law) and non-statutory (supporting engagement) basis. Where reporting relies on submissions by regulated parties, the legislation should contain specific and powers of information acquisition and powers to require that reporting be undertaken regulatory in an agreed format. Regard should be had to matters of privacy, security and consideration of commercial sensitivity.
Financial instruments	Ensuring the statutory basis is sound for any financial mechanisms ensure nonpayment (free riding) can be acted on to support maintenance of a level playing field and that other aspects of maladministration can be avoided. Developing the statutory basis for a financial mechanism requires: • The basis for the amount • The means of collection • A means of enforcement/follow up • A way of managing the funds including hypothecation pathways as appropriate • A basis for reporting/assurance • Checks on potential risks of theft, bribery and corruption

Core component	How the legislation should provide for this
Future proofing	Ensuring the legislation is set up to deliver on more aspirational elements at the outset removes a step required before the approach to e-waste can be made for sophisticated. Enable the legislation to be able to introduce new requirements over time with general underlying mechanisms and further regulatory powers to expand the scope.

8.1.4 Determining the financial model for the system

A range of design choices sit at the interface of legislation and operations. While mostly operational in nature, they derive their legitimacy from being provided for in the statutory framework. A range of possible financing mechanisms are set out below. Consultation and policy analysis should consider whether the underlying financial mechanisms are provided for in the eventual policy framework.

Table 8-3. Potential Financial Mechanisms

Funding source	Purpose and provision in statute
Central government core budget	
Private sector investment (partnerships)	Investment in the development of facilities for e-waste management may benefit from partnerships with the private sector.
Cost recovery provisions	Fees and charges that relate to the statutory requirements including application, processing and administrative fees related to licensing and any other process where a regulated party pays money to the regulator to be able to participate. Ensuring fees are reasonable and appropriately deployed will require statutory mechanisms. The legislative framework will need to provide for an opportunity to consider and contest fees and to address other related disputes.
Costs sought through enforcement processes	Costs of compliance and enforcement are generally collected as monitoring fees, but penalties may be paid to the regulator depending on the design choices for the system. Awarding costs in court is at the discretion of the judiciary and should not be relied upon to fund a scheme. However, if costs support offsetting complex enforcement cases this can reduce reluctance to enforce on the basis of cost. How income in the form of costs should be managed by the regulator, including any restrictions on its expenditure should be codified in legislation. Supporting mechanisms to avoid fraud and corruption should also be in place.

Funding source	Purpose and provision in statute
Specific interventions (e.g. Advance Recovery Fee and Deposit (ARFD) Scheme)	The implementation of an Advance Recovery Fee and Deposit Scheme that applies a levy to the importation or manufacture of products that will become e-waste is a potential mechanism to ensure appropriate funds are available to implement the necessary management, collection, processing, and compliance actions related to the environmentally sound management of e-waste. It is recommended that specific legislation developing the ARFD be developed and an e-waste Regulation be utilised to govern the e-waste management elements. This design will then enable CEPA to implement other Regulations to replicate the Scheme for other waste streams such as beverage containers, used vehicles, used tyres, used lead acid and lithium batteries, etc. Further insights are available on this instrument here: https://library.sprep.org/content/step-1-implementing-arfd-guidance-21-step-pathway-decisions-and-actions-needed

8.2 Regulatory administrative/infrastructure development

Developing the administrative infrastructure should be initiated in advance of the expansion of the regime. These are required regardless of the function. Examples of key administrative infrastructure includes:

- Geographic information systems and other databases to manage the system and the information the agency/ies hold about actors in it
- Administration systems including computer and financial systems capable of supporting the regulatory role (e.g. receiving monitoring reports as required)
- IT systems to support oversight and regulatory functions (e.g. case management system or protocol)
- Marketing, branding and other materials such as clothing and equipment to undertake the role
- Training and capability frameworks to support the development and retention of skilled staff (**see Guideline 2 and 3 for further detail on training**)
- Human Resources and other systems to support employee wellbeing
- Document management systems and conventions (file naming, style guides etc)
- Data management including security and privacy controls and access restrictions

It is also necessary to determine roles and responsibilities of various parties at a greater level of detail. An example of a matrix that guides priority of tasks is in the breakout box below, relevant to waste.

Monitoring and evaluation matrix to guide regulatory function establishment

Good practice would suggest that a monitoring and evaluation matrix is established and utilised by CEPA, or other parties involved on their behalf, to track progress and measure the effectiveness of e-waste management by using key performance indicators (KPIs) to assess implementation of this guideline and related compliance with legislation. Information (qualitative and quantitative) would be gathered from e-waste system operators on the ground. An example monitoring matrix is given below:

Monitoring aspect	Frequency	Purpose	Responsible party
Collection and storage (including security and labelling)			
Communication with the public/business			
Handling, health and safety			
Pre-treatment			
Logistics and export			
Reuse and recycling rates			
Financial management			
Staff training and awareness			
Overall compliance and transparency			

8.3 Develop regulatory function

Developing the specific e-waste regulatory function should occur well in advance of statutory instruments coming into force. Determining scope, location, interaction with existing regimes and the development of operational policy, implementation strategies and protocols will guide the initial introduction of requirements and support any development over time of the complexity or reach of the regime. The following elements are addressed in detail for consideration:

- Establishment of the team and function
- Operational framework including compliance strategy
- Compliance monitoring byauthorities including enforcement

8.3.1 Establishment of regulatory team/function

Establishing human resources to implement the proposals is best undertaken in advance of the introduction of the statutory basis and requires a variety of expertise to be active in different parts of the system, including:

- Policy expertise to undertake the regulatory stewardship role on an ongoing basis including performance monitoring
- Compliance expertise to establish and operationalise the monitoring and enforcement function
- Communications and engagement expertise to design and deliver information and materials to users of the system and other stakeholders, initially and ongoing.

Guiding the activities of the core initial function to build the necessary relationships and develop the operational frameworks to ensure long term success will be a critical role.

An effective compliance system comprises five key elements:

1. Education, engagement and encouragement to comply (these promote voluntary compliance through shared understanding – incentives can be particularly effective at motivating participation and higher recovery rates in waste regulation.)
2. Monitoring of behaviour to detect non-compliance promptly
3. Investigating to determine whether breaches have occurred
4. Acting on non-compliance
5. Performance monitoring

8.3.2 Operational framework including compliance strategy

Development of an operational framework to guide the function includes:

- Strategies and guidelines to provide transparency as to how the regime will be administered, the flows of money, materials and waste that can be expected and where responsibilities for different aspects lie
- The day-to-day policies and procedures to guide administration and micro-decision making will support effective implementation
- Establishment of specialist roles and processes (such as any relevant disputes resolution processes) and associated functions such as finance and management of data privacy (these may be shared with those already existing in agencies that assume this role)

Setting out how regulatory agencies will administer a compliance function can be challenging due to complexity and high levels of discretion in environmental enforcement. A common approach is to set out a suite of principles such as those set out below. The principles in this strategy may overlap with more strategic documents, but they have specific application in a compliance context. Examples of principle for consideration include being transparent, fair, reasonable, and proportional, informed and evidence based and lawful, ethical and accountable.

8.3.3 Compliance monitoring including enforcement

Compliance monitoring is a specific form of monitoring directed at regulated parties by the regulator to ensure compliance with the law. Administering an effective and efficient compliance monitoring function relies on detecting, investigating and taking appropriate action on non-compliance that is confirmed. There are several design choices in how to establish a compliance monitoring function.

The approach is best tailored to the flows of information and actors in the system, but would usually comprise three key types: proactive, reactive and inspections or audit followed by investigations – all of which may proceed to an enforcement stage. These four elements are set out in more detail in the table below.

Existing legislative requirements already include monitoring powers and enforcement tools – these will likely require expansion and diversification over time as the scope of the system broadens. There may be elements of a compliance monitoring system already in place which can be adopted or augmented for this purpose.

Table 8-4: Components of compliance monitoring

Component	Brief description	Key elements for statutory regime
Proactive broadscale monitoring	Using data and information from other sources (e.g. aerial photography) at a system level to detect offending	Strong powers of information acquisition and powers of entry to sites/localities support proactive measures to detect non-compliance.
Inspections or audits	Structured assessments of compliance with requirements	Systematic auditing frameworks consider the requirements of a regulated party or another obligated entity with standards or laws. Audits are independent and impartial determinations of compliance, often governed by overarching quality assurance mechanisms such as those administered by the International Standards Organisation (ISO). Audits may focus on both compliance (with regulated obligations) and conformance with best practice requirements which can be a useful mechanism for performance improvement in a system over time. Audits can be carried out by third parties in some systems (especially where uncommon expert knowledge is required) and this potential consideration can form part of policy development.
Reactive monitoring/incident response	Incident responses often to complaints notified by another party or as a referral from the above proactive or audit approaches.	Incident response is usually supported by powers of information acquisition and entry to land/facilities. Often incident response necessitates urgent actions to be taken, and consideration of potential for these to be useful should occur in the context of policy development (e.g. the ability to carry out emergency works to protect life or property and on-charge the cost of them to offenders).

Component	Brief description	Key elements for statutory regime
Investigations	A formal escalation in response to allegations of non-compliance that determines whether a breach has occurred and considers further action.	Investigations usually occur where there is a reasonable expectation that wrongdoing has occurred. Further powers are required to support investigation such as the ability to seize equipment, clone systems etc. Controls on evidence collection, interviewing and other human rights elements may engage general legislation as well.

The various aspects of the approach to compliance and enforcement can be further codified in an enforcement policy that guides choices at the frontline of delivery.

Investigating alleged non-compliance can arise out of any of the possible approaches to monitoring and is the process that determines the facts.

Taking appropriate action on breaches ensures that the consequences of non-compliance are apparent to the offender and to the community more broadly.

The options available to carry out enforcement are set out in the legislation and many options requires separate formal decision-making arrangements and management tools (e.g. infringement fines).

An example of a separate formal decision-making arrangement is an Enforcement Decision Group in which several officials (and potentially a lawyer) make a decision on next appropriate steps. This is common and useful particularly when contemplating significant punitive action such as prosecution.

Matters for consideration in whether and how to act include:

- The extent to which acting is possible based on the evidence
- The extent to which taking further action serves the public interest
- Seriousness of the breach
- the harm or potential harm resulting from the non-compliance and any aggravating or mitigating elements
- overall considerations related to the regulatory system itself, including fair and reasonable interpretation of the law, precedent etc.

The basis for decision making can be codified in an enforcement policy to ensure consistency.

9.0 Implementing Phase 3

9.1 Education and engagement (including capability building)

Communications with regulated parties and the wider community becomes more complex once statutory instruments are in place and parties are bound to certain obligations.

See **Guideline 3** for further details on:

- Communication with duty holders and affected parties in respect of obligations around collection, drop off, processing etc.
- Training and recruitment of suitably qualified persons for practical roles in collection and dismantling

See **Guideline 2** for details on:

- Communication with the public and consumers on correct handling of e-waste at end of life

9.2 Policy development (including licensing system, ARFD)

Developing the policy to support improved waste management should anticipate amendment and improvements over time, including the development of specialised interventions including:

- Licensing of regulated parties
- The development of product stewardship schemes

Future proofing the legislative framework avoids lengthy repeat consultation in a few short years as practice improves and opportunities for other markets or techniques comes to light. Undertaking a thorough review of horizon options is important during consultation and system design and making provision for a dynamic set of requirements is useful (e.g. broad regulation making powers).

Further insights can be found here on this matter: https://library.sprep.org/content/waste-licensing-and-environmental-monitoring-policy-pacific-island-countries-and

9.3 Implement regulatory function/s (including stewardship and monitoring)

Developing a team and culture that supports the aim of the statutory framework enhances the chance for success, and being able to demonstrate effectiveness secures the reputation of the regulator. Regular evaluation enables this.

The experience of implementing the regulatory function provides critical feedback on the design and delivery of systems. Proactive regulatory stewardship enables learnings to be taken up in future amendments. All forms of monitoring (system effectiveness, compliance and agency effectiveness can feed into stewardship).

9.3.1 Ongoing development of regulatory function through monitoring and continuous improvement

An example of a commonly applied evaluation framework is the Modern Regulator Improvement Tool, developed by the Australasian Environmental Law Enforcement and Regulators Network (AELERT). The Modern Regulator Improvement Tool is a standardised evaluation framework targeted at environmental regulators. The tool measures regulatory maturity, dividing the key aspects of this across 12 indicators under four themes. The objectives of the framework are to:

- Identify organisational strengths and areas to improve
- Empowers organisations to build and own their maturity action plans
- Measures change over time to report movement and reward for effort
- Facilitates sharing and collaboration with peers in the AELERT network
- Build regulatory depth and resilience in organisations across Australasia

The MRIT framework recommends that regulators use findings of this assessment to inform a 'Maturity Action Plan' to seek to advance their practice up the levels. This helps support continuous improvement. (see more: https://aelert.net/mrit/).

Guideline 2

10.0 Overview

10.1 What is e-waste and what should be collected?

The e-waste groups considered in this Guideline are essentially all electrical and electronic equipment (EEE), both domestic (business to consumer, or B2C) and commercial (business to business, or B2B) that:

- Need an electric currents or electromagnetic field to work properly in terms of their primary function
- Are for generating, transferring and measuring these currents and fields
- Are designed for use with a voltage rating 1,000 volts or less for alternating current, and 1,500 volts or less for direct current
- Are not part of a very large fixed or industrial installation, or a vehicle (unless available as a separate product)
- Are not an implanted or infectious medical device

All e-waste is to be collected, both from citizens (members of the public) and businesses.

10.2 Who is the intended audience?

This document is intended to provide guidance for individuals and organisations involved in collection and pre-treatment of e-waste. This may include (but not limited to):

- Private companies
- Individuals
- Community and not for profit organisations
- Local government

That undertake the following types of activities in respect of e-waste:

- Receiving, via a drop-off or by collection
- Storage, consolidation, packing
- Transport / logistics
- Disassembly, refurbishment or repair
- Initial processing (i.e. pre-treatment of e-waste)
- Preparation for export

11.0 Environmental and health Issues

Electrical and electronic equipment (EEE) products are made from a wide range of valuable materials, including steel, aluminium, copper, silver, gold, platinum and rare minerals of various kinds, used in very tiny amounts (e.g. tantalum, indium) but which are still critical to EEE operation; such as circuit board and touch screen operation.

EEE also often contains small amounts of hazardous substances, including toxic heavy metals (e.g. mercury, lead) and other substances (e.g. brominated flame retardants [BFR] used on plastics) that are toxic to human health (carcinogens, mutagens etc.) and can lead to fatal or chronic health problems with long-term effects. There is also the risk of serious harm to the wider natural world (i.e. flora and fauna). Some substances used in EEE are so-called 'forever' chemicals (persistent organic pollutants or POPs), while others (e.g. refrigerants) are global warming and/or ozone depleting.

By burning e-waste in the open, toxic gases are released which can be extremely harmful to those that breath in the smoke. By landfilling e-waste, hazardous chemicals can be leached into the soils and the waters that all life relies on.

