TechCollect NZ

INTERNATIONAL RESEARCH PAPER:
PRODUCT STEWARDSHIP AND EXTENDED PRODUCER RESPONSIBILITY FOR E-PRODUCTS AND E-WASTE

FEBRUARY 2021

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ACKNOWLEDGMENTS

The International Research Paper: Product stewardship and extended producer responsibility for e-products and e-waste, is a collaborative effort coordinated by TechCollect NZ — a member-based not-for-profit (NFP) organisation established to support the development of a regulated product stewardship scheme for electrical and electronic products in Aotearoa New Zealand.

TechCollect NZ would like to thank the following contributors for sharing their in-depth knowledge and expertise across the research aspects in focus.

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E-WASTE ISSUES WERE RECOGNISED BY THE NEW ZEALAND GOVERNMENT IN JULY 2020

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PURPOSE OF THIS RESEARCH PAPER

The average New Zealander generates more than 21 kilograms (kg) of unwanted and end-of-life e-products (or e-waste) each year.

Electrical and electronic products (or e-products) have become an essential part of our daily lives, and New Zealanders are among the highest consumers of e-products across the globe. The latest reports estimate that the average New Zealander generates more than 21 kg of unwanted and end-of-life e-products (or e-waste) each year[1].

However, responsibly managing these products throughout their life cycle remains a challenge in Aotearoa New Zealand, including the potentially hazardous impacts of components embedded within e-products that can be detrimental to human health and the well-being of the natural environment. Mismanaging e-products also represents a wasted opportunity to recover valuable resources and transform them into useful secondary materials to give new life and become more circular, utilising the earth's critical and finite resources to their fullest potential.

At present, there are a number of voluntary e-product stewardship programmes operating in Aotearoa New Zealand as well as an active e-product repair, refurbishment and recycling sector. Although these programmes go a long way to lessen negative product life cycle impacts and improve waste reduction, product reuse, recycling and resource recirculation, they do not cover all e-product categories, nor do they benefit from full market participation which creates an unfair and uneven playing field across all actors.

Aotearoa New Zealand's mounting e-waste issues (and opportunities) were recognised by the New Zealand Government in July 2020, when e-products were declared as one of six priority product classes for the establishment of regulated product stewardship schemes under the Waste Minimisation Act 2008 (the Act). This priority product declaration covers any device with a plug or battery (including batteries themselves) and sends a clear signal to Aotearoa New Zealand's e-product sector that a mandatory product stewardship scheme is coming. It also triggers the Ministry process that encourages industry and other key stakeholders to co-design the best options recommended for a local scheme in Aotearoa New Zealand.

This priority product declaration means that a regulated product stewardship scheme must be developed and accredited as soon as practicable, and regulations can be established such as only to allow the sale of priority products in Aotearoa New Zealand in accordance with the requirements of a regulated scheme. The Ministry encourages the use of a co-design process to develop suitable scheme design options, ensuring that key stakeholders are actively engaged and involved throughout the co-design process.

This co-design process is being coordinated by TechCollect NZ, a local member-based NFP, established by some of the world's largest IT brands who are demonstrating a real commitment to support the development of a regulated product stewardship scheme for e-products in Aotearoa New Zealand. As a first step in the co-design approach, TechCollect NZ convened a Circular E-Stewards Network (CEN) of key stakeholders across government, industry and community with the goal of developing, refining and recommending regulated scheme options for e-products that are fit-for-purpose in Aotearoa New Zealand.

New Zealand government agencies and authorities, member-based and private organisations represented in the CEN include Abilities Group, Australia New Zealand Recycling Platform, Consumer NZ, eDay Trust, EY (as independent chair), Fire and Emergency New Zealand, Para Kore, Remarkit Solutions Limited, Retail NZ, Territorial Authorities Officers Forum, WasteMINZ, TES-AMM Australia and New Zealand, The WEEE Forum, WorkSafe New Zealand and Zero Waste Network. Ministry are also involved as observers.

TechCollect NZ and the CEN are undertaking targeted research and consultation to inform the most effective options for an e-product stewardship scheme in Aotearoa New Zealand, including international research of other jurisdictional approaches towards e-product stewardship and extended producer responsibility.

This international research aims to gather technical insights across global e-product stewardship and extended producer responsibility programmes, while understanding what has worked well in different jurisdictional approaches, what hasn't, what Aotearoa New Zealand should avoid, and what scheme design aspects are effective in operation to incentivise and spur more circular stewardship action for all actors. It will be used to understand technical aspects of various scheme design approaches and gather insights to address the e-waste issue/opportunity in Aotearoa New Zealand, helping to inform scheme design options recommended for a mandatory product stewardship system that will work best in our own backyard.

The scope of this research report and the jurisdictions selected for inclusion were confirmed in consultation with the Ministry.

A summary of the research, engagements, analysis and observations are provided in this research paper under the following parts:

- Defining 'e-products' and 'e-waste'
- Product stewardship approaches in Aotearoa New Zealand
- Benefits of product stewardship and extended producer responsibility
- Jurisdictional profiles
- Learnings across key legislative and programme design aspects

ENABLING A CIRCULAR ECONOMY THAT INCORPORATES WASTE PREVENTION AND PRODUCT REPAIR AND REUSE INITIATIVES WHERE POSSIBLE

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KEY OBSERVATIONS

The key observations of the design and operation of e-product stewardship schemes researched in this paper are summarised below.

Objectives and intended outcomes:

Core objectives of schemes are:

- Preserving, protecting and improving the quality of the environment.
- Protecting human health.
- Utilising natural resources responsibly.

Other objectives include:

- Material resource recovery and efficient resource utilisation.
- Building resilient local supply chains.
- Avoiding landfill disposal due to a lack of space available.
- Some schemes include aspirational goals around enabling a circular economy and where possible, incorporate waste prevention, product repair and reuse initiatives.