Managing e-waste responsibly protects humans, the environment, and keeps valuable and finite resources in circulation for as long as possible. When e-waste is reused and recycled responsibly, it is possible to:

- recover and reuse valuable and finite resources already in circulation;
- avoid further mining and carbon-intensive extraction of natural resources; and
- manage hazardous materials without negatively impacting human health or ecosystems.

Managing e-waste effectively is part of what is called the Circular Economy, that is far more sustainable than the historic 'linear' economy where we 'make, use and throw away' EEE as another disposable product. As well as material recycling, Circular Economy for e-waste involves direct reuse, repair and refurbishment (preparing for reuse) and remanufacture (utilising large parts of products to create a 'good as new' whole item).

SPREP implemented the "Stop the POPs" program in 2017 across the 14 Pacific Island Countries. The project is designed to address the incomplete coverage of issues relating to POPs in existing legislation and the low levels of monitoring and enforcement of existing laws.

12.0 Relevant legislation

Drafting Guidance:
In country legislation should be discussed in this section

13.0 Collection facilities

13.1 Network of collection facilities

Good practice for e-waste collection takes account of this and suggest that that the following types of collection arrangements be put in place.

Council collection

- Mobile e-waste local/regional collection, at scheduled intervals, for mixed e-waste excluding large appliances including refrigeration and air-conditioning equipment. This could be a transportable container, left at a site (e.g. a village or small town) for a short period, or a timed 'sweep' by a dedicated collection vehicle.

- Specific bulky waste collections, ordered by a household/s or community group (see below), for large appliances and TVs/monitors, in urban areas, ideally with collection from inside the property boundary.

- In this regard, refrigeration and air-conditioning equipment should not be left out in a public place, e.g. on the street, as this could lead to theft and/or the removal of copper from the cooling circuit, thereby releasing very harmful gases to atmosphere.

Retailer collection

- On delivery of a like-for-like item, particularly large domestic appliances and TVs/monitors, which need careful handling and management.

- In larger stores, for small electrical equipment (e.g. <10kg) sold in the store – with two collection containers at front-of store in a prominent position; one for mobile phones and batteries, and one for other small e-waste. A shelf or rack should be provided within a container for light bulbs and a collection tube for fluorescent light tubes / strips, so as to prevent then risk of breakages and release of hazardous substances.

Community based collection, within:

- Schools, offices, community centres, sports clubs etc. for small e-waste only (e.g. < 10kg). Ideally, two collection containers should be provided in a prominent position; one for mobile phones and batteries, and one for other small e-waste. A shelf or rack should be provided within a container for light bulbs and a collection tube for fluorescent light tubes / strips, so as to prevent then risk of breakages and release of hazardous substances.

Waste transfer and disposal sites (council or privately owned depots) – standalone or part of an existing facility (such as a landfill or scrap metal yard)

- All e-waste, brought by citizens and businesses. See Section 13.6 in regard to segregation and storage at larger waste facilities.

The specific sites and mobile arrangements that collect e-waste would ideally be permitted iin respect of hazardous waste, and in line with this Guideline.

Good practice is to give the collection sites a clear name that helps residents understand their function – for example, "E-waste Collection Facilities (ECF)" – and to have a list made publicly available on council and national web sites to inform the public, alongside other communications on e-waste (see below).

A potential future option is for this network to be set-up and funded under a product stewardship scheme (such as an Advanced Recycling Fee scheme). This could cover expansion and operational costs and to maximise access and could involve a mix of public and privately-run facilities; some through public-private partnerships (e.g. council depot with a private operator).

13.2 Accessibility of collections

Good practice would involve making the network accessible to all communities (urban and rural) and raising awareness amongst communities of the e-waste scheme and have reasonable opportunities to participate.

The static waste sites would ideally be open six or seven days per week, and open early evening and mornings to allow access to those that work during the day. Good practice should consider noise control if sites are close to sensitive noise receivers (e.g., hospitals and aged care facilities, etc.).

Free collection for citizens would be considered best practice to encourage participation, whilst an 'amnesty period' could be used initially for businesses to encourage clearance of stored 'legacy' waste.

13.3 Accepting used EEE (repair and refurbishment)

Good practice suggests that all items, regardless of their relative state of condition (but subject to size limitations noted above), should be accepted through the various collections, in order to encourage used EEE products and e-waste items be deposited for safe disposal or repair and refurbishment. Note that in terms of temperature control equipment, including, fridges, freezers and air-con units, under no circumstances should people be asked to de-gas these appliances, e.g. vent them to atmosphere, before drop off/collection. This will cause very harmful gases to be released and is counter to the Montreal Protocol (a legal treaty).

Where used EEE and e-wastes are deposited with retailers, or community-based collection points, the organisation in question would either be able to have the items collected by an e-waste operator (and receive any related funding if a product stewardship scheme exists), or sell any working items (potentially forgoing any funding from a product stewardship scheme).

Where possible, reusable items (directly or after repair or refurbishment) should be identified by a trained worker at the receiving collection facility. The decision over whether the item is reusable, or e-waste, should ideally be made by considering if:

- essential parts, such as wires or plugs, are missing;
- the item has been clearly damaged beyond economic repair, potentially making it unsafe;
- the item no longer works (when plugged in to a power source);
- there is no regular market for the equipment (such as very old computers).

The waste sites (ECF or MPF – see Section 17.0) should, if possible, provide facilities for professional repair and refurbishment on site, or be able to utilise pre-existing reuse initiatives or EEE repair expertise, aiming to prolong the life cycle of e-products in circulation, and reduce the generation of e-waste. As part of this, operations will increase the recovery of components (by cannibalisation of non-reparable EEE) for reuse and refurbishment.

Note that there are very strict controls around export of used EEE (and e-waste) which are set out in **Guideline 3**.

13.4 Contracts and funding

Operators of the ECFs, and related logistics, recycling, reuse and export operations (e.g. at MPFs – see Section 17.0), can be private, community or not for profit run or operated directly by local authorities/ councils.

Where operations are established through national or local government initiatives, it would be considered good practice to govern the arrangements through a formal contract, or other form of agreement. If an operation is part of a product stewardship scheme the contract would most likely be through the Product Stewardship Scheme Coordinator responsible for operating the collection network.

Good practice would require this agreement to:

- Allow the operator to receive funding through the chosen mechanism.
- Commit the provider to a minimum level of service. The following could be considered a minimum requirement under a Service Level Agreement:
    - the types and number of collection services to be operated in each region
    - what is to be collected (i.e. used EEE and categories of e-waste) at each site and how
    - the minimum quantities of e-waste of each category to be accommodated (i.e. capacity in volume and/or weight terms)
    - customer accessibility and satisfaction – including opening hours
    - responsibility and arrangements for:
        - safe handling and storage
        - reuse, repair and refurbishment
        - recycling, through approved routes including export (see Guideline 3)
        - the achievement of any targets
    - data reporting requirements on re-use and recycle, including via export
    - establishment and implementation of standard operating procedures that ensure a consistent standard of operation
    - staff training and equal opportunities in employment
    - establishment of fees and charges (where appropriate) and basis of payment

The agreement could also ideally provide provision for local approved re-use organisations to obtain reusable items (if they do not provide the collection service themselves).

Good practice is for ECFs and MPFs (see Section 17.0) to be allocated funding based on:

- fixed costs of set-up (and any amendments to that, e.g. costs incurred in expanding collection); and
- its day-to-day operating costs (including export costs), minus revenues from the sale of e-waste and/or its materials.

Operating a full e-waste collection site would, of course, require far more funding than required by a retailer merely handling e-waste for example.

Good practice also suggests that Key Performance Indicators (KPIs) be set, based on targets to maximise re-use and recycling of e-waste received (e.g. >85% recovery rates by weight), and to grow the quantities of e-waste collected. Rewards for meeting targets could be used to provide the incentive for contractors to achieve targets, while monies could be withheld where poor performance has been achieved.

If a deposit-refund system is used, then arrangements would have to be put in place, for at least some facilities (e.g. those not run by community groups), to return an equivalent amount to the deposit to the person providing the e-waste (not necessarily the purchaser) or make an equivalent donation to a designated charity. Appropriate means of payment would need to be used for the audience and to help prevent fraud. This might involve vouchers for certain retail outlets for example or fintech payments / bank transfers.

13.5 Site security

E-waste is generally hazardous, and includes valuable materials, such as copper, steel, platinum, silver and gold, which makes theft both likely and more dangerous for those involved. Good practice therefore requires that static e-waste collection and storage sites have:

- appropriate high security fencing completely enclosing the site
- gates that are locked when the site is not open/supervised
- lighting and CCTV cameras/motion sensors that link to loudspeakers (that tells trespassers to leave the site)
- manned security for sites with significant security problems and ideally link with the local police to ensure a quick response if / when needed

Staff vetting and training in cash handling, along with fair remuneration (commensurate with the level of responsibility to process cash exchanges or managing stockpiles of e-waste recovered materials that might hold significant value compared to locally paid salaries) can aid in avoiding any improper behaviour (e.g. taking part in or assisting theft).

Good practice would also require theft of e-waste from ECFs to be legislated as a crime, with appropriate penalties, with clear signage (on fences and gates) warning any potential criminals against theft of e-waste and the potential dangers and penalties involved.

Mobile collection may experience security challenges, but potentially lockable containers can be used with an access code given to a community requesting a collection. As noted earlier, it is not advisable to include the collection of refrigeration and air-con equipment in such collections to avoid the risk of the removal of cooling circuits and de-gassing to atmosphere. Specific bulky waste collections to a property, or retailer collection of old appliances on delivery of a new appliance, are preferable.

13.6 Segregation and storage

Given the varied nature of e-waste, and the different handling and treatment requirements needed, best practice advises that it is segregated and stored as outlined below. In general, the ultimate aim of the containment method is to prevent pollution incidents, reduce health and safety risks, facilitate security, and not inhibit subsequent treatment.

Seven separate storage containers/areas are recommended for the larger ECFs that collect all categories, as described in Table 13-1.

Table 13-1. Suggested categories of WEEE for separate storage

E-product category	Category examples
Temperature exchange equipment	Fridges, freezers, air conditioning, heat pumps
Equipment containing screens with surface area larger than 100 cm^2	Screens, monitors, monitors, laptops, LCD photo frames, solar PV panels
Lamps	Incandescent bulbs, LEDs, fluorescent tubes
Large equipment with any dimension more than 50 cm	Washing machines, tumble dryers, dishwashers, stoves, large printers and copiers
Small equipment with no dimension more than 50 cm	Microwaves, vacuum cleaners, kettles, hairdryers, toasters, irons, clocks and watches, calculators, cameras
Small IT and telecommunication equipment	Mobile phones, GPS, routers, personal computers, printers, telephones
Batteries	Single-use and rechargeable

Category 8 can be considered as Reusable and Reparable Items. Segregation and storage requirements by category can be summarised by category as:

1. **Temperature exchange equipment.** Separate from other e-waste and store in a water-tight container (e.g. ISO shipping container) or building that is locked when the site is not open to the public. These items have to be de-gassed by a trained operative and should not have their compressor and pipework damaged or detached until this is done. See Section 17.0.

2. **TVs/monitors/PV panels.** Separate from other e-waste and store in a water-tight container (e.g. ISO shipping container) or building that is locked when the site is not open to the public. CRT TVS and monitors should also be kept separate from flat-panel units (e.g. LCD, OLED and QLED) as they require separate treatment, as should PV panels.

3. **Light bulbs/tubes.** Separate from other e-waste and store in a water-tight container or building that is locked when the site is not open to the public. The container should have racking/shelving etc. that allows light bulbs and tubes to be placed on them, rather than dropped into a container, to prevent the items smashing and releasing harmful substances.

4. **Large equipment (e.g. white goods, lawn mowers).** Separate from scrap metal, on an impermeable surface with a small containment bund around it, and treated as e-waste (does not need to be kept in a container).

5. **Small equipment (small mixed e-waste).** Keep separate but can be left in open skips and containers, on an impermeable surface with a small containment bund around it.

6. **Batteries.** These, in particular Li-Ion batteries, should be removed by citizens where possible from e-waste brought to site (e.g. when part of cordless device with a rechargeable or removable battery) and be stored in a watertight and fireproof container. Batteries should be discharged (in accordance with manufacturer's instructions) and terminals insulated to prevent discharge during

storage. Lead-acid and other vehicle-type batteries should be kept separately from other batteries, and kept upright in a waterproof container to prevent any leakage of acid from the battery.

7. **ICT Equipment.** Digital data devices (such as laptops and mobile phones) should be kept securely in a cabinet that is locked at all times with limited access for only senior / trusted site operational staff. Data devices should be sent for data-wiping by a certified provider where feasible.

8. **Reusable items.** Kept separate from other e-waste and stored in a water-tight container or building that is locked when the site is not open to the public.

Rules pertaining to hazardous waste would ideally be met for all categories. The World Bank, in its Group Environmental Health and Safety (EHS) Guidelines and related e-waste documents, suggests the following for hazardous e-waste management in particular:

- Storing waste to prevent the commingling or contact between incompatible e-waste and by thorough inspection between containers to monitor leaks or spills. Examples include sufficient space between incompatible wastes or physical separation such as walls or curbs;
- Storing waste in closed containers (some could be radioactive proofed), away from direct sunlight, wind and rain;
- Utilising secondary containment systems constructed with materials appropriate for the e-waste being contained to prevent loss to the environment;
- Provision of readily available information on compatibility to employees, including labelling each container to identify its contents;
- Limiting access to hazardous e-waste storage areas to only employees who have received proper training;
- Clearly identifying (labelling) and demarcating the area, including documentation of its location on a facility map or site plan; and
- Conducting periodic inspections of e-waste storage areas and documenting the findings.

Note that re-use could involve segregation for off-site testing, repair/refurbishment and resale, or onsite testing, repair/refurbishment and resale. The latter could involve:

- The site operator, which could set up and run a re-use/refurbishment facility/shop, providing required testing and resale activity.
- A re-use or repair organisation (ideally under contract) which has its own staff on the site and manages the facilities separately to the main site operator.

14.0 Communication with e-waste disposers

14.1 Government and Local Government Communications

Current awareness of what e-waste is, its hazards, and how to handle and manage it, is poor and so there is a need to educate a wide range of stakeholders, from the general public through to the waste industry and Government officials. National communication 'campaigns', local communications, social media, government websites etc. can all be used. Information should ideally be in both English and in key local languages, at least online. The communications would ideally be run through agencies that understand the languages and cultures.

The following elements would ideally be included as a minimum in such communications:

- where they can deposit e-waste, including pick-up and drop-off services
- eligible items and what is not allowed
- collection facility opening times and any access restrictions
- If drop-off facilities or mobile collections will be taking place in communities
- the potential to recover any deposit paid through certain types of ECFs

Good practice would require retail outlets that sell EEE to provide the buyer with clear information on how to correctly handle e-waste at end of life, including notifying the buyer of information on collection systems/drop off points. If a product stewardship scheme is in operation, notification of the availability of this scheme and how it works could also be provided at the point of sale. Guideline 1 discusses the need for communication (section "Implementing Phase 3").