Fees, funding and cost-effectiveness:

- Overall, there are two main scheme funding models: advanced disposal fees and product recovery and recycling fees.
- In some jurisdictions a blend of these two funding models is used for different e-product categories and corresponding programmes.
- Fee eco-modulation is a relatively new funding approach where those deemed liable provide scaled contributions for a programme or scheme's operation, modulated on the basis of environmental criteria linked with a product's life-cycle management requirements.
- There is a European taskforce that has been established through the WEEE Forum that is currently exploring the best options for a harmonised fee eco-modulation approach across Europe.

Governance:

- For regulated systems, there are clearly defined roles, responsibilities and governance requirements for various actors specified in legislation or scheme design documentation.
- Many regulatory systems also provide options for individual producer responsibility (IPR) approaches whereby those deemed liable (e.g. producers) can opt to coordinate their own stewardship efforts rather than through a PSO.
- Governance arrangements for regulated systems are underpinned by regular and transparent reporting.
- PSOs also have codes of conduct or service provider agreements with standard terms and conditions around ethical business conduct.

Targets:

- There are two main scheme targets that underpin the objectives and intended outcomes of a programme or scheme's delivery: e-product collection targets (tonnes) and material recovery targets (percentage).
- One scheme has a reasonable access target, which is most suited to jurisdictions with large transport distances to cover.
- One scheme has preparation for reuse targets that apply to large equipment and small information technology and communication equipment.
- Targets are typically informed by e-product placed on market (POM) data, either for individual product categories or across the full scope of products included, and, in some cases, they can be scaled, increasing over time.

Performance standards, training and certification:

- Only recycling activities have mandatory requirements to be certified to an industry standard.
- However, some of the industry standards also have sections addressing collection and transport activities.
- No scheme has mandatory training requirements to undertake operational activities associated with a scheme's delivery.

Liability and insurance:

- In regulatory settings, liable parties are specified in legislation with clearly defined roles and responsibilities, which may vary across different actors.
- Some schemes have requirements for PSOs to take out insurance for their activities, and PSOs can also require collection sites, transporters and recyclers to be insured for their activities.

Design for Environment:

- In general, Design for Environment approaches are complementary to extended producer responsibility and product stewardship legislation.
- In Europe, there is an Eco-Design Directive that establishes a framework for setting eco-design requirements for energy-related products.
- It is generally preferable that waste legislation is not used to drive e-product design decisions and that separate legislation specific to eco-design be developed.

Reporting and public accountability:

- Reporting scheme performance, including target achievement, is an important scheme design aspect.
- Regular and transparent reporting raises awareness of a scheme or programme's availability and highlights the benefits realised through coordinating efforts to address the identified product impacts or market failures.
- PSOs are generally required to submit annual reports to the scheme regulator.
- Liable parties are generally required to submit POM data to the scheme regulator, or the scheme regulator can obtain this data elsewhere (e.g. product import records).

Education and awareness:

- Education and awareness programmes are important to achieve scheme participation by the community and industry.
- Specific resources are allocated by PSOs and scheme regulators for this activity, and for some jurisdictions this is mandated.
- Nationally consistent messaging is important, especially where there are multiple PSOs, to prevent consumer confusion over which products are accepted by a scheme and how they are managed.

Monitoring compliance and enforcement:

- Enforcement of scheme requirements is fundamental to ensuring an even playing field between PSOs, service providers (e.g. recyclers, collectors and transporters) and liable parties.
- As such, robust compliance monitoring programmes are required by the scheme regulator.

Accessible collection networks:

- E-product collection networks vary by jurisdiction, scheme and the e-product categories that are in scope.
- Types of e-product collection networks are often dictated by the ease or suitability of consolidated collection networks available, treatment pathways and handling requirements for certain e-products containing hazardous substances.
- There are a variety of collection methods used including dedicated collection points, retailers of e-products and post-back options.

Market development and government support:

- Financial support was available for developing collection and recycling infrastructure at the start of many schemes.
- Most ongoing support from government is used to fund general research and development programmes.

E-PRODUCTS AND E-WASTE HAVE DIFFERENT DEFINITIONS ACROSS THE GLOBE

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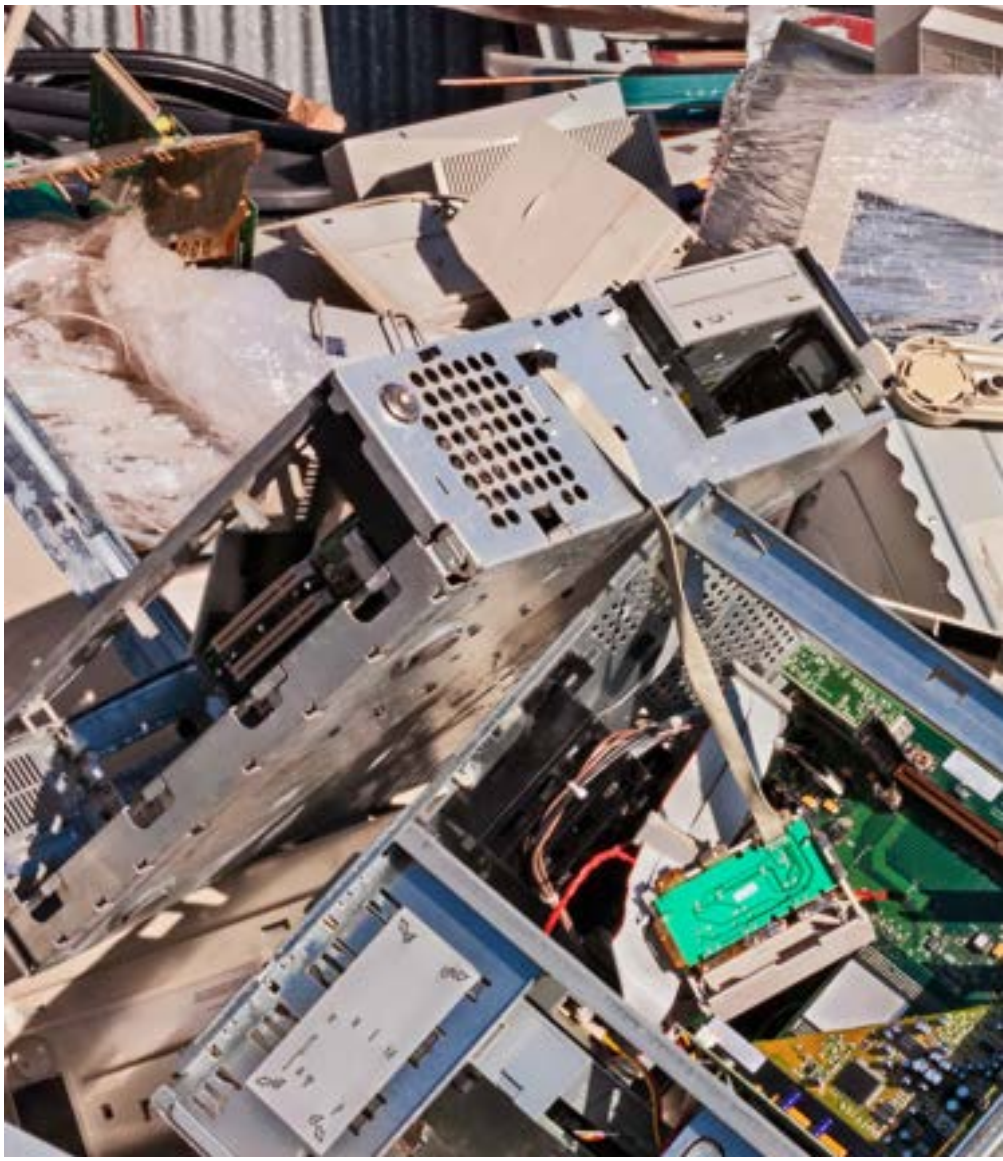
DEFINING ‘E-PRODUCTS’ AND ‘E-WASTE’

E-products and/or e-waste are defined in different ways across the globe. Disparate approaches to defining what products are captured by these definitions, especially in local jurisdictions, can lead to adverse and unintended outcomes, like scheme user confusion, and a consistent approach is required from the outset to ensure coordinated stewardship efforts are effective and outcomes can be accurately assessed. It will also mean that all actors have a clear understanding of the products in and out of any mandatory management system that will be developed and implemented.

As a starting point for Aotearoa New Zealand’s product stewardship investigations, e-products and e-waste are defined as follows:

- Electrical and electronic products (or e-products) means equipment which is dependent on electric currents or electromagnetic fields in order to work properly and equipment for the generation, transfer and measurement of such currents and fields and designed for use with a voltage rating not exceeding 1,000 volts for alternating current and 1,500 volts for direct current.
- Unwanted and end-of-life e-products (or e-waste) means electrical or electronic equipment which is waste within the meaning of Article 3(1) of Directive 2008/98/EC, including all components, sub-assemblies and consumables which are part of the product at the time of discarding.



4.1

E-PRODUCTS IN SCOPE

On 29 July 2020, pursuant to section 9 (1) of the Act, the Honourable Eugenie Sage, Associate Minister for the Environment, acting under delegated authority, scheduled 'Electrical and Electronic Products' as priority products for the purposes of the Act[2] as displayed below.

All:

a. rechargeable batteries designed for use in electric or hybrid electric vehicles or household-scale and industrial renewable energy power systems, including, but not limited to, lithium-ion batteries;

b. other re-chargeable and non-rechargeable batteries, including lead-acid batteries used in vehicles or stationary power systems; and

c. categories of waste electrical and electronic equipment (WEEE) defined in Annex III and Annex IV of European Directive 2012/19/EU.

Category 7 Notes:

1. Not part of Annex III of the 2019 recast of the European WEEE Directive 2012/19/EU.
2. It is noted that the Battery Industry Group (B.I.G.) has developed a large battery stewardship scheme for these batteries. All batteries not covered by the large battery scheme are being investigated through this co-design process.

Table 1 — Electrical and electronic product categories as per Annex III and IV of the European WEEE Directive 2012/19/EU

1	**Temperature exchange equipment:** E.g. Refrigerators, Freezers, Equipment which automatically delivers cold products, Air conditioning equipment, Dehumidifying equipment, Heat pumps, Radiators containing oil and other temperature exchange equipment using fluids other than water for the temperature exchange.
2	**Screens, monitors, and equipment containing screens having a surface greater than 100 cm^2:** E.g. Screens, Televisions, LCD photo frames, Monitors, Laptops, Notebooks.
3	**Lamps:** E.g. Straight fluorescent lamps, Compact fluorescent lamps, Fluorescent lamps, High intensity discharge lamps - including pressure sodium lamps and metal halide lamps, Low pressure sodium lamps, LED.
4	**Large equipment:** E.g. Washing machines, Clothes dryers, Dishwashers, Cookers, Electric stoves, Electric hotplates, Luminaires, Equipment reproducing sound or images, Musical equipment (excluding pipe organs installed in churches), Appliances for knitting and weaving, Large computer-mainframes, Large printing machines, Copying equipment, Large coin slot machines, Large medical devices, Large monitoring and control instruments, Large appliances which automatically deliver products and money, Photovoltaic panels.
5	**Small equipment:** E.g. Vacuum cleaners, Carpet sweepers, Appliances for sewing, Luminaires, Microwaves, Ventilation equipment, Irons, Toasters, Electric knives, Electric kettles, Clocks and Watches, Electric shavers, Scales, Appliances for hair and body care, Calculators, Radio sets, Video cameras, Video recorders, Hi-fi equipment, Musical instruments, Equipment reproducing sound or images, Electrical and electronic toys, Sports equipment, Computers for biking, diving, running, rowing, etc., Smoke detectors, Heating regulators, Thermostats, Small electrical and electronic tools, Small medical devices, Small monitoring and control instruments, Small appliances which automatically deliver products, Small equipment with integrated photovoltaic panels.
6	**Small IT and telecommunication equipment (no external dimension more than 50 cm):** E.g. Mobile phones, GPS, Pocket calculators, Routers, Personal computers, Printers, Telephones.
7	**Batteries[1]:** Non-rechargeable batteries (e.g. AA, AAA) and rechargeable batteries excluding batteries designed for use in electric vehicles, or household-scale and industrial renewable energy power systems[2].