In all wider (e.g. web-based) communications, the public would also ideally be informed of the benefits of recycling e-waste and the hazards associated with handling certain e-waste and of not disposing of e-waste correctly. In particular, they should be informed of the need to handle light bulbs/tubes, TVs and monitors, and refrigeration and air-conditioning equipment carefully so as not to break them, as this can lead to the release of hazardous substances. Under no circumstances should people be asked to de-gas refrigeration and air-conditioning appliances, e.g. vent them to atmosphere, before drop off/collection. This will cause very harmful gases to be released and is counter to the Montreal Protocol (a legal treaty). They should therefore be informed not to vent or attempt to de-gas.

Householders and businesses can also be given guidance on what not to include in e-waste collections, for example:

- Gas cylinders and cartridges (e.g. for barbeques)
- Petrol cannisters and tanks (e.g. chain saws and for lawn mowers)
- Cooking oil and food (e.g. in fridges and fryers)

They should also be informed of any re-use initiatives, and where and how these can be accessed.

Furthermore, all laptops, tablets, phones and other digital data devices should ideally go to a data wiping service agent, regardless of how they are acquired, to prevent fraud and identity theft. If digital data devices are donated for reuse, and the receiving organisation does not offer secure data removal, donors need to be made aware that it is their responsibility to ensure their data is removed before they donate.

14.2 Pick-Up from Households

For retailers delivering electrical products and taking back e-waste, and potentially councils (or their contractors) collecting electrical equipment, householders ought to be able to have access, via local and national Government websites, to contact e-mails and phone numbers to call, to notify:

- the need for the pick-up of e-waste;
- the nature of the item being collected; and
- whether it might be suitable for reuse (i.e. is in good order and is working).

Good practice would also require that householders are notified to label re-usable items prior to collection, and that collection crews are trained and notified to handle potentially reusable items with care to avoid damage (e.g. keep them safely stored and protected from rain). Where possible, local re-use organisations would ideally collect items directly, rather than obtain these items from retailers or councils.

14.3 Drop-Off at Sites

In both retail and other drop-off sites (e.g. waste transfer stations) it is important to have customer signage that ensures proper segregation in line with the best practice noted in the section above. Providing in English as well as in the local languages, directly or via a QR code, increases accessibility.

Clear and simple signage posted in prominent places can guide the public and describe what e-waste can be placed where and provide instructions on correct disposal to reduce contamination (mixed waste). In terms of vehicle drop-offs, position signs so that they can be seen by incoming traffic and not obscured, e.g. by containers or vehicles.

On metal containers, magnetic signs can be good as they are easy to remove and place onto the new empty container. Recognisable pictures can also be used to help those with reading difficulties and for non-English speakers. It is also considered good practice to link to national communication campaigns to increase recognition by the public.

At waste sites, good practice would require that staff are available to ‘meet and greet’ those dropping off waste, to triage for reuse, repair and refurbishment (where available), to guide to the correct e-waste area/container, to advise and help with the handling of e-waste (particularly heavy and potentially hazardous items such as large appliances, TVs and light bulbs/tubes), and to encourage and help with the removal of batteries where practical.

The container used, site layout etc. may determine whether the public is able to have direct access or only be allowed to drop the load for site staff to deposit in the relevant container. It is also good practice to house the e-waste containers next to the other hazardous waste materials, for example, a clearly marked gas cylinder container.

15.0 Handling of e-waste (including health and safety)

E-waste needs to be handled carefully to avoid damage (which could prevent reuse and repair) and because most e-waste has hazardous components or chemical treatments. Large domestic appliances can also be very heavy and awkward to move. The key risks when handling e-waste are:

- Muscular skeletal injuries, trips and falls
- Exposure to toxic chemicals
- Fume and dust inhalation
- Fires and explosions

Please Note: Advice on health and safety is provided here for information only. Organisations handling e-waste are strongly advised to undertake a full health and safety assessment of specific risks and appropriate control measures and to implement suitable systems that comply with all legal standards.

The World Bank Group Environmental, Health, and Safety (EHS) Guidelines focus on preventing waste in the first instance, and promoting good practice otherwise (e.g., recycling and reuse). Several key aspects of an effective e-waste management system are identified by the guidelines including:

- Segregation of hazardous waste
- Appropriate storage of hazardous components of e-waste, including labelling
- Record keeping supporting tracking of waste through collection, storage and shipping

It would be good practice for all ECFs, irrespective of size or whether community based or commercial, to ensure that there is compliance with all relevant health and safety and environmental legislation, and that good practice guidelines, such as the World Bank EHS Guidelines, are followed. Clear and rigorous health and safety training and compliance procedures around the following topics would ideally be set up, as a minimum:

- Manual handling of heavy and large items (note that a washing machine or large fridge freezer can be 70kg or more), plus trip hazards such as cables;
- Hazardous substances; as set out in Table 15-1

Table 15-1. Categories of WEEE and associated hazards

E-product category	Typical hazards
Temperature exchange equipment	HCFCs and F-gases (in cooling circuits and insulation foams) that need to be extracted (de-gassed) before recycling, and other oils and coolants that can be toxic
Equipment containing screens with surface area larger than 100 cm2	Cathode-ray tubes (CRT) contain leaded glass, LCD panels can contain mercury vapour, LED and newer screens can contain heavy metals and flame retardants. There is also a general risk from broken glass (e.g. imploding CRT tubes) and dust inhalation
Lamps	Fluorescent lighting equipment contains mercury, LED light bulbs can contain lead and arsenic, plus there is a general risk from broken glass and dust inhalation

E-product category	Typical hazards
Large equipment with any dimension more than 50 cm	hexavalent chrome-plated surfaces, printed circuit boards with heavy metals, and flame-retardant plastics.
Small equipment with no dimension more than 50 cm	printed circuit boards with heavy metals, and flame-retardant plastics. Some items can contain radioactive substances such as ionisation smoke alarms
Small IT and telecommunication equipment	printed circuit boards with heavy metals, and flame-retardant plastics
Batteries	heavy metals such as lead and cadmium, and lithium-ion batteries, which can set on fire and explode if handled carelessly

Particular care needs to be taken with items like screens (e.g. TVs), temperature control equipment (e.g. fridges, freezers and air-conditioning equipment), light bulbs/globes and strips, and batteries; all of which can leak very hazardous substances (such as mercury and lead) that can be extremely harmful to the operator and/or the wider environment.

The equipment to treat these items comprehensively and safely is unlikely to be available, and as such most will most likely need to be exported whole, and hence will need to be carefully handled so as to not cause damage and unintended releases of fugitive gases and other pollutants, or (in the case of some batteries), fires.

In terms of fridges, freezers and air-conditioning equipment, the risk of damage to the cooling circuit during transport is significant and these items should, where possible, be de-gassed prior to export. See Section 17.0 for further information.

In addition, training of site staff to remove contamination (i.e. incorrect items mixed in with another category) from e-waste containers, where safe to do so, is good practice.

Safe handling of e-waste is not just about Personal Protective Equipment (PPE), but rather care in assessing and reducing risks; ideally avoiding them altogether. It is recommended that this be done through the preparation and proper use of Safe Work Method Statements (SWMS) which:

- anticipate and proactively address risks or hazards, i.e. are risk assessments and mitigation frameworks
- are designed before the work activity takes place – considering all known risks
- are not set and forget – they can be regularly reviewed and updated

Required site and collection PPE is likely to include some or all the following, depending on the task in hand:

- Hi-visibility jackets and/or sleeveless tabards
- Safety goggles
- Heavy duty ‘ballistic’ gloves, trousers and jackets (to resist penetration from broken glass and sharp metal edges etc.)
- Toe-cap protection shoes/boots with high-grip soles (for heavier items)
- Masks and respirators to prevent dust and particle inhalation
- Helmets (where there is a risk of items falling from height)

Mechanical aids, such as forklift trucks, hand trolleys and pallet lifts can all help to reduce the risk of manual handling injury for heavier loads (e.g. over 10kg).

16.0 Logistics

Container loads will need to be prepared and shipped off site (from an ECF to a Material Processing Facility (see next section), or to an exporter) by the site operator or by a third-party haulier. This can be done on a regular pick-up basis (e.g. every Tuesday if the quantities justify that) or ordered as and when necessary, e.g. when the relevant containers are around 75% capacity. Generally, the haulier is contacted in advance of the container being full, as normally it may take a few days for the haulage contractor to coordinate the exchange of the full container for an empty shipping container as often space is at a premium and exchanging shipping containers minimises haulage costs. Good practice would involve making haulage contractors aware of times to avoid the site, e.g. busy times for drop offs and other site movements.

Good practice is for a site to carry out a booking procedure for uplifts, with a booking reference number recorded in a digital site log-book (or a paper-based one otherwise), and to use a 'transfer' or 'consignment' note (a copy being kept by both the site and waste carrier). Ideally when preparing for shipment, the following would be recorded:

- Name and identification number of the material(s) composing the e-waste
- Quantity (e.g., kilograms or litres, number of containers)
- Waste shipment tracking documentation to include, quantity and type, date despatched, date transported, and date received, record of the originator, the receiver, and the transporter
- Method and date of storing, repacking, treating, or disposing at the facility, cross-referenced to specific manifest document numbers applicable to the e-waste
- Location of each e-waste within the facility, and the quantity at each location

It would be good practice for this to be 'signed-off' by a suitably senior staff member, the 'transfer' or 'consignment' notes kept electronically, and any relevant waste carrier permits/authorisations checked on each occasion that a load is taken off site.

Ideally, loads would be recorded and categorised as per the segregation noted earlier in this document, and weighed on a weighbridge as they leave the site. If not possible, a note can be made of the composition of the load, and an estimate made of the load volume and approximate weight (using defined load weight factors per waste item type and container volume – see Appendix X). This will assist physical load tracking (e.g. through to export) and also allow checks to be made on progress, e.g. in terms of theoretical reuse and recycling rates.

United Nations Recommendations on the Transport of Dangerous Goods and Model Regulations sets our guidance that can be followed for the packaging and marking of containers, in accordance with any relevant hazard categories of the load, noting that most e-waste will be hazardous.[1]

[1] https://unece.org/transport/dangerous-goods/un-model-regulations-rev-23

17.0 Pre-treatment at Material Processing Facilities

Whilst most treatment of e-waste is likely to be done outside of the PICs, some bulking/consolidation is likely to be required, moving e-waste from smaller ECFs to Material Processing Facilities (MPFs - which could also be based at larger ECFs), and minor pre-treatments. As with ECFs, where operations are established through national or local government initiatives, it would be considered good practice to govern the arrangements through a formal contract, or other form of agreement (see Section 13.4).

The Material Processing Facility (MPF) functions could include:

- Collecting items from a ECF, arranging the logistics;
- Bulking up and consolidation of loads from ECFs (especially smaller ECFs);
- Authorising ECF operating payments;
- Minor processing of e-waste for:
    - reuse, if necessary through repair and refurbishment; and/or
    - recycling or for export.
- Packing and delivery of processed e-wastes/materials to exporters / end-markets.

Minor processing for recycling could take the following forms:

- Disassembly (particularly of larger items that are bulky, largely non-hazardous, and quite easy to take apart, such as washing machines) to help:
    - reduce the bulk of e-waste for export;
    - maximise the yield of key components (e.g. for reuse);
    - increase material values (as cleaner single material streams); and
    - segregate hazardous elements (see Guideline 3 for further information).
- Repair, refurbishment and portable appliance testing (PAT), if reuse and resale is to occur. This should be undertaken to the Institution of Engineering and Technology (IET) *Code of Practice for In-Service Inspection and Testing of Electrical Equipment*.[2]

Disassembly is best done manually (rather than through fragmentation or shredding), to carefully access whole components within e-waste and so improve the yield of the more valuable items and segregate hazardous from non-hazardous materials. This is very important since export of hazardous and whole e-waste is subject to strict controls under the Basel and Waigani Conventions while pure materials such as steel and aluminium can be exported without restriction. Details around this can be found in **Guideline 3**.

Shredding or fragmentation (automated or otherwise) should be avoided since this can lead to the release of hazardous substances (which can be very harmful to the operator and/or wider environment). Temperature control equipment and heavy metal containing items need particular care as noted in the box below. The capture of the released pollutants should be comprehensive, and the equipment is specialised and expensive. Such items will need to be properly protected, handled and exported whole and undamaged and in line with the requirements of the Minamata convention on mercury, as well as the wider Basel and Waigani Conventions on hazardous waste in general (see **Guideline 3**).

[2] https://www.theiet.org/publishing/iet-codes-and-guidance

Managing temperature control equipment

With temperature control equipment (e.g. refrigeration and air-con), good practice would see it be protected against damage of the cooling circuit and compressor prior to de-gassing, i.e. at the ECF or MPF and in transit. De-gassing of the cooling system, to a collection cylinder or tank, should be undertaken as a minimum (at the ECF or MPF) unless there is a low-risk option to send whole appliances for complete de-gassing offshore (i.e. including the insulation foams), and the appliances can be properly protected from damage in transit. De-gassing of the cooling circuit and compressor should only be undertaken by a technician who has the training and skills to minimise the emission of these refrigerants to atmosphere (e.g. a refrigeration mechanic / technician with appropriate qualifications).

Collected gases, in closed cylinders, should be exported for recovery and reuse or thermal destruction (under relevant approvals, and with relevant labelling – see Guideline 3). Example companies in Australia providing this service include A-Gas[3], while other useful contacts can be found through Refrigerant Reclaim Australia (RRA)[4], the product stewardship organisation for the Australian refrigerants industry. The remainder of the appliance should ideally be sent for further treatment to also capture the gases in the insulation foams, which also contain damaging ozone depleting and global warming gases. This would mean that the appliance should not just be included with other scrap metal, which will be shredded, harmfully releasing the insulation foam gases to atmosphere.

Managing CRTs and heavy metal containing equipment

CRTs (old style TVS and monitors) contain leaded funnel glass and phosphor-coated screen glass, while many items (e.g. flat screen TVs/monitors, light bulbs/globes etc.) contain small amounts of mercury. Consequently, these items need to be dealt with through enclosed and filtered systems, ideally under negative pressure. These machines, often involving robotics, allow operators to work remotely, for example to separate screen glass from funnel glass, and to remove and collect mercury powder and vapour, without being exposed to the hazardous substances being released inside. Leaded CRT glass is difficult to recycle, with very limited options, although mercury can be refined to allow its reuse (e.g. in dentistry tooth fillings) or it can be otherwise thermally treated to stabilise it and make it non-toxic for disposal. Various overseas companies have expertise in handling these items, including eco-cycle[5] and Veolia[6] in Australia.