4.2

E-PRODUCTS OUT OF SCOPE AND SCOPE EXEMPTIONS

Along with capacity threshold exemptions for products captured by the definition of e-products or e-waste, the European WEEE Directive also stipulates explicit exclusions for specific e-product users and for certain intended applications.

Table 2 — Electrical and electronic product category exemptions as per Article 2 (Scope) of the European WEEE Directive 2012/19/EU scope exemptions

European WEEE Directive 2012/19/EU scope exemptions
The WEEE Directive shall not apply to any of the following EEE (electrical and electronic equipment):
a. equipment which is necessary for the protection of the essential interests of the security of Member States, including arms, munitions and war material intended for specific military purposes;
b. equipment which is specifically designed and installed as part of another type of equipment that is excluded from or does not fall within the scope of this Directive, which can fulfil its function only if it is part of that equipment; and
c. filament bulbs.
In addition to the equipment specified in paragraph 3, from 15 August 2018, this Directive shall not apply to the following EEE:
a. equipment designed to be sent into space;
b. large-scale stationary industrial tools;
c. large-scale fixed installations, except any equipment which is not specifically designed and installed as part of those installations;
d. means of transport for persons or goods, excluding electric two-wheel vehicles which are not type-approved;
e. non-road mobile machinery made available exclusively for professional use;
f. equipment specifically designed solely for the purposes of research and development that is only made available on a business-to-business basis; and
g. medical devices and in vitro diagnostic medical devices, where such devices are expected to be infective prior to end of life, and active implantable medical devices.

4.3

E-WASTE: AN INTERNATIONAL ISSUE

E-waste is the fastest growing waste stream globally, with the average New Zealander generating more than 21 kg each year[3].

There are many reasons for this, from shorter product life cycles to customer attitudes and behaviours geared towards having the latest and greatest gadget or device which will soon be superseded by the next must have model. We are all contributing to the rise in e-waste generation, and we must take our fair share of responsibility to ensure that these products, and the hazardous and valuable materials found within them, are safely managed and used to their fullest potential.

Although New Zealanders are among the highest consumers of e-products across the globe, these trends are not unique to Aotearoa New Zealand. The amount of e-products used across the world grows by 2.5 million tonnes each year. In 2019, 53.6 million tonnes of e-waste were generated globally, up by 21% in just five years, and this volume is predicted to reach 74 million tonnes by 2030[4].

TechCollect NZ is committed to effective e-product stewardship and is an active member and affiliate of two dedicated organisations shaping shared responsibility approaches, and continual improvement for e-product life cycle management programmes globally.

The Solving the E-waste Problem (StEP) Initiative emerged in 2004 as an independent, multi-stakeholder platform for designing strategies that address all dimensions of electronics in an increasingly digitized world. StEP takes a pragmatic approach, working in constructive partnerships with all major players from around the world and along the entire life cycle of electrical and electronic equipment.

StEP's working areas include:

Research:
Overcoming the e-waste problem requires knowledge, leadership and action. By conducting and sharing scientific research, StEP is helping to shape effective policy-making. Research is also key to reducing or replacing resources used in manufacturing. By fostering the generation of problem-solving ideas, StEP supports their implementation and monitors their effects.

Strategy and goal-setting:
While the overall goal is the elimination of e-waste as a problem, there are realities to be embraced along the way. Targets, goals and strategies must take into account the varying circumstances of different jurisdictions and markets. StEP constantly analyses current, innovative and exploratory approaches to the problems and opportunities surrounding global e-waste.

Training and development:
StEP's experience in capacity-building work illustrates the initiatives commitment to the development of sustainable, efficient and targeted trainings. StEP facilitates knowledge transfer and enthusiastically supports capacity-building programmes around the globe through the organisation of regular webinars as well as physical training programmes.

Communication and awareness raising:
One of StEP's priorities is to ensure that members, prospective members and legislators are all made aware of the nature and scale of the e-waste problem, its development opportunities and how StEP is contributing to finding solutions. StEP promotes good practices via its website as well as newsletters.

The WEEE Forum is the world's largest multi-national centre of competence as regards operational know-how concerning the management of WEEE. It is a not-for-profit association of 43 WEEE product stewardship organisations across the world and was founded in April 2002.

Through exchange of best practice and access to its reputable knowledge base toolbox, the WEEE Forum enables its members to improve their operations and be known as promoters of the circular economy.

Since their foundation, the PSOs of the WEEE Forum have collected, de-polluted and recycled or sent for preparation for reuse 21 million tonnes of WEEE. The members of the WEEE Forum are representative of the whole spectrum of members of the manufacturing industry, two thirds of whom are market leaders.

The WEEE Forum has designed and developed a number of platforms and software tools, allowing the product stewardship organisations to benchmark their operations and have access to key data and intelligence.

The WEEE Forum is a vibrant community of PSOs that are committed to tackling the challenge of electrical and electronic waste. The 43 PSOs are based in Australia, Austria, Belgium, Bosnia, Canada, Czechia, Cyprus, Colombia, Denmark, Estonia, France, Greece, Iceland, India, Ireland, Italy, Lithuania, Luxembourg, Malta, the Netherlands, Aotearoa New Zealand, Nigeria, Norway, Poland, Portugal, Romania, Slovenia, South Africa, Spain, Sweden, Switzerland and the United Kingdom.