The following materials are key targets for disassembly, to remove hazardous and higher value materials and components:

- batteries (particularly lithium ion and heavy-metal containing chemistries)
- printed circuit boards of mobile/cell phones and those >10 square centimetres
- screens > 100 square centimetres
- polychlorinated biphenyls (PCB) containing capacitors and electrolyte capacitors containing substances of concern
- heavy-metal (notably mercury, lead, cadmium, arsenic) containing items, e.g. gas discharge lamps, TV/monitor backlights, cathode ray tubes and mercury switches
- toner cartridges, liquid and paste, as well as colour toner

[3] https://www.agas.com/au/sustainability/
[4] https://refrigerantreclaim.com.au/
[5] https://ecocycle.com.au/
[6] www.anz.veolia.com/services/recycling-waste-services/hazardous-waste

- plastic containing brominated flame retardants (where known, by testing or suspected)
- components containing radioactive substances
- asbestos waste and components which contain asbestos
- components containing refractory ceramic fibres
- external and internal copper cables

All disassembly and other minor processing would ideally be carried out by trained operatives, with appropriate health and safety training. It is worth noting that manual processing, as well as repair and refurbishment, can offer opportunities to provide training and employment opportunities for disadvantaged groups.

The items, once removed, can be bulked-up in containers for onward transport, and safely stored (i.e. in weatherproof containers, on impermeable bases, secure from theft - e.g. in locked containers or rooms, with controlled access).

As with all logistics and transfers of e-waste, a system of 'transfer / consignment notes' can be used; to the MPF from the ECF, and from the MPF; to carefully track quantities of e-waste by type and to reduce the risk of fraudulent activities. Checking of weights and item numbers before and after transfer will allow records to be kept and cross checking made between facilities.

18.0 Reporting and monitoring of operations

Regular reporting of scheme operations, including those of the ECFs, MPFs and exporters, ensures that accurate and consistent information is captured. This in turn allows/provides:

- transparency in terms of scheme operations
- Local authorities to monitor scheme progress, e.g. against set targets and KPIs, and prosecute non-compliance more widely
- reassurances to citizens in terms of the effectiveness of using the scheme
- reassurances to importers of e-waste to be treated in their territory

It is therefore recommended that all parties in the e-waste scheme, report on the following annually:

- Quantities of e-waste (ideally number of items by type, and weight (measured or estimated otherwise):
    - collected at ECFs
    - treated at MPFs
    - sent for reuse and recycling
    - sent for reuse and recycling via export
    - overall reuse and material recycling rates, post any residual wastes from the above operations
- Compliance in terms of any relevant legislation and operational guidance, including this Guideline
- Financial information including capital and operational costs, ARF funding, and deposit returns

19.0 Training

Training would ideally be given to all operational staff in the e-waste management system, as well as community organisations, and relevant national and local government staff. This would ideally be carried out on induction and annually as part of refresher training, including training on all aspects of this Guideline, with a focus on:

- E-waste categories and hazards
- Legislation and related obligations
- Collection systems
- Communications with the public and businesses
- E-waste segregation and storage, including security and labelling
- E-waste handling, health and safety
- Logistics
- Financial management, including deposit returns
- Data gathering and reporting

Good practice for recruitment of staff would also involve taking consideration of the factors above in terms of whether new staff are considered 'fit and proper' to conduct operative and management roles. Examples of comprehensive training materials and related qualifications can be found via the UK organisation CIWM in relation to WAMITAB qualifications[7] - employer-led qualifications for people working in the waste management and recycling industries. The degree to which training will be required for staff (existing and newly recruited) will depend on their existing level of competency, i.e. relevant knowledge and skills. In good practice terms, this can be assessed against a competency framework as set out below.

Competency Assessment Framework				
0	**1**	**2**	**3**	**4**
0-1 / 10	**2-3 / 10**	**4-5 / 10**	**6-8 / 10**	**9-10 / 10**
No exposure to competency	Requires competency training / retraining	Demonstrates basic understanding of relevant competencies with some gaps	Demonstrates good understanding of relevant competencies	Demonstrates detailed experience of relevant competencies
No relevant knowledge / capability	**Limited relevant knowledge / capability**	**Some relevant knowledge / capability**	**Good relevant knowledge / capability**	**Detailed relevant knowledge / capability**
Requires focused instructor attention and retraining			**Proceed to instructor debrief**	

[7] https://ciwmquals.co.uk/qualification-sectors/

Guideline 3

20.0 Overview

20.1 Outline of Guideline 3

This guideline is in support of the operationalisation of the E-waste Strategy and concerns overseas markets for e-waste, and related export controls. Two further guidelines concern the Collection and Pre-Treatment of e-waste, and the role of Government, both national and local, in the operation of an e-waste product stewardship scheme.

The Guideline is not mandatory, however its use is strongly recommended as it links to legally binding conventions including the Basel and Waigani Conventions. As a good practice guidance, it focuses mainly on the more stringent controls and agreements set out under Basel.

While this document summarises most of the requirements under these conventions, it is not intended to replace regulations, and full regulatory technical guidance which should be understood before exporting e-waste.

These guidelines cover all e-waste collected, both from residences and businesses. The e-waste groups considered in this Guideline are essentially all electrical and electronic equipment (EEE), both domestic (business to consumer, or B2C) and commercial (business to business, or B2B) that:

- Need an electric currents or electromagnetic field to work properly in terms of their primary function
- Are for generating, transferring and measuring these currents and fields
- Are designed for use with a voltage rating 1,000 volts or less for alternating current, and 1,500 volts or less for direct current
- Are not part of a very large fixed or industrial installation, or a vehicle (unless available as a separate product)
- Are not an implanted or infectious medical device

The key audiences for this Guideline are:

- any individuals or organisations involved any aspect of the export of e-waste,
- the local agency responsible for management and enforcement of e-waste regulations; and
- other relevant government officials, e.g. customs officials checking exported loads.

21.0 Environmental and Health Issues

21.1 Overview

Electrical and electronic equipment (EEE) products are made from a wide range of valuable materials, including steel, aluminium, copper, silver, gold, platinum and rare minerals of various kinds, used in very tiny amounts (e.g. tantalum, indium) but which are still critical to EEE operation; such as circuit board and touch screen operation.

EEE also often contains small amounts of hazardous substances, including toxic heavy metals (e.g. cadmium, mercury, lead) and other substances (e.g. brominated flame retardants used on plastics) that are toxic to human health (carcinogens, mutagens etc.) and can lead to fatal or chronic health problems with long-term effects. There is also the risk of serious harm to the wider natural world (i.e. flora and fauna). Some substances used in EEE are so-called 'forever' chemicals (POPs (persistent organic pollutants)), while others (e.g. refrigerants) are global warming or ozone depleting.

A 2015 UNEP study showed that 60% to 90% of e-waste was illegally traded or dumped and treated inappropriately[8]. More recent studies show that the situation remains very serious[9]. By burning e-waste in the open, toxic gases are released which can be extremely harmful to those that breath in the smoke, while other hazardous materials can get into soils and water courses. By landfilling e-waste, hazardous chemicals can be leached into the soils and surrounding waters.

Managing e-waste responsibly protects humans, the environment, and keeps valuable and finite resources in circulation for as long as possible. When e-waste is reused and recycled responsibly, it is possible to:

- recover and reuse valuable and finite resources already in circulation,
- avoid further mining and carbon-intensive extraction of natural resources, and
- manage hazardous materials without negatively impacting human health or ecosystems.

Managing e-waste effectively is part of what is called the Circular Economy, that is far more sustainable than the historic 'linear' economy where we 'make, use and throw away' EEE as another disposable product.

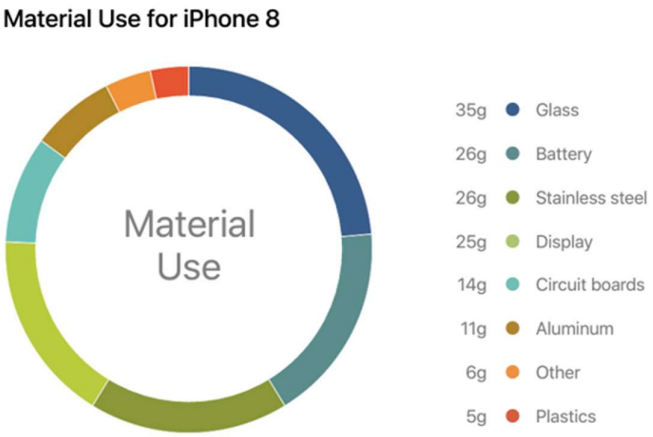
SPREP implemented the "Stop the POPs" program in 2017 across the 14 Pacific Island Countries.[10] The project is designed to address the incomplete coverage of issues relating to POPs in existing legislation and the low levels of monitoring and enforcement of existing laws. More information relating to POPs can be found on the SPREP website.

[8] Waste Crimes, Waste Risks: Gaps and Challenges In the Waste Sector. UNEP, 2015
[9] Burning old TVs to survive: The toxic trade in electrical waste. BBC News, 24 November 2024
[10] SPREP, September 2017, 'Stop the POPs' promoting clean air for Pacific people, https://www.sprep.org/news/stop-pops-promoting-clean-air-pacific-people

21.2 Hazardous materials in e-waste

Electrical and electronic equipment (EEE, as defined in Section 20.1), and therefore e-waste, includes a wide variety of materials; a composition for an iPhone is shown below, depicting the range of its composition.

Table 21-1. Material composition of iPhone 8[11]



While small as a percentage of the weight, hazardous substances are found in most e-waste, notably in the display, the circuit boards, the battery, and often the plastics used. These hazardous substances vary by EEE product group, and by product generation and type within a product group. To give one example, older televisions used Cathode Ray Tubes (CRTs), which contain a rear, lead (Pb) coated 'funnel' section, a screen containing phosphorus-based fluorescent coatings, and other components containing heavy metals including cadmium.

More modern 'flat-panel' liquid crystal display (LCD) TVs and monitors use backlights that often use Cold Cathode Fluorescent Lamps (CCFL), containing very small amounts of mercury which is released as a vapour if a backlight tube is broken. LED backlight LCD TVs and OLED TVs, where the screen pixels generate their own light, don't have these CCFL tubes, but can still contain small amounts of heavy metals, and (like most EEE) flame retardant plastics if an electrical fault causes a fire.

Key hazardous substances by EEE product group are set out in Table 21-2.

Table 21-2. Categories of WEEE and associated hazards

E-product category	Typical hazards
Temperature exchange equipment	HCFCs and F-gases (in cooling circuits and insulation foams) that need to be extracted before recycling, and other oils and coolants that can be toxic
Equipment containing screens with surface area larger than 100 cm2	Cathode-ray tubes (CRT) contain leaded glass, LCD panels can contain mercury vapour, LED and newer screens can contain heavy metals and flame retardants. There is also a general risk from broken glass and dust inhalation

[11] Apple, September 2017, iPhone 8 Environmental Report

E-product category	Typical hazards
Lamps	Fluorescent lighting equipment contains mercury, LED light bulbs can contain lead and arsenic, plus there is a general risk from broken glass and dust inhalation
Large equipment with any dimension more than 50 cm	Hexavalent chrome-plated surfaces, printed circuit boards with heavy metals, and flame-retardant plastics.
Small equipment with no dimension more than 50 cm	Printed circuit boards with heavy metals, and flame-retardant plastics. Some items can contain radioactive substances such as ionisation smoke alarms
Small IT and telecommunication equipment	Printed circuit boards with heavy metals, and flame-retardant plastics
Batteries	Heavy metals such as cadmium, and lithium-ion batteries, which can set on fire and explode if handled carelessly

It is important to note that even the export of most mixed plastic waste, from the disassembly or shredding of e-waste for example, is now controlled under the Basel Convention procedures.

21.3 Stockpiling

Currently, a significant amount of e-waste is stockpiled on Pacific islands, awaiting further handling and treatment.[12] Efforts to deal with these stockpiles face hurdles such as economic and logistical challenges, limited access to disposal points and recycling markets, and the high cost of transporting e-waste out of the region. To give an example of a problematic material, Cathode Ray Tubes (CRTs) and CRT glass were once easily recycled into new CRTs. However, the demand for new CRTs has collapsed in favour of new flat panel technologies. Because of rising costs, negative economic incentives and shifts in CRT glass markets, some CRT processors and recyclers are choosing to store the glass indefinitely rather than send it for recycling or disposal, which increases the risk of mismanagement and/or abandonment of CRTs.

Product stewardship schemes, such as the proposed Advance Recovery Fee & Deposit (ARFD) scheme, offer the means to fund proper collection and recycling, or at least safe and appropriate disposal, overseas. It is also worth noting that the Moana Taka Partnership provides reduced cost shipping of eligible 'non-commercial' wastes, including those that may have been stock-piled, including e-wastes.

The Moana Taka Partnership

The Moana Taka Partnership (MTP) is a partnership between The China Navigation Company Ltd. / Swire Shipping Agencies, and SPREP, to provide free container hire and free shipment of eligible 'non-commercial waste' (including e-waste) between Swire Shipping serviced ports. "Non-Commercial" waste cargoes are those that without the assistance of the MTP, would not have been shipped as the cost of container hire and shipping would be close to or greater than the value of the cargo*. E-waste is generally an eligible cargo. Note, however, that if a waste cargo has been shipped for profit in the prior two years it is regarded as "commercial" for the purpose of determining MTP eligibility. See the MTP guide noted above for further information.[13]

[12] ITU and UNITAR, November 2024, Global E-waste Monitor 2024, https://ewastemonitor.info/wp-content/uploads/2024/12/GEM_2024_EN_11_NOV-web.pdf
[13] https://library.sprep.org/content/moana-taka-partnership-guide-pacific-island-countries-and-territories

22.0 Relevant legislation

22.1 Overview

Drafting Guidance:
In country legislation should be discussed in this section

- The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal; and
- The Convention to Ban the Importation into Forum Island Countries of Hazardous and Radioactive Wastes and to Control the Transboundary Movement and Management of Hazardous Wastes within the South Pacific Region (the Waigani Convention).

These conventions and their implications are discussed in detail below.

22.2 The Basel and Waigani Conventions

22.2.1 Basel Convention

The Basel Convention[14] dates to 1989 and was the first global agreement on transboundary (inter-country) control of hazardous wastes; a major aim being to prevent the dumping of hazardous waste from developed and industrialised (notably OECD and EU) countries on less developed countries without the means to treat that waste safely and effectively. Controls include notification, prior informed consent and movement tracking. This approach was seen as ineffective in some cases, and in 1994 a 'Ban Amendment' to the Basel Convention was agreed. This is a full export ban on all forms of hazardous wastes to developing countries (non-OECD and EU states under Annex VII of Basel), from OECD and EU countries, for reuse, recycling and other recovery operations as well as disposal. This came into force in 2019, and so far been ratified by 104 of the Parties to Basel.

In May 2019, an amendment of the Basel Convention was agreed to include plastic waste as regulated material. In 2022, the fifteenth meeting of the Conference of the Parties adopted amendments to Annexes II, VIII and IX to the Convention (which define what is and isn't deemed hazardous) by adding entries on electrical and electronic waste specifically, clarifying the situation around movement of e-wastes. The entries in the Electric and Electronic Waste Amendments to Annexes II, VIII and IX to the Convention became effective on 1 January 2025.