THE MINISTRY ENCOURAGES USE OF A CO-DESIGN PROCESS TO DEVELOP SUITABLE SCHEME DESIGN OPTIONS FOR E-PRODUCTS IN AOTEAROA NEW ZEALAND

5

PRODUCT STEWARDSHIP APPROACHES IN AOTEAROA NEW ZEALAND

Voluntary product stewardship schemes are designed, funded and led by industry. They are most effective when there is a high rate of industry participation, good governance structures are in place, and schemes are designed to appropriately address identified product impacts and/or market failures. The Act provides for accreditation of voluntary product stewardship schemes that demonstrate that they are designed to meet the objectives of the Act and other criteria.

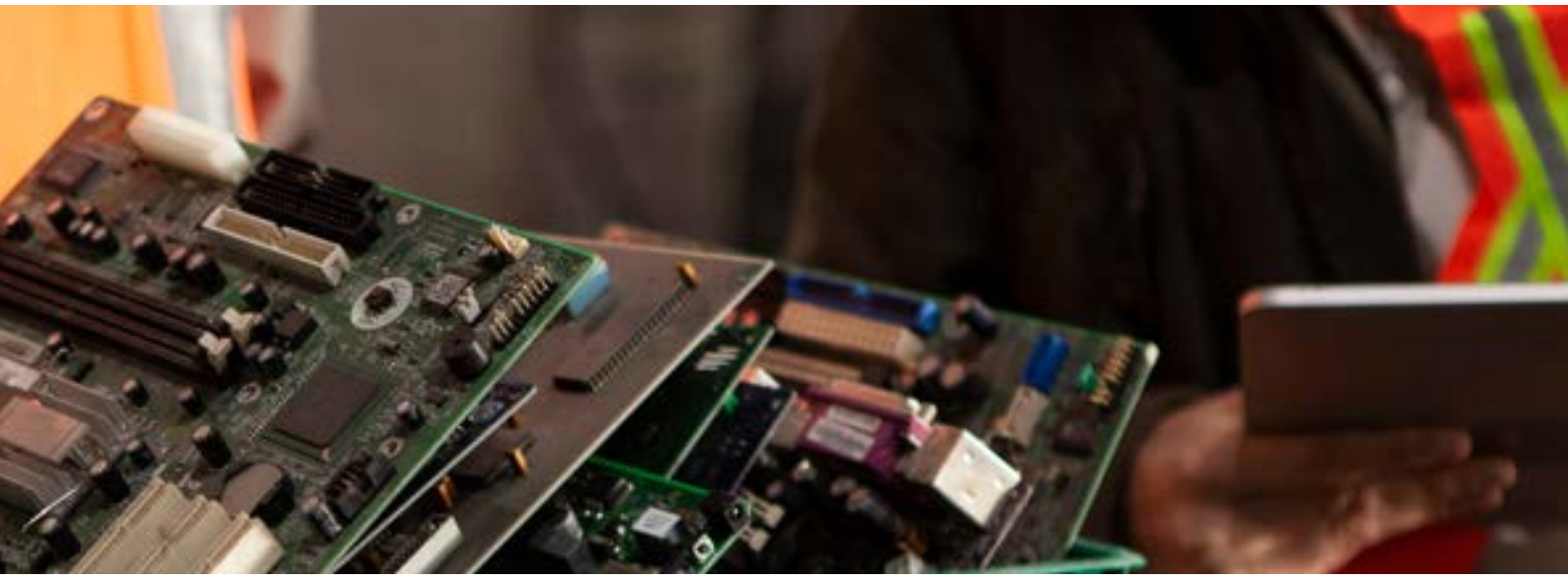
Although voluntary product stewardship can avoid regulation and can be faster to implement than mandatory or regulated schemes, one of its major downfalls is free-riding. Free-riding is when parties who benefit from a scheme, particularly producers, do not pay their fair share (or any) of the scheme costs. The incidence of free-riding generally increases with the number of producers and the length of the product supply chain. Where there is a high degree of free-riding or industry unwillingness to support voluntary product stewardship, coordinated industry-led action can be undermined, resulting in significant delays to establishing a voluntary scheme or derailing it altogether.

Regulatory product stewardship approaches can be described as a mix of industry action and formal regulation under the Act. The New Zealand Government sets the operational requirements of a product stewardship scheme and the minimum outcomes that must be achieved. Liable parties, i.e., producers of products and others deemed liable, would be required to participate in an accredited scheme to acquit their defined obligation.

Accredited product stewardship schemes have requirements set by the Act and by guidelines under that Act. For proposed regulations, a cost benefit analysis and regulatory impact assessment would be performed, including risk to human health and the environment, and options for mitigating the risks to benefit the community

Regulatory product stewardship allows for penalties to be imposed on liable parties who do not participate and fail to meet their obligations under the Act.

The Ministry encourages use of a co-design process to develop suitable scheme design options for e-products, ensuring that key stakeholders are actively engaged and involved throughout the co-design process.



5.1

VOLUNTARY E-PRODUCT STEWARDSHIP PROGRAMMES IN AOTEAROA NEW ZEALAND

Under the Act, the New Zealand Government has accredited three voluntary product stewardship programmes for e-products that fall under the categories specified for mandatory product stewardship intervention.

The following sections provide an overview of each scheme and the e-product category alignment with the product categories declared by the New Zealand Government. Details of the schemes have been sourced from the Ministry website.

5.2

FUJI XEROX ZERO LANDFILL SCHEME

Fuji Xerox New Zealand offers customers a take-back service for used machines, printer cartridges, drums and fusers. This is to ensure they are responsibly recycled rather than sent to landfill.

Fuji Xerox reports the scheme has a reuse and recycling rate of over 99.5%. Recycling of materials is carried out by industry partner TES-AMM New Zealand Ltd, which has R2 and ISO 14001 certifications.

Fuji Xerox customers can order a recycling collection box or arrange a pickup. E-products accepted through the Fuji Xerox programme align with Categories 4 (Large equipment) and 6 (Small IT and telecommunication equipment).

5.3 RE:MOBILE

The RE:mobile programme offers e-waste recycling for mobile phones and accessories. Unwanted mobile phones that are still working are sold for refurbishment and resale overseas while others are recycled.

Proceeds from the scheme are donated to Sustainable Coastlines, an organisation which plants trees along waterways to restore habitats for native animals, reduce sediment and improve water quality.

Old phones can be dropped off at 2degrees, Spark or Vodafone retail stores and kiosks nationwide or they can be sent in by post.

E-products accepted through the RE:mobile programme align with Category 6 (Small IT and telecommunication equipment).

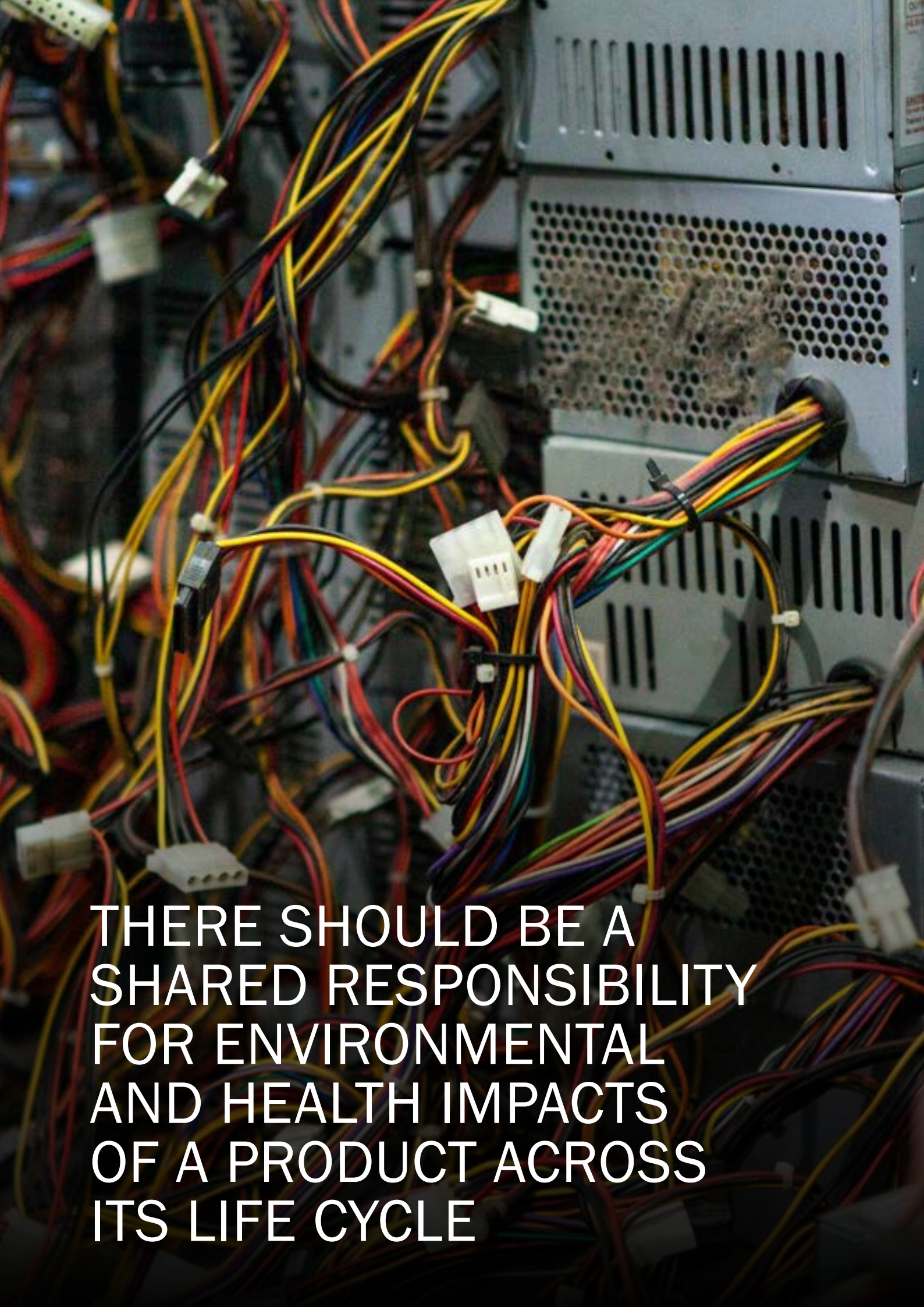
5.4 SHARP COMPREHENSIVE RECYCLING AND WASTE REDUCTION SCHEME

Sharp New Zealand aims to reuse and recycle 100% of its packaging materials, electronic products, equipment, and obsolete and used parts.

In 2016, the Sharp scheme recycled 1,006 m^3 of e-waste, 18,782 toner cartridges and 1,249 m^3 of packaging waste. Sharp's waste to landfill decreased 29% between 2015 and 2016.

Sharp consumers can return Sharp electrical products, including microwaves, refrigerators, TVs, and display screens to any Sharp branch. Customers can also return used toner cartridges.

E-products accepted through the Sharp programme align with Categories 4 (Large equipment) and 6 (Small IT and telecommunications equipment).