22.2.2 The Waigani Convention

The Waigani Convention[15], agreed in PNG and adopted in 1995, is modelled on the Basel Convention and constitutes the regional implementation of the international hazardous waste control regime. The main aim is to prevent the dumping of hazardous waste in the Pacific region where not already covered under Basel.

[14] UNEP, Basel Convention, Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, https://www.basel.int/TheConvention/Overview/TextoftheConvention/tabid/1275/Default.aspx

[15] Waigani Convention, The Convention to Ban the importation into Forum Island Countries of Hazardous and Radioactive Wastes and to Control the Transboundary Movement of Hazardous wastes within the South Pacific Region, https://www.sprep.org/att/publication/000129_Waigani_PDF.pdf

There are also some differences between the two conventions: the Waigani Convention also covers radioactive wastes; and its territorial coverage includes each Party's Exclusive Economic Zone (200 nautical miles) (rather than extending only to outer boundary of each Party's territorial sea (12 nautical miles) as under Basel). The Convention is also strongly related to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and other matters, 1972 (London Convention).

The key general requirements of the Basel Convention that are of significance in terms of exports are as follows:

- Ensure that the transboundary movement of hazardous wastes and other wastes is reduced to the minimum consistent with the environmentally sound and efficient management of such wastes, and is conducted in a manner which will protect human health and the environment against the adverse effects which may result from such movement;

- Not to allow the export of hazardous wastes or other wastes to a State or group of States belonging to an economic and/or political integration organisation that are Parties (to the Convention), particularly developing countries, which have prohibited by their legislation all imports, or if it has reason to believe that the wastes in question will not be managed in an environmentally sound manner.

The objective of the Waigani Convention is to reduce and eliminate transboundary movements of hazardous and radioactive waste, to minimise the production of hazardous and toxic wastes in the Pacific region, and to ensure that disposal of wastes in the Convention area is completed in an environmentally sound manner.

Parties' commitments to Waigani include:

- to take all appropriate measures to ban the import and export of hazardous waste to and from the Convention Area (Art. 4.1);
- to prohibit dumping of hazardous wastes and radioactive wastes in the Convention Area (4.2);
- to ensure that within the areas of their jurisdiction the generation of hazardous wastes is reduced (art.4.4); and
- to ensure availability of adequate treatment and disposal facilities for the environmentally sound management of hazardous wastes in the Convention Area (4.5).

A majority of e-waste is considered hazardous, and the Waigani Convention effectively bans the import of all hazardous and radioactive wastes into South Pacific Islands Forum countries that have agreed to the Waigani Convention, although it does allow Australia to receive hazardous wastes exported from Pacific Islands Forum countries that have agreed to the Waigani Convention. Consequently, most of the e-waste from PICs will need to be exported to outside the Waigani convention area, with the exception of Australia, and consequently the Basel Convention needs careful consideration in that it restricts what, where and how e-waste (and related hazardous plastic waste) can be exported. These key topics are addressed further below.

22.3 Other key legislation

Drafting Guidance:
Other In country legislation should be discussed in this section

23.0 General restrictions under Basel / Waigani

Under the Basel Convention, transboundary movements of hazardous wastes and 'other wastes' requiring 'special consideration' are permitted only if:

- Such wastes, if exported, are managed in an environmentally sound manner in the country of import or elsewhere; and
- One of the following conditions is met:
    - The country of export does not have the technical capacity and the necessary facilities, capacity or suitable disposal sites to dispose of the wastes in question in an environmentally sound and efficient manner; or
    - The wastes in question are required as a raw material for recycling or recovery industries in the country of import; or
    - The transboundary movement in question is in accordance with other criteria decided by the parties.

The Basel and Waigani Conventions have set up a very strict control system, based on the Prior Informed Consent (PIC) procedure of the notification of transboundary movement of hazardous wastes (or 'other wastes' subject to the Basel Convention). This means that transboundary movements of hazardous wastes (or other wastes subject to the Basel Convention) can take place only upon prior written approval of the Competent Authorities of the State of import and transit. Parties have adopted a '*notification document*' for this purpose. The waste shipment may occur only after the transit and receiving countries have given consent for the shipment.

Furthermore, each shipment of hazardous wastes (or other wastes subject to the Basel Convention) has to be accompanied by a '*movement document*' from the point at which a transboundary movement begins to the point of disposal, including countries through which the waste transits. All Parties have the sovereign right to prohibit or restrict transboundary movements of hazardous and/or other wastes and can impose additional requirements on such movements in their territory.

The relevant Waigani documents can be found at the links below (related to Pacific movements only, including Australia):

- Notification form
- Movement form
- Form for Confirmed Cases of Illegal Traffic

More widely, in terms of Basel controlled movements, the more up to date revised notification and movement documents, and instructions for completing these documents, can be found in UN document UNEP/CHW.15/INF/20.[16]

Best practice would see that the wastes are transported according to generally accepted and recognized packaging, labelling and transport international rules and standards, such as the United Nations Recommendations on the Transport of Dangerous Goods and Model Regulations.[17]

[16] UNEP, March 2022, Consequential implications of the review of Annex IV to the Convention, https://www.basel.int/Portals/4/download.aspx?d=UNEP-CHW.15-INF-20.English.pdf
[17] UN, 2019, Recommendations on the Transport of Dangerous Goods, Model Regulations, Volume I, Twenty-first revised edition, https://unece.org/fileadmin/DAM/trans/danger/publi/unrec/rev21/ST-SG-AC10-1r21e_Vol1_WEB.pdf

Annex II of the Basel Convention, on 'other wastes' requiring special consideration, can include mixed and non-hazardous e-waste, but these wastes still need trade controls to protect the environment and provide transparency due to the likelihood of improper management (e.g. informal recycling or dumping due to proper recycling being uneconomic). The default control procedure is still therefore PIC – i.e. Prior Informed Consent sought from the importing nation.[18]

24.0 Implications of the conventions

24.1 Overview

In terms export of used electrical equipment, there are two key factors:

- Is the used EEE actually waste, or is it intended for reuse?; and
- Is the e-waste hazardous, or still requiring 'special consideration' under Basel (i.e. problematic even if non-hazardous per se)?

If the answer to both questions is yes, then the e-waste can only be exported under the Basel restrictions (and Waigani restrictions if exporting to Australia), with varying levels of control.

It is also worth noting that, through disassembly and testing, the quantity of hazardous waste can often be reduced or isolated and export restrictions eased – e.g. by removing a hazardous printed circuit boards from metal assemblies which then become unambiguously non-hazardous, and without the need for export control. These matters are discussed further below.

24.2 Waste versus non-waste (reuse)

Reuse is the best outcome for used EEE, however if this involves export, great care needs to be taken to ensure that the item is genuinely going to be reused in that market, rather than become waste in that receiving market. The lack of clarity in defining when used equipment is not considered waste (for example it has been claimed to be donated for reuse) has led to several situations where such equipment was exported, in particular to developing countries, where, on arrival, a large percentage of shipments have been found to be waste rather than functioning equipment and have had to be taken back by the exporter or be disposed of in the country of import.[19]

The frequent presence of hazardous substances and components in this equipment / waste, and a shortage of adequate installations to treat these in an environmentally sound manner, have led to serious problems for human health and the environment in the countries receiving this e-waste. E-waste is often burnt in the open, or circuit boards placed in chemical baths, to recover the precious metals present, whilst allowing toxic emissions to air, land and water.[20]

UNEP provides technical guidance on how to determine if a used EEE item meets the definition of waste as defined by the Basel Convention.[21] This document notes that used equipment would be considered waste if:

[18] https://library.sprep.org/content/moana-taka-partnership-guide-pacific-island-countries-and-territories
[19] Basel Action Network, e-waste transparency project. https://www.ban.org/trash-transparency
[20] https://www.ellenmacarthurfoundation.org/circular-economy-in-africa-e-waste
[21] UNEP, March 2023, Technical guidelines on transboundary movements of electrical and electronic waste and used electrical and electronic equipment, in particular regarding the distinction between waste and non-waste under the Basel Convention, https://www.basel.int/Implementation/TechnicalMatters/DevelopmentofTechnicalGuidelines/TechnicalGuidelines/tabid/8025/Default.aspx

- The equipment is destined for disposal or recycling, instead of repair or reuse, or its fate is uncertain;
- The equipment is not complete - essential parts are missing and the equipment cannot perform its key functions;
- The equipment shows a defect that materially affects its functionality and fails relevant functionality tests;
- The equipment shows physical damage that impairs its functionality or safety, as defined in relevant standards, and cannot be repaired at a reasonable cost;
- The protection against damage during transport, loading and unloading operations is inappropriate, e.g., the packaging or stacking of the load is insufficient;
- The equipment is particularly worn or damaged in appearance and its appearance reduces its marketability;
- The equipment has among its constituent part(s) a hazardous component that contains hazardous substances to an extent that the equipment is required to be disposed of, is prohibited to be exported or is prohibited for use in such equipment under national legislation, specific multilateral environmental agreements and relevant international standards and guidelines;
- There is no regular market for the equipment to be reused, including where the equipment contains a cathode ray tube, except when there is a regular market for equipment for professional use containing a cathode ray tube;
- The equipment is destined for disassembly and cannibalization (to gain spare parts); or
- The price paid for the equipment is significantly lower than would be expected for fully functional equipment intended for reuse.

Equipment that can be considered used and intended for reuse (i.e. not waste) is as follows (paragraph numbers and Appendix numbers from the UNEP Technical Guidance 2023[22]):

- When it is not destined for any of the operations listed in Annex IV of the Basel Convention (recovery or disposal operations) and it is destined for direct reuse, or extended use by the original owner for the purpose for which it was originally intended, and the following is provided or is in place both prior to and during transport:
    - A copy of the invoice and contract relating to the sale and/or transfer of ownership of the used equipment, and documentation accompanying the equipment in accordance with paragraphs 34, 43 and appendix II;
    - Evidence of evaluation or testing[23] in the form of a copy of records (certificate of testing – proof of functionality) on every item within the shipment and a protocol containing all recorded information (see section III.C);
    - A declaration made by the person who arranges the transport of the equipment that none of the equipment within the shipment is defined as or is considered to be waste in any of the countries involved in the transport (countries of export and import and, if applicable, countries of transit);

[22] As above
[23] Testing of used equipment should be performed before shipment in the country of export.

- Each piece of equipment is individually protected against damage and to prevent hazards during transportation, loading and unloading, in particular through sufficient packaging and stacking of the load.

- When the person who arranges the transport of the used equipment claims that the equipment is destined for failure analysis (i.e. does it work), or for repair or refurbishment with the intention of reuse, or extended use by the original owner, for its originally intended purpose, provided that the criteria set out in the sub-paragraphs above and all of the following conditions are met:
    - Proper documentation accompanies the equipment (as per paragraph 34 and appendix III of the Technical Guidance[24]);
    - A valid contract exists between the person who arranges the transport and the legal representative of the facility where the equipment is to be repaired or refurbished or undergo failure analysis (i.e. does it work). The contract would ideally contain a minimum set of provisions, including the following:
        - The intention of the transboundary transport is failure analysis, repair or refurbishment;
        - Provisions to ensure that any residual hazardous waste and other wastes generated through the failure analysis, repair or refurbishment activities are managed in an environmentally sound manner, either in the country where the facility is located or in another country;

- A provision stating the responsibility of the person who arranges the transport to comply with applicable national legislation and international rules, standards and Basel Convention guidelines. Including the following provisions can ensure such compliance:
    - A provision allocating responsibility to specific persons throughout the whole process, from export until the equipment is either analysed or repaired or refurbished to be fully functional, including cases where the equipment is not accepted by a facility and has to be taken back;
    - A provision requiring the facility to provide the person who arranged the transport with a feedback report on the failure analysis, repair or refurbishment activities that were performed on the equipment and on the management of any residual hazardous waste and other wastes that may have been generated from such activities. If appropriate, the contract may include the possibility of a review of the feedback report by the person who arranged the transport, or by a third party.

This repair and refurbishment option is seen as a loophole by many countries and experts of the Convention, in that it is hard (for those exporting and regulatory compliance bodies) to establish if repair and refurbishment will actually take place in reality, even if the correct documentation is in place; this option would therefore ideally not be used.

24.3 Export of EEE destined for direct reuse

When preparing the transboundary transport of used equipment destined for direct reuse, rather than of electrical and electronic waste, good practice would involve the person who arranges for the transport taking the following steps:

[24] UNEP, March 2023, Technical guidelines on transboundary movements of electrical and electronic waste and used electrical and electronic equipment, in particular regarding the distinction between waste and non-waste under the Basel Convention

Step 1: evaluation and testing

- The tests to be conducted depend on the kind of equipment in question. Equipment functionality is tested and the presence of hazardous substances or components in the equipment evaluated. The completion of a visual inspection of the equipment without testing its functionality is unlikely to be sufficient. For most of equipment, a functionality test of key functions is sufficient.
- Conducting portable appliance testing (PAT) ensures safety, ideally to the Institution of Engineering and Technology (IET) *Code of Practice for In-Service Inspection and Testing of Electrical Equipment*.[25]
- Testing ideally would be conducted by a qualified, certified or trained technician.

Step 2: recording

- It is best practice to keep a record of the results of evaluation and testing, containing the following information:
- Name of the item;
- Name of the producer (if available);
- Identification number of the item (type No.), where applicable;
- Year of production (if available);
- Name and address of the company responsible for evidence of functionality;
- Result of tests described in step 1 (e.g., naming of defective parts and defects or indication of full functionality), including date of the functionality test;
- Kind of tests performed;
- Signed declaration by the company responsible for evidence of functionality.
- The record typically accompanies the shipment and is fixed securely but not permanently either on the used equipment itself (if not packaged) or on the packaging so that it can be read without unpacking the equipment.

24.4 Hazardous or non-hazardous

The definitions and practicalities around what is deemed to be hazardous, non-hazardous, or still in need of 'special consideration', are complex and involve Annexes under the Waigani Convention (Pacific region exports to Australia), the Basel Convention (global export excluding a few small states, plus the USA), and the closely related OECD procedures (export between OECD countries, but which might also apply to export to these countries). The various elements that are relevant and referenced further are listed in Table 24-1.