THERE SHOULD BE A SHARED RESPONSIBILITY FOR ENVIRONMENTAL AND HEALTH IMPACTS OF A PRODUCT ACROSS ITS LIFE CYCLE

6

BENEFITS OF PRODUCT STEWARDSHIP AND EXTENDED PRODUCER RESPONSIBILITY

At its core, product stewardship is the principle that there should be a shared responsibility for environmental and health impacts of a product across its life cycle. This principle spans across a product's entire value chain, i.e., manufacture, import, distribution and consumption, as well as management once it is no longer wanted or has reached the end of its useful life.

Extended producer responsibility (EPR) on the other hand, is an environmental policy approach in which a producer's responsibility for a product is typically extended to the post-consumer stage of a product's life cycle. Like with product stewardship approaches, EPR policies look to shift the burden of managing certain end-of-life products, and their impacts, from local authorities and communities to producers.

However, there is no one set pathway across these approaches. Both can follow voluntary or regulatory frameworks and the degree of end-of-life management activities, financial contributions or incentives to address, reduce or avoid negative product life cycle impacts from a product's design phase vary by jurisdiction and product category. The majority of jurisdictions assessed through this research have regulated EPR frameworks in place for e-products as noted in section 7.

The latest projections available indicate that more than 98,000 tonnes of e-waste is generated in Aotearoa New Zealand each year[5] and this figure will only increase with time. In addition, there are emerging e-product streams that will end up as problem waste streams in future if not addressed. An example is photovoltaic (PV) panels, which are only beginning to come to the end of their life. The sheer volume of e-waste generation demonstrates the need to work in a collaborative and nationally consistent way to develop proactive policies and regulations that focus on reusing and recycling e-waste. This will result in benefits for our economy, environment and people, which are discussed in the following sections.

6.1

AVOIDS LANDFILL DISPOSAL OF HAZARDOUS MATERIALS

E-products can contain hazardous materials, like mercury, lead, cadmium, chromium, nickel, antimony and brominated flame retardants.

It is estimated that e-products are the source of 40% of the lead and 75% of the heavy metals found in landfills. Once e-products are disposed of in landfill, crushed and broken, the acidic conditions cause lead and other heavy metals to dissolve and collect as leachate. Other pollutants from e-products in landfills can also be released into the air[6].

Therefore, without e-product stewardship frameworks in place, we will continue to see hazardous e-product components disposed of in landfill and the negative impacts associated with this activity.

6.2

RECOVERS VALUABLE RESOURCES AND STRENGTHENS LOCAL SUPPLY CHAINS

The latest global forecasts show that e-waste is worth over NZ$96 billion annually, which is more than the gross domestic product (GDP) of most countries[7].

Manufacturing e-products can be costly and extremely energy-intensive. Recent global events, like the coronavirus pandemic, have shown that we need to become less dependent on international supply chains, especially for critical raw materials found in e-products, like antimony, cobalt, graphite and tantalum.

These critical materials have no viable substitutes available on planet earth and can be found in abundance embedded within e-products. Compared with mining, e-product recycling activities or 'urban mining', emit less carbon into our atmosphere and consume less water and energy. Urban mining can be more economically viable than extracting valuable minerals from the earth as the resources recovered from urban mining are typically worth more on local and international commodity markets as they have a higher purity content compared with raw minerals. This is because e-products can contain components with up to 50 times higher concentration of valuable metals and minerals than those found in ores extracted from the earth[8]. For example, recycling one tonne of copper uses only 10% of the total energy that is used to extract copper from mined copper ore and can be worth up to 90% of its original cost.

Other non-ferrous metals contained in e-products, like nickel, aluminium and lead, are also recyclable without effect on their properties. Reactive metals like lithium, commonly used in batteries, also have huge potential to be recycled and reused efficiently in the production of new batteries[9].

E-products also contain precious metals, like gold, silver, copper and nickel, as well as rare earth metals, such as indium and palladium. A single device can contain up to 60 elements from the periodic table[10], and it is estimated that up to 7% of the world's gold may currently be contained within e-waste[11]. All raw materials, even when not classed as critical, are important for our economy. Conserving all raw materials, precious and rare earth metals found in e-products and keeping them out of our landfills will make Aotearoa New Zealand's economy, and the global economy, more resource efficient and resilient.

6.3

CRITICAL MATERIALS AND CONFLICT MINERALS

Recycling e-waste recirculates valuable materials embedded within, which in turn reduces our demand and reliance on mining and refining the earth's finite resource supplies. In 2017, the European Commission created a list of 27 critical raw materials that are considered of high importance to the European Union's economy, yet their supply is not readily available.

The list is provided in Figure 1 below, and includes materials that are relied upon in the manufacture of everyday e-products and are essential for further technological advancement (both in Europe and Aotearoa New Zealand)[12]. These critical raw materials are irreplaceable in renewable energy technologies that are crucial for the New Zealand Government's commitments to reach net zero emissions by 2050, e.g., PV panels, wind turbines, electric vehicles, and energy-efficient lighting.

Another type of finite resource that can be found within e-waste is conflict minerals. Conflict minerals are minerals that are extracted and sold to fund and perpetuate fighting in conflict zones, like the Democratic Republic of the Congo and neighbouring nations. The four most common conflict minerals are tin, tantalum, tungsten and gold, often referred to as '3TG'. Recycling e-waste can reduce sourcing 3TG from conflict zones.

Figure 1 — European Union's Critical Raw Materials List[13]

2017 Critical Raw Materials (27)			
Antimony	Fluorspar	Light Rare Earth Elements	Phosphorus
Baryte	Gallium	Magnesium	Scandium
Beryllium	Germanium	Natural graphite	Silicon metal
Bismuth	Hafnium	Natural rubber	Tantalum
Borate	Helium	Niobium	Tungsten
Cobalt	Heavy Rare Earth Elements	Platinum Group Metals	Vanadium
Coking coal	Indium	Phosphate rock	

6.4

LIFE CYCLE BENEFITS — CO_2, ENERGY AND WATER REDUCTION

The reuse, refurbishment and recycling of e-waste can lead to significant life-cycle benefits due to the avoidance of producing new commodities.