[25] The Institution of Engineering and Technology, 2020, Code of Practice for In-Service Inspection and Testing of Electrical Equipment, 5th Edition, https://shop.theiet.org/code-of-practice-for-in-service-inspection-and-testing-of-electrical-equipment-5th-edition

Table 24-1. Key categories of waste under the Basel, Waigani and OECD procedures

Procedure	Hazardous waste – requiring controls	Other 'special consideration' wastes – still requiring controls	High risk non-Basel wastes – requiring control intra-OECD countries	Non-hazardous wastes – not requiring controls	Low risk non-Basel wastes – not requiring controls intra-OECD countries
Waigani	Annex 1 (or containing characteristics in Annex II)				
Basel	Annex VIII (containing Annex I constituents so it exhibits an Annex III [hazardous] characteristic	Annex II		Annex IX	
OECD	Amber procedure Part 1 wastes	Amber procedure Part 1 wastes	Amber procedure Part II wastes	Green procedure Part 1 wastes	Green procedure Part II wastes

The Waigani Convention obligations to reduce and control movement and production of hazardous wastes extend to all the wastes contained in Annex I (Categories of wastes which are hazardous wastes), or those that possess the characteristics contained in Annex II (List of hazardous characteristics). These annexes cover all wastes and are extensive.[26] Under the Basel Convention e-waste that falls under code A1181 (Annex VIII) is hazardous, and if it falls under Y49 (Annex II) it is deemed 'Other Waste' requiring special consideration even if it is technically non-hazardous.[27] The OECD has related procedures as set out in the box below.

Related OECD procedures

Since March 1992, transboundary movements of wastes destined for recovery operations between members of the Organisation for Economic Co-operation and Development (OECD) have been supervised and controlled under the specific intra-OECD Control System (i.e. only between OECD countries). Established by the Decision of the Council on the Control of Transboundary Movements of Wastes Destined for Recovery Operations (OECD/LEGAL/0266), the OECD Control System for waste recovery aims at facilitating trade of recyclables in an environmentally sound and economically efficient manner by using a simplified procedure, as well as a risk-based approach to assess the necessary level of control for materials. The OECD Decision includes two categories of control procedures for wastes destined for recovery in another OECD member: the Green control procedure and the Amber control procedure. The Amber control procedure is closely related to the PIC procedure under Basel and applies to Annex VIII and II under Basel (Part I of Appendix 4 of the OECD Decision) plus some additional wastes considered high risk under Part II of Appendix 4, which don't appear under Basel. The Green procedure requires no PIC procedure and applies to Appendix 3 of the Decision, Part 1 of which applies to Annex IX under Basel, while Part II contains an additional list of wastes that OECD member countries have agreed can be considered low-risk – i.e. are assessed as wastes that do not pose any risk for human health and the environment when destined for recovery within the national jurisdiction of any OECD member. The OECD Decision imposes a general requirement that all wastes, including those subject to the Green control procedure, shall be destined for recovery operations within a recovery facility which will recover them in an environmentally sound manner according to national laws, regulations and practices.

[26] www.sprep.org/att/publication/000129_Waigani_PDF.pdf
[27] The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. Texts and Annexes Revised 2023. https://www.basel.int/TheConvention/Overview/TextoftheConvention/tabid/1275/Default.aspx

The detail is complex and can be found in the Convention texts, but in terms of e-waste the key aspects are as follows (taken from the Basel Convention) under sections 24.4.1 to 24.5 below. In the absence of such testing, it will generally be necessary to assume that all e-waste is to be treated as hazardous.

24.4.1 Hazardous e-wastes

Waste electrical and electronic equipment (e-waste) that is hazardous, is defined as follows under the Basel Convention Technical Guidance and relates to Annex VIII wastes:

- containing or contaminated with cadmium, lead, mercury, organohalogen compounds or other Annex I constituents to an extent that the waste exhibits an Annex III [hazardous] characteristic, or
- with a component containing or contaminated with Annex I constituents to an extent that the component exhibits an Annex III characteristic, including but not limited to any of the following components:
    - glass from cathode-ray tubes included in Annex VIII, list A
    - a battery included in Annex VIII [lead-acid or containing lead, cadmium, mercury]
    - a switch, lamp, fluorescent tube or a display device backlight which contains mercury
    - a capacitor containing Polychlorinated biphenyls (PCBs)
    - a component containing asbestos
    - certain circuit boards
    - certain display devices
    - certain plastic components containing a brominated flame retardant
- Waste components of electrical and electronic equipment containing or contaminated with Annex I constituents to an extent that the waste components exhibit an Annex III characteristic, unless covered by another entry on list A

It is important to note that wastes that are not covered under these definitions, but are defined as, or considered to be, hazardous wastes by the domestic legislation of the Party of export, import or transit, are still considered hazardous under the Basel Convention. The definition of hazardous waste therefore incorporates domestic law, such that material regarded as a hazardous waste in one country but not another is defined as hazardous waste under the Convention.

Wastes for special consideration (aka 'other waste') under Basel are covered under Annex II and are neither asserted as being hazardous or non-hazardous per se, however a recent amendment added category Y49 to Annex II to include all non-hazardous electrical and electronic waste explicitly, and as such even this waste is still controlled under Basel. Wastes that have been processed to an extent that they are covered by specific entries under Annex IX on non-hazardous wastes (e.g. pure metal elements from e-waste), are not considered e-waste and do not need control under Basel.

The Basel PIC Procedure (which is essentially the Amber control procedure under OCED terminology) is followed for shipments of hazardous e-waste under code A1181 and of 'other' e-waste requiring special consideration, under code Y49.

24.4.2 Non-hazardous and low-risk e-wastes

In essence non-hazardous e-waste is:

- Waste electrical and electronic assemblies or scrap (including printed circuit boards) not containing the hazardous components listed above (; and

- Items that have undergone reprocessing to produce, for example, pure metals or uncontaminated plastic polymers

Those wastes covered by Annex IX of Basel (pure materials derived from e-wastes, such as metals), can be exported to OECD countries without a PIC procedure, subject to separate national requirements in the importing country.

In addition, some OECD countries may be willing to accept non-OECD e-wastes that fall under Part II of the OECD green procedure, namely:

- Electrical assemblies consisting only of metals or alloys.
- Electronic scrap (e.g. printed circuit boards, electronic components, wire, etc.) and reclaimed electronic components suitable for base and precious metal recovery.

Best practice would involve finding out in advance what controls the proposed destination country imposes on the type of waste you are exporting. Some further information on national controls can be found in the UNEP technical guidance[28], Appendix IV.

24.5 Hazardous and non-hazardous e-waste plastics

The Basel Convention also imposes rules on hazardous plastics including those from e-waste. Plastic e-waste containing certain flame retardants (notably brominated flame retardants or BFRs) is classed as hazardous under the Basel Convention. Many countries also have local rules banning or otherwise controlling the import of such plastics.

Chemicals of particular concern are the BFR's listed under the Stockholm Convention:

- hexabromodiphenyl ether and heptabromodiphenyl ether (also known as octabromodiphenyl ether and octaBDE), and
- tetrabromodiphenyl ether, and pentabromodiphenyl ether (also known as pentabromodiphenyl ether, pentaBDE).

An industry-led investigation in the UK identified the presence of decabromodiphenyl ether (deca BDE) and other polybrominated diphenyl ethers (PBDE) in some WEEE plastics. Traditional sink-float separation methods have proven unsatisfactory in terms of separating POPs plastics from non-POPs plastics meaning that most e-waste plastics must be treated as hazardous plastics unless more sophisticated test methods, such as XRF detection, can be effectively deployed.

Screening studies of e-waste materials in New Zealand[29] and elsewhere indicate that some items have very high levels[30] of BFR in the plastics. These include:

- printed circuit boards – are likely to have high levels of BFRs. Those that have high power loads or are exposed to heat may have very high or high levels. Other types may have very little
- CRT TVs and computer monitors – usually very high levels in the plastic housing and foot, coil and some of the printed circuit boards. High levels in the remaining printed circuit boards. TV remote controls usually have very high levels in the printed circuit boards, the connectors and power unit

[28] UNEP, March 2023, Technical guidelines on transboundary movements of electrical and electronic waste and used electrical and electronic equipment, in particular regarding the distinction between waste and non-waste under the Basel Convention
[29] Export of electronic waste (e-waste), The New Zealand Environmental Protection Agency, May 2014
[30] Very high means >10% of plastic component is BFR by weight; high means >1% of plastic component is BFR by weight. The age of items is a consideration. The Stockholm-listed BDEs started to be phased out in 2004 and by 2008 most manufacturers had stopped using them.

- computers – usually very high levels in the fan, some of the printed circuit boards (especially in older models) and in many CD drives. Other components containing high levels include printed circuit boards, hard drives and CPUs
- modems and routers – most have very high levels in the plastic
- printers – sometimes very high levels in the laser printer fuser units. High levels were often, but not always, present in other printer units. Toner cartridges do not have high levels.
- photocopiers – sometimes very high levels in plastic on outside panels. Printed circuit boards often have high levels
- EFTPOS machines
- power boards/multiplugs
- telecommunications wire splitters
- fan heaters – very high levels in some models, high in others
- hair dryers – few tested but very high in one model but not in two others, and
- microwave ovens – can be very high in the door panels.

Items with high levels of BFR in plastic components include:

- stereo equipment – varies between models and makes. A few items have very high levels in components, others high levels and many have low levels
- light bulb fittings
- some CD players
- some washing machines
- some fridges (in the plastic by the power source)
- dishwashers, and
- some freezers.

Plastics containing BFRs, and unsorted plastics, are considered hazardous plastic wastes, under Basel Annex VIII, entry A3210: Plastic waste, including mixtures of such waste, containing or contaminated with Annex I constituents, to an extent that it exhibits and an Annex III hazardous characteristic.

If the plastic is robustly sorted with non-BFR-containing fractions, and 'other' mixed plastics, then the latter would be treated as unsorted plastic (Y48 in Annex II on other waste requiring special consideration) and the former can be exported as non-hazardous waste under Basel Annex IX, code B3011, which is defined as below:

> *Plastic waste provided it is destined for [mechanical] recycling in an environmentally sound manner and almost free from contamination and other types of wastes. Plastic waste almost exclusively consisting of one non-halogenated polymer, including but not limited to the following polymers:*
>
> - *Polyethylene (PE)*
> - *Polypropylene (PP)*
> - *Polystyrene (PS)*
> - *Acrylonitrile butadiene styrene (ABS)*
> - *Polyethylene terephthalate (PET)*

- *Polycarbonates (PC)*
- *Polyethers*

Plastic waste almost exclusively consisting of one cured resin or condensation product, including but not limited to the following resins:

- *Urea formaldehyde resins*
- *Phenol formaldehyde resins*
- *Melamine formaldehyde resins*
- *Epoxy resins*
- *Alkyd resins*

Plastic waste almost exclusively consisting of one of the following fluorinated polymers:

- Perfluoroethylene/propylene (FEP)
- Perfluoroalkoxy alkanes:
- Tetrafluoroethylene/perfluoroalkyl vinyl ether (PFA)
- Tetrafluoroethylene/perfluoromethyl vinyl ether (MFA)
- Polyvinylfluoride (PVF)
- Polyvinylidenefluoride (PVDF)

Mixtures of plastic waste, consisting of polyethylene (PE), polypropylene (PP) and/or polyethylene terephthalate (PET), provided they are destined for separate recycling of each material and in an environmentally sound manner, and almost free from contamination and other types of wastes.

The Basel PIC procedure (Amber control procedure in OECD terminology) covers shipments of plastic waste covered by Basel entry A3210, i.e. hazardous, and Y48, Annex II on 'other waste' requiring special consideration.

25.0 Legitimate markets

A Party of the Basel Convention, cannot permit hazardous wastes or 'other wastes' (under the Convention, including Y49 e-waste) to be exported to a non-Party (i.e. non-ratified agreements with Basel), nor can they allow the export of hazardous wastes or other wastes for disposal within the area south of 60° South latitude (Antarctica), whether or not such wastes are subject to transboundary movement. Similar restrictions apply under Waigani in terms of export of hazardous wastes to Australia (they are not allowed to other parts of the Pacific region).

As of June 2023, there are 191 parties to the Basel treaty, which includes 188 UN member states, the Cook Islands, the European Union, and the State of Palestine. The five UN member states that are not party to the treaty are Timor-Leste, Fiji, Haiti, South Sudan, and the United States. Basel signatories, including the US, have stated an intention to become 'parties' but have not ratified the treaty. Exports of controlled waste to the United States of America and other non-parties, requires a special Article 11 agreement under Basel, or is deemed illegal.

The parties to the Waigani Convention are:

- Australia
- Cook Islands
- Federated States of Micronesia
- Fiji (i.e. covered here but not under Basel)
- Kiribati
- New Zealand
- Niue
- Papua New Guinea
- Samoa
- Solomon Islands
- Tonga
- Tuvalu, and
- Vanuatu.

Under Basel, non-OECD countries are only allowed to export hazardous and 'other' non-hazardous e-waste (Annex II, Y48 for plastics and Y49 for e-waste) to Basel Parties with the PIC (Prior Informed Consent) procedure, and for environmentally sound management (according to national laws, regulations and practices), unless it has first been pre-processed into an Annex IX non-e-waste waste (e.g. B3011, non-hazardous plastic (e.g. single polymer, clean) or B1010, non-hazardous metal (e.g. pure aluminium, pure steel). An export is otherwise deemed illegal and a criminal act.

The Basel Ban Amendment offers a safe principle to follow – i.e. it is sensible not to send hazardous and 'other' wastes (i.e. Y48 and Y49) to non-OECD / EU states, for reuse, recycling and other recovery operations as well as disposal.

In the following sections, the following three categories of countries for export of e-waste are suggested:

- Low risk markets – OECD (and most EU) countries that have a strong regulatory framework for e-waste and an established e-waste collection and legitimate treatment / disposal system.

- Medium-risk markets - OECD accession candidate and partner countries that have a developing regulatory framework for e-waste and an e-waste collection and legitimate treatment/disposal system.
- High-risk markets – non-OECD countries that have no specific e-waste regulatory framework and/or no means of legitimate treatment and/or disposal of e-waste.

Section 25.5 sets out what is considered as legitimate processing.

The countries noted in Sections 25.1 to 25.3 are examples only, and not meant to be a comprehensive list. For further information on markets see the SPREP Recycling Market Research Report from November 2021[31] and the UN Global E-waste Monitor, 2024.[32]

The Moana Taka Partnership (MTP)[33] can also provide useful support for exporters of e-waste, with links to legitimate markets globally. The MTP can also provide further details on the shipping procedures, forms to use etc.

25.1 Low-risk markets

OECD member countries, and other EU countries (with three exceptions noted below under medium risk), are considered low risk for e-waste exports in terms of legitimate recycling and reuse being undertaken, subject to the correct Convention procedures being in place. The OECD countries are mainly in Europe and North America, however Asia-Pacific OECD members include Australia, New Zealand, Japan and South Korea. A full list of OECD countries can be found at here: Members and partners | OECD

Australia is the only country in the South Pacific with specific legislation covering e-waste management, although regulated and mandated product stewardship only covers TVs and computers. Mobile phones and batteries are covered by accredited but voluntary initiatives. Refrigerant Reclaim Australia (RRA) is the product stewardship organisation for the Australian refrigerants industry.[34] At the time of writing New Zealand only has a fledgling e-waste collection system with regulated product stewardship due in the near to medium term, although this will not cover all e-waste in its initial form. New Zealand also has regulated product stewardship on the way for refrigerants.

Asia accounted for nearly half of the world's electronic waste in 2022 but only contributed a quarter of global e-waste recycling, according to the recent UN Global e-waste Monitor report.[35] Japan, Taiwan and South Korea all have large and well-developed e-waste recycling systems, and have strong regulatory frameworks for dealing with e-waste in country.

25.2 Medium-risk markets

OECD accession candidate countries include Indonesia, Thailand, Argentina, Peru and Brazil, and partner countries include China, India, and South Africa. These countries are all Basel Parties to the convention. They are likely to be higher risk than OECD member countries, but lower risk than certain other countries noted below under 'high risk'. There are also recent and less-developed OECD members that may need to apply stricter controls for transboundary movements of wastes if this is deemed necessary. For instance, Colombia recently became an OECD member and has temporary measures in place.

[31] https://library.sprep.org/content/recycling-market-research-report
[32] Global E-waste Monitor, UN 2024
[33] https://library.sprep.org/sites/default/files/moana-taka-partnership_0.pdf
[34] https://refrigerantreclaim.com.au
[35] Global E-waste Monitor, UN 2024

It is worth noting that South-Eastern European countries, the three countries on the OECD accession track (Bulgaria, Croatia and Romania), while EU member states, are likely to be higher risk than other EU states. Albania, Bosnia and Herzegovina, Kosovo, Montenegro, North Macedonia and Serbia are likely to be medium to high risk at present as they have less developed recycling systems and are non-OECD or EU.

In terms of South-East Asia, in 2014, the OECD launched the Southeast Asia Regional Programme (SEARP) which has played an instrumental role in deepening co-operation between the region and the OECD. Indonesia may offer a lower risk than some other countries in the region since in 2024 the OECD opened accession discussions with Indonesia. The Government of Indonesia developed the National Action Plan on E-waste Management in 2019. The plan was launched in February 2020, covering the period to 2025. In terms of non-hazardous plastic waste, Indonesia has set a limit of 0% of extraneous material in imported plastic waste.

China has various laws in place and developing systems, although it still has challenges around the informal waste sector in particular. China also banned the import of e-waste in 2018, although this only prevents e-waste from entering mainland China, and does not apply to licensed imports into Hong Kong, which remains high risk as a non-OECD. China also still allows import of solid wastes that can be used as raw materials, such as pure steel or clean non-hazardous plastics (e.g. put PET rather than mixed plastics). In terms of non-hazardous plastic waste, Hong Kong has set a limit of 0.5% of extraneous material in imported plastic waste.

Regulatory developments in India (including The E-waste Rules 2011and amendments) have improved controls and incentives to recycle e-waste, with around 400 authorized recyclers operating in the country today, compared to only 23 in 2010. There remain challenges around the informal waste sector, however India is a Party to the Basel Convention and does not have any blanket bans on hazardous waste including e-waste.

25.3 High-risk markets

Basel Action Network studies[36] and other research[37] have shown that likely illegal exports of European hazardous wastes have occurred to the developing countries of Nigeria, Ghana, Tanzania, Ukraine, Pakistan, Thailand and Hong Kong. None of these territories are OECD countries and hence the Basel Ban Amendment applies for all hazardous and 'other wastes' under the convention.

While most African countries are Parties to Basel, Africa in general is a very high-risk destination for e-waste, with many examples of e-waste burning and other environmentally and unsafe practices common in places such as Ghana and Nigeria. A 2017 study[38] found that consignments of used EEE shipped to a country in West Africa contained only about 20 per cent non-functional used EEE. In this case, used EEE are interlinked with illegal e-waste imports.

Southeast Asia is also dealing with an increasing amount of e-waste from its neighbours, despite low recycling rates and significant remaining involvement from the informal waste sector which is unlikely to treat e-waste safely or effectively. All SE Asian countries are Parties to Basel, but none of them are OECD countries and most can therefore be considered high-risk. As noted above, Indonesia is potentially medium risk, and while Thailand could potentially be considered medium to high risk, this is a moot point as it banned the import of e-waste in 2020.

[36] Holes in the Circular Economy: WEEE Leakage from Europe. Basel Action Network, 2019
[37] https://www.bakerinstitute.org/research/closing-loop-worlds-fastest-growing-waste-stream-electronics
[38] Odeyingbo, Nnorom and Deubzer, 2017, reported in the UN Global E-Waste Monitor report 2020

25.4 Other countries of significance

It is believed that none of the Arab states of the Middle East and North Africa have imported any e-waste through formal channels[39] and are therefore not a useful market for e-waste. In addition, some bans are in place. For example:

- Kuwait, where port customs authorities assume that used EEE for sale or reuse are considered e-waste and cannot be imported.
- Egypt, which bans e-waste and any used equipment over 5 years old (with some exceptions).

25.5 Legitimate reprocessing

Annex IV to the Basel Convention lists the disposal and recovery operations for hazardous wastes under two sections, namely section A entitled "Operations which do not lead to the possibility of resource recovery, recycling, reclamation, direct re-use or alternative uses", and section B entitled "Operations which may lead to resource recovery, recycling reclamation, direct re-use or alternative uses". Section B encompasses all such operations with respect to hazardous wastes, and which otherwise would have been destined for operations included in Section A.

Ideally e-waste is treated under Section B processes that offer genuine recycling rather than merely recovery, e.g. for energy generation.

The activities under each classification are shown in Table 25-1 and Table 25-2.

[39] Regional E-waste Monitor for the Arab States, UN 2021

Table 25-1. Section A: Disposal Operations

D1	Deposit into or onto land, (e.g., landfill, etc.)
D2	Land treatment, (e.g., biodegradation of liquid or sludgy discards in soils, etc.)
D3	Deep injection, (e.g., injection of pumpable discards into wells, salt domes of naturally occurring repositories, etc.)
D4	Surface impoundment, (e.g., placement of liquid or sludge discards into pits, ponds or lagoons, etc.)
D5	Specially engineered landfill, (e.g., placement into lined discrete cells which are capped and isolated from one another and the environment, etc.)
D6	Release into a water body except seas/oceans
D7	Release into seas/oceans including sea-bed insertion
D8	Biological treatment not specified elsewhere in this Annex which results in final compounds or mixtures which are discarded by means of any of the operations in Section A
D9	Physico chemical treatment not specified elsewhere in this Annex which results in final compounds or mixtures which are discarded by means of any of the operations in Section A, (e.g., evaporation, drying, calcination, neutralization, precipitation, etc.)
D10	Incineration on land
D11	Incineration at sea
D12	Permanent storage (e.g., emplacement of containers in a mine, etc.)
D13	Blending or mixing prior to submission to any of the operations in Section A
D14	Repackaging prior to submission to any of the operations in Section A
D15	Storage pending any of the operations in Section A

Table 25-2. Section B: Recovery and Recycling Operations

R1	Use as a fuel (other than in direct incineration) or other means to generate energy
R2	Solvent reclamation/regeneration
R3	Recycling/reclamation of organic substances which are not used as solvents
R4	Recycling/reclamation of metals and metal compounds
R5	Recycling/reclamation of other inorganic materials
R6	Regeneration of acids or bases
R7	Recovery of components used for pollution abatement
R8	Recovery of components from catalysts
R9	Used oil re-refining or other reuses of previously used oil
R10	Land treatment resulting in benefit to agriculture or ecological improvement
R11	Uses of residual materials obtained from any of the operations numbered R1-R10
R12	Exchange of wastes for submission to any of the operations numbered R1-R11
R13	Accumulation of material intended for any operation in Section B

There is a general requirement that all e-wastes that are exported shall be destined for recovery operations within a recovery facility which will recover them in an environmentally sound manner according to national laws, regulations and practices. The EU defines recycling as the process of reprocessing waste materials into new products, materials, or substances; for the original purpose or for other uses. Recovery is defined as using waste to replace other materials or to prepare waste to fulfil a function, and can include energy from waste generation.

In essence this means that:

- The wastes in question are required as a raw material for recycling or recovery industries in the State of import;
- The recycling process produces a valuable product or intermediate; and
- The recycler manages any hazardous material, and any secondary/residual material from reprocessing, in an environmentally sound manner.

Furthermore (according to the US EPA[40]) examples of "sham" recycling, that should be avoided, include:

- Ineffective or only marginally effective for the claimed use - e.g., using certain heavy metal sludges in concrete when such sludges do not contribute any significant element to the concrete's properties.
- Used in excess of the amount necessary - e.g., using materials containing chlorine as an ingredient in a process requiring chlorine, but in amounts that well exceed the required chlorine levels.
- Used to produce a product that has no value – e.g., a recycler that uses materials to make blocks or building materials for which there is no market and then “uses” those blocks to make a warehouse to store the remainder of the materials that it can’t sell.
- Handled in a manner inconsistent with its use as a raw material or commercial product substitute - e.g. storing materials in a leaking surface impoundment as compared to a tank in good condition that is intended for storing raw materials.
- Recycled product is not comparable to a product made from analogous raw materials – e.g. producing a product with much higher concentrations of hazardous constituents than would normally be found in such a product.

[40] https://www.epa.gov/hw/legitimate-hazardous-waste-recycling#sham

26.0 Key recycling methods and good practice

The following are the most common methods used in recycling e-waste. Good practice standards and further detail regarding e-waste treatment can be found through the EU WEEELABEX initiative and the UK 'best available treatment recovery and recycling techniques (BATTRT)'[41] and 'Waste electrical and electronic equipment: appropriate measures for permitted facilities.'[42] Table 26-1 gives a list of standards that may be used to certify e-waste management operations.

The WEEELABEX system is based on the EU CENELEC 50625 and EN 50614 series regarding the correct treatment of WEEE / e-waste.[43] Ideally foreign reprocessors of e-waste would be certified to these standards or their equivalents. A database of WEEELABEX-certified operators exists, although are all Europe based.[44]

Table 26-1. E-waste management certifications

Certification	Description
EU WEEELABEX[45]	A set of standards developed by the WEEE Forum and EU recycling industries in the European Union. It is closely linked to the EU CENELEC standards that also cover the safe and responsible collection, storage, transport and recycling of e-waste (called WEEE in the EU). These are as yet voluntary but considered to be the highest standards in the handling of e-waste globally.
R2[46]	This standard addresses the safe recycling of electrical and electronic products. It is a voluntary scheme aiming to establish best practices and provide assurances to potential customers. It provides a set of processes, safety measures, and documentation requirements for businesses looking to recycle or refurbish e-waste.
E-Stewards[47]	The e-Stewards standard (from the Basel Action Network) focuses on the proper refurbishment, repair and recycling of e-waste. Key topics addressed by the standard include data security, due diligence of vendors, compliance with transboundary movement regulations, reuse & refurbishment, and robust environmental management systems (either ISO14001 or RIOS).
RIOS[48]	The Recycling Industry Operating Standard (RIOS) is an environmental management system framework setting quality, environmental and health & safety standards for the recycling industry (not specific to WEEE recycling). Facilities become certified through implementing a RIOS management system and subsequent auditing.

[41] Guidance on Best Available Treatment Recovery and Recycling Techniques (BATRRT) and treatment of Waste Electrical and Electronic Equipment (WEEE), November 2006
[42] https://www.gov.uk/guidance/waste-electrical-and-electronic-equipment-weee-appropriate-measures-for-permitted-facilities
https://www.weeelabex.org/about-us/news-events/quality-standards-for-the-processing-of-weee/
[43] https://www.weeelabex.org/about-us/news-events/quality-standards-for-the-processing-of-weee/
[44] https://www.weeelabex.org/operators-list/
[45] https://www.weeelabex.org/
[46] https://sustainableelectronics.org/r2/
[47] https://e-stewards.org/
[48] https://rioscertification.org/

Disassembly and de-pollution

De-pollution is undertaken before e-waste is shredded, crushed or otherwise fragmented in automated or semi-automated plant. For example, it is important that all gases, fluids, and hazardous elements such as asbestos, heavy metals and poly-chlorinated bi-phenols are removed completely from e-waste, along with flammable lithium-ion batteries, as this is extremely difficult in shredding / fragmentation plant.

Disassembly and de-pollution helps to reduce the bulk of e-waste, maximise the yield of key components, increase material values, and segregate hazardous elements. Ideally the following items/materials are removed through manual disassembly to ensure their complete removal and high materials yields:

- batteries (particularly lithium ion and heavy-metal containing chemistries)
- printed circuit boards of mobile/cell phones and those >10 square centimetres
- screens > 100 square centimetres
- polychlorinated biphenyls (PCB) containing capacitors and electrolyte capacitors containing substances of concern
- heavy-metal (notably mercury, lead, cadmium, arsenic) containing items, e.g. gas discharge lamps, TV/monitor backlights, cathode ray tubes and mercury switches
- toner cartridges, liquid and paste, as well as colour toner
- plastic containing brominated flame retardants (where known, by testing or suspected)
- components containing radioactive substances
- asbestos waste and components which contain asbestos
- components containing refractory ceramic fibres
- external and internal copper cables

Fluids are ideally safely removed prior to crushing or shredding operations, while best practice for temperature control equipment (e.g. refrigeration and air-con) would include checking and protecting against damage, prior to de-gassing (to remove chlorofluorocarbons (CFC), hydrochlorofluorocarbons (HCFC) or hydrofluorocarbons (HFC), hydrocarbons (HC)).

Detailed information on appropriate levels of de-pollution, can be found in the WEEELABEX document, 'de-pollution monitoring specification, November 2020'. All disassembly/de-pollution and other minor processing would ideally be carried out by trained operatives, with appropriate health and safety training, the correct reprocessing equipment and techniques, and the correct personal protective equipment (PPE).

Cathode ray tubes (CRTs)

CRTs were mainly used in computer monitors or televisions, and while they have largely been replaced by flat panel screens, they still arise as e-waste. Handling of CRTs can present a danger of implosion of the tube, resulting in flying glass, as well as from lead and fluorescent phosphor coatings on the funnel and screen glass respectively. As a consequence, safe systems of work need to be used to control the risk to operators. This would typically include enclosure of the process and removal of the leaded cone from the screen glass, using a hot wire, laser or cutting disc, followed by removal of the fluorescent coatings.

Flat panel displays

Many flat panel displays (FPDs) use cold-cathode fluorescent lamps (CCFLs) as back-lights which contain mercury. Unless a display is clearly identifiable as having a plasma screen or a screen backlit by LED or organic LED (OLED), it is advised to treat all flat panel displays as though they contain CCFLs. The plastic

casings as well as plastic components such as cables and printed circuit boards may contain BFRs that are POPs. Careful removal of CCFLs minimises breakage and the release of mercury, including through removing them within a controlled environment such as a sealed booth with local exhaust ventilation. You can only shred/crush whole or partially dismantled FPDs containing CCFLs if you can clearly demonstrate that:

- there is no fugitive release of mercury
- all releases from the process are channelled and abated to capture dust and mercury vapour
- recycled outputs are not more contaminated by mercury than those produced by manual treatment

Mercury containing equipment

Fluorescent tubes/lamps (including cold cathode tubes in TVs and monitors), and other gas discharge lamps (such as high intensity discharge lamps and high-pressure sodium lamps), contain mercury which may be present as a vapour, but will also be present in the phosphor powders, glass, electrodes and end caps. You can only crush lamps to reduce volume before transport using dedicated crushing equipment designed and built specifically for that purpose. Whether you are crushing for volume reduction or carrying out full treatment, it is important for all equipment to be sealed and operated under negative pressure, and for all exhaust gases to be channelled and abated through a filter system that captures dust and mercury. This will require the use of both a HEPA (high efficiency particulate air) filter and a sulphur-impregnated carbon filter.

Degassing of refrigerant gases

Best practice would see refrigeration degassing taking place inside an automated or semi-automated enclosed chamber that fully captures gases and oils from both the refrigerant circuit and insulation foams. Transit damage of the cooling circuit and compressor is, however, likely and consequently de-gassing of the cooling system, to a gas-tight collection cylinder or tank, may need to be undertaken as a minimum prior to export. The remainder of the appliance should ideally be sent for further treatment to also capture the gases in the insulation foams, which also contain damaging ozone depleting and global warming gases. This would mean that the appliance should not just be included with other scrap metal, which will be shredded, harmfully releasing the insulation foam gases to atmosphere. The collected refrigerant and blowing agent gases are sent for destruction (usually by high temperature incineration). Further information can be found on the WEEELABEX website[49] and in the UK "Guidance on the recovery and disposal of controlled substances contained in refrigerators and freezers"[50] and the guidance on appropriate measures for facilities that treat or transfer waste temperature exchange equipment (WTEE)'.[51]

Shredding / fragmentation of mixed e-waste

Post disassembly for de-pollution, as discussed above, course shredding, crushing and fragmentation is common, to allow line picking / extraction (e.g. by air jets, eddy currents, and magnets) for key components that may not have been removed fully through disassembly, such as PCBs and integrated batteries, and common materials including steel, aluminium and plastics. The removed components can then be sorted, collated and sent for further reprocessing.

Printed circuit board smelting

Pyrometallurgical (smelting-refining) processes are widely used and effective in extracting at least the copper and precious metals within the PCBs. At a commercial scale the electronic waste is only a fraction of the total feed stream. Hydrometallurgy is also a common method to extract precious metals within the

[49] https://www.weeelabex.org/
[50] https://www.sepa.org.uk/media/155012/guidance_-recovery_storage_controlled-substances_in_fridge_freezers.pdf
[51] https://www.gov.uk/guidance/waste-temperature-exchange-equipment-appropriate-measures-for-permitted-facilities; Waste cooling equipment (WCE): appropriate measures for permitted facilities. Environment Agency, July 2021

PCBs. While more economical than pyrometallurgy methods, it still presents problems in terms of scalability and chemicals used and released in the process. Care needs to be taken that the wastewater from this process does not contaminate water. Novel combinations of different pre-treatments and hybrid thermal-chemical routes are often reported for improved separation efficiency and performance. Selective recovery, using solvent extraction, precipitation, polymer inclusion membrane, adsorption, ion exchange, can produce a high purity output product.

High-temperature Incineration

Fully authorised high-temperature incineration, with or without energy recovery, can be an effective treatment option for residual hazardous e-waste that remains after other treatments, including recycling and preparing for reuse. It is best practice for any items of e-waste and any component or material fractions derived from the treatment of e-waste that is POPs waste are treated by incineration or similar thermal treatment. It is particularly necessary for unsorted plastic or hazardous plastic containing BFRs, which may only be accepted for export if it will be incinerated in a high temperature incinerator. This plastic is not recyclable.

Landfilling

Around 78% of the total global volume of e-waste is unaccounted for[52], and is likely placed into landfills (where not burnt or treated informally in the open). Authorised hazardous waste landfills could be used where no other option for e-waste is available. Note that some nations and regions have banned the disposal of e-waste in landfills (e.g. the Australian states Victoria and Western Australia).

[52] The Global E-Waste Monitor 2024, Unitar, ITU, November 2024

27.0 Summary and Checklist for Exporters

Reprocessing opportunities and markets for whole e-waste items are extremely limited and the Pacific islands (excluding Australia), not least because almost all e-waste has at least some components or materials that are considered hazardous under international law. Hazardous elements, for example heavy metals and persistent organic pollutants (POPs), can be extremely harmful to both humans and the natural environment in receiving countries.

Aside from reuse, export is the key route for used EEE and e-waste. Export of e-waste and related plastics is, however, governed by the Basel and Waigani Conventions on transboundary movements of hazardous (and radioactive) wastes, and the related Stockholm and Montreal conventions/protocols on control of POPs and Ozone depleting and Global Warming gases.

Remember that:

1. No hazardous wastes or 'other wastes' (under the Basel Convention, including Y49 e-waste and Y48 plastics) is to be exported to a non-Party (i.e. non-ratified agreements) under Basel, nor can they allow the export of hazardous wastes or other wastes for disposal within the area south of 60° South latitude (Antarctica). Exports of e-waste and plastics to the USA and other non-parties to Basel, requires a special Article 11 agreement, or is deemed illegal.

2. Under Basel, non-OECD countries are only allowed to export hazardous (code A1181 for e-waste and A3210 for plastics) and 'other' waste requiring special consideration (Y48 for plastics and Y49 for e-waste) to Basel Parties with the PIC (Prior Informed Consent) procedure, and for environmentally sound management (according to national laws, regulations and practices), unless it has first been pre-processed into an Annex IX waste (e.g. B3011, non-hazardous plastic (e.g. single polymer, clean) or B1010, non-hazardous metal (e.g. pure aluminium, pure steel). An export is otherwise deemed illegal and a criminal act.

The following points address the key good practice for exporters to follow.

Exporting used EEE that has not become waste:

- Reuse is the best environmental option for most used EEE, and if intended for reuse is not defined as waste. However, great care needs to be taken in ensuring that any exported equipment is destined for reuse in the importing country. If you wish to export used EEE, you must follow the controls under the Basel Convention, as set out in Sections 24.2 and 24.3 of this guideline.

- Export of used and broken EEE, for analysis and repair, is high-risk and should be avoided. It can often be a cover for dangerous and/or illegal disposal of e-waste, rather than reuse or recovery.

Exporting EEE that has become waste, i.e. e-waste:

1. If possible, pre-treat the e-waste, before it leaves, ideally through manual disassembly, to isolate hazardous elements such as screens, printed circuit boards, batteries and flame-retardant plastics, so as to leave 'pure' uncontaminated plastics and metals for example, which are not considered e-waste and can be freely exported (e.g. Annex IX under Basel).

2. Check where possible if the e-waste is definitely hazardous (Annex VIII under Basel), 'other waste' requiring special consideration (Annex II under Basel), or one of the low-risk wastes under the OECD Green List Part II.

3. Check whether any plastic from the e-waste might contain brominated flame retardants (BFR), and if there is doubt you should consider the plastic hazardous.

4. Check with the country you are thinking of exporting to, to see if they have their own definitions and restrictions concerning hazardous or 'other' e-wastes and plastics. Exporting parties to the Basel Convention should prohibit the export of e-wastes and related plastics if the country of import prohibits the import of such wastes.

5. If in doubt, you need to assume that the e-waste, and plastics from that e-waste, is hazardous waste.

6. Look for a suitable market country that is low or medium risk (see Section 25.0), in that it has a credible regulatory framework and appropriate reprocessing for e-waste and related plastics. The Basel Ban Amendment, offers a safe principle to follow – i.e. it is sensible not to send hazardous and 'other' wastes (i.e. Basel Annex II wastes) to non-OECD / EU states, for reuse, recycling and other recovery operations as well as disposal.

7. Look for overseas operators that can be checked for having systems to minimise the release of hazardous materials into their environment and that comply with their countries' rules and regulations, to avoid sham recycling and recovery at all costs.

8. Make sure that the priority (other than legitimate reuse) of the processor is to maximise recycling of e-waste and its constituent components and materials, and then to recover what cannot be recycled and to safely dispose of the remainder (generally in high-temperature incineration or hazardous waste landfills). Certified recyclers should be used where possible – see Section 26.0.

9. Find an appropriate shipping agent – The Moana Taka Partnership (MTP)[53] is a useful option for exporters of e-waste, and can provide further details on the shipping procedures, forms to use etc.

10. Make sure that information regarding any proposed transboundary movement of hazardous and 'other wastes' is provided to the export countries concerned, and any transit countries, using the accepted 'Notification Form' under Basel/Waigani.

11. Obtain Basel and/or Waigani authorisations from the receiving country and each transit port/country.

12. Once the importing country has authorised the export and provided the required permits, notify the appropriate in-country regulators and request a letter of acknowledgement permitting transboundary movements.

13. Obtain shipping insurance, which may be necessary for some hazardous wastes.

14. Ensure that hazardous wastes and 'other' wastes subject to transboundary movements are packaged, labelled and transported in conformity with international rules and standards, e.g. under the UNEP United Nations Recommendations on the Transport of Dangerous Goods and Model Regulations.[54]

[53] https://library.sprep.org/sites/default/files/moana-taka-partnership_0.pdf
[54] UN, 2019, Recommendations on the Transport of Dangerous Goods, Model Regulations, Volume I, Twenty-first revised edition, https://unece.org/fileadmin/DAM/trans/danger/publi/unrec/rev21/ST-SG-AC10-1r21e_Vol1_WEB.pdf

15. Prepare the ‘Movement Document’ to accompany the shipment, from the point at which the transboundary movement commences to the point of disposal, including transit countries.

16. Arrange with the local shipping agent to coordinate loading logistics, and with the local agent in the receiving country to arrange unloading logistics and complete and submit any relevant paperwork. Make sure that the Receiver/Consignee is to accept liability and responsibility for unloading logistics.

17. Export the waste, making sure that the approved shipment is accompanied by the appropriate ‘Movement Document’.

Finally, remember that if e-waste or plastics are shipped as non-hazardous and are subsequently found to be hazardous, the country of import may require that the shipment be returned, and the exporter held responsible for the cost of any return shipment.

Appendices

A.1.0 Further information

The following offer helpful further context and guidance relating to Guideline 2:

- Development of an Advanced Recovery Fee and Deposit Legislation - Papua New Guinea Situation Review, Options Analysis and Summary of Decision Points. PacWastePlus. 2022
- Collection of waste electrical and electronic equipment (WEEE) from designated collection facilities (DCFs): UK code of practice, 2019
- End-of-life management for ICT equipment. ITU. 2012
- Institution of Engineering and Technology (IET) Code of Practice for In-Service Inspection and Testing of Electrical Equipment.
- World Bank Group Environmental, Health, and Safety (EHS) Guidelines for Waste Management Facilities, December 2007
- EU Directive 2012/19/EU on Waste Electrical and Electronic Equipment
- The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal
- The Convention to Ban the Importation into Forum Island Countries of Hazardous and Radioactive Wastes and to Control the Transboundary Movement and Management of Hazardous Wastes within the South Pacific Region (the Waigani Convention)

The following offer helpful further context and guidance relating to Guideline 3:

- Moana Taka Partnership - A Guide [on shipping of waste] for Pacific Island Countries & Territories, SPREP, October 2020
- Recycling Market Research Report. SPREP. November 2021
- The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal

- The Convention to Ban the Importation into Forum Island Countries of Hazardous and Radioactive Wastes and to Control the Transboundary Movement and Management of Hazardous Wastes within the South Pacific Region (the Waigani Convention)
- Basel and Waigani Conventions; Inter-linkages among Chemicals and Hazardous Waste-Related Conventions. SPREP
- Technical guidelines on transboundary movements of electrical and electronic waste and used electrical and electronic equipment, regarding the distinction between waste and non-waste under the Basel Convention, May 2023
- Global E-waste Monitor 2024, Unitar/UIT, November 2024
- OECD Decision of the Council on the Control of Transboundary Movements of Wastes Destined for Recovery
- World Bank, E-Waste Management Guideline, Maldives Competitiveness and Growth Project, 2nd-July-2024
- Waste cooling equipment (WCE): appropriate measures for permitted facilities, July 2021, Environment Agency (UK)
- Guidance on Best Available Treatment Recovery and Recycling Techniques (BATRRT) and Treatment of Waste Electrical and Electronic Equipment (WEEE), Defra (UK), November 2006
- UNEP's "Waste Crimes, Waste Risks: Gaps and Challenges In the Waste Sector
- https://www.sprep.org/news/stop-pops-promoting-clean-air-pacific-people

A.2.0 Glossary

Term	Definition
BFR	*Brominated Flame Retardant* Compounds used to reduce the flammability of products.
CCFL	*Cold Cathode Fluorescent Lamp* A type of lamp that produces light by passing an electric current through mercury vapor in a glass tube. CCFLs are often used as backlights for LCD monitors, televisions, and laptops.
CRT	*Cathode Ray Tubes* A glass video display component often used in televisions and computer monitors, typically considered hazardous waste due to the presence of lead.
ECF	*E-Waste Collection Facility* A plant where unwanted or broken electronic devices are collected and processed for recycling.
EEE	*Electrical and Electronic Equipment* Equipment which is dependent on electric currents or electromagnetic fields in order to work properly
F-gases	*Fluorinated gases* Man-made gases including hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride and other fluorinated compounds. F-gases are used in common products, equipment and processes such as refrigeration, air conditioning, heat pumps, insulation, fire protection, power lines, and aerosol propellants as well as in industrial processes.
FPD	*Flat Panel Display* A thin, lightweight electronic display that shows images and text, used in many devices, including televisions, computers, mobile phones, and medical equipment as an alternative to CRT displays.
GWP	*Global Warming Potential* A metric that measures how much heat a greenhouse gas (GHG) traps in the atmosphere compared to carbon dioxide (CO_2)
HCFCs	*Hydrochlorofluorocarbons* Chemicals that contain chlorine, fluorine, hydrogen, and carbon, mainly used as refrigerants and aerosol propellants.
MPF	*Material Processing Facility* A plant that receives, sorts, and prepares materials for reuse or recycling.
OLED	*Organic Light-Emitting Diode* A type of light-emitting diode, typically used in digital display screens.
PCB	*Printed Circuit Board* A thin board that connects electronic components to form a circuit. PCBs are found in many modern devices, including phones, tablets, and computers.

Term	Definition
PIC	*Prior Informed Consent* A process that involves sharing information and obtaining consent before starting a project or activity.
POPs	*Persistent Organic Pollutants* Toxic chemicals that adversely affect human health and the environment, which persist for long periods of time in the environment and can accumulate and pass from one species to the next through the food chain.
QLED	*Quantum Dot Light-Emitting Diode* A type of light-emitting diode typically used in digital display screens.
WAMITAB	*Waste Management Training & Advisory Board* Regulated qualifications for people working in the waste management and recycling industry, awarded by the Chartered Institution of Waste Management.
WEEE	*Waste Electrical and Electronic Equipment* Any electrical or electronic equipment that's broken or no longer works and is destined for disposal. Also known as e-waste.


EUROPEAN UNION
SPREP
Secretariat of the Pacific Regional Environment Programme
PacWastePlus
PACIFIC WASTE MANAGEMENT