Life Cycle Assessment (LCA) methodology is used to evaluate the full cradle to grave environmental impacts and benefits of products and processes by assessing the environmental flows at each stage of the life cycle.

A recent study in Australia quantified the environmental impacts and benefits associated with the recycling of television, computer and general IT e-waste, including the transportation and reprocessing of used equipment as well as the replacement of virgin material by recovered materials in the collected e-waste. The study found that for 1 tonne of e-waste collected and recycled the following net impacts were avoided:

- 1,268 kg CO_2e emissions,
- 19,464 MJ of energy consumption,
- 2,016 g of particulate matter emissions,
- 2,100 L of water consumption[14].

A significant proportion of these savings came from avoided production of metals (iron, aluminium, copper) and, to a lesser extent, plastics. Whilst undertaken for Australian conditions, and only for a limited scope of e-waste, the results would be readily comparable to Aotearoa New Zealand.

6.5

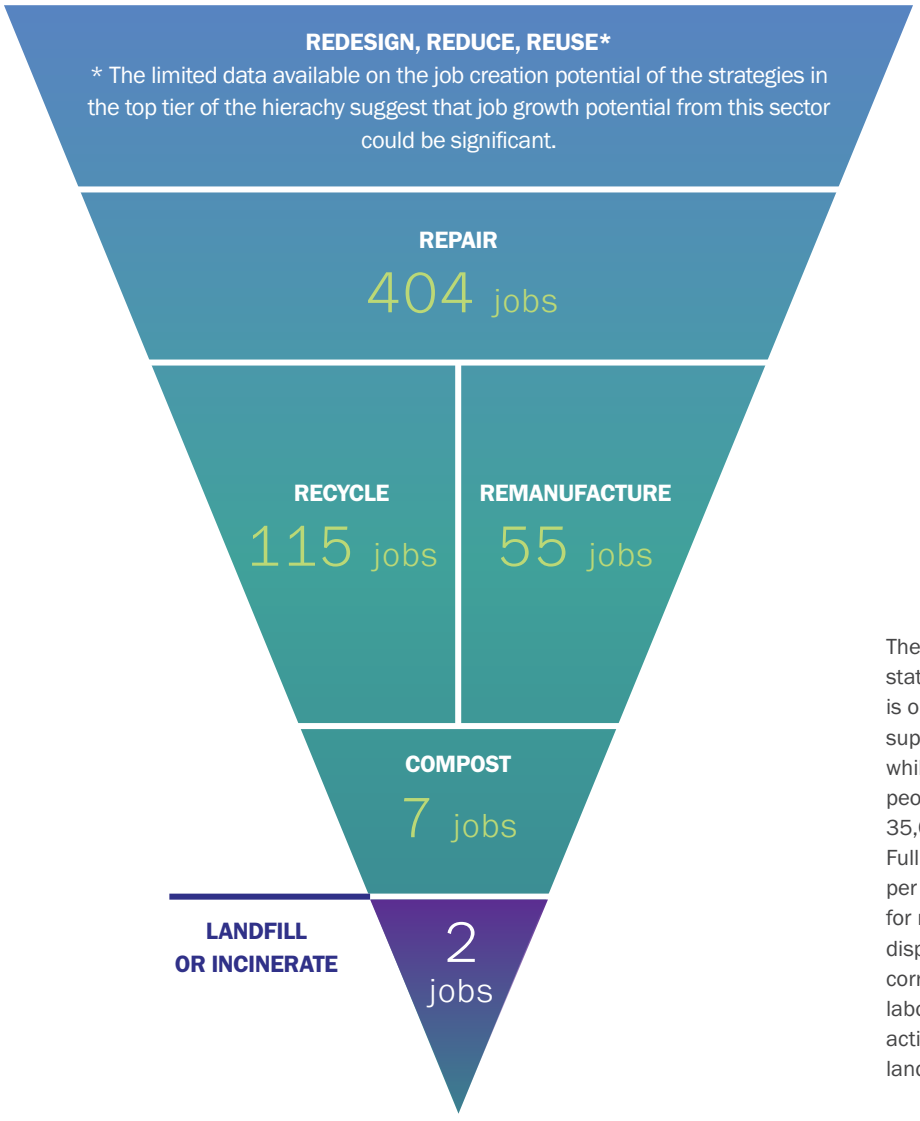
LEADS TO JOB CREATION

In the September 2020 quarter, as the impact of COVID-19 hit the labour market, the seasonally adjusted number of unemployed in Aotearoa New Zealand rose by 37,000 to reach 151,000,

There are significant social benefits associated with responsible e-waste management. Product stewardship interventions can also be used as an effective economic instrument to create jobs in Aotearoa New Zealand's e-product management sector.

An international study using data from 16 countries determined that zero waste approaches create more jobs than disposal-based systems. It estimates that zero waste approaches have the potential to create 2.9 million jobs across 97 cites[15]. This is summarised in Figure 2 below.

Figure 2 — Waste Hierarchy with mean job generation figures per 10,000 tonnes of waste processed per year[16]



The Australian Council of Recycling stated that Australia's recycling industry is one of the country's growth industries, supporting a more sustainable economy, whilst directly employing over 20,000 people and indirectly creating almost 35,000 jobs[17]. The estimated direct Full Time Equivalent (FTE) employment per 10,000 tonnes of waste is 9.2 for recycling and only 2.8 for landfill disposal[18]. On a national level, this corresponds to an estimated direct labour force of 22,243 FTEs in recycling activities and only 6,695 FTEs in landfill operations[19].

6.6

ADVANCES SUSTAINABLE DEVELOPMENT GOALS

In 2015, the United Nations and member states adopted the 2030 Agenda for Sustainable Development, which comprises of 17 Sustainable Development Goals (SDGs) for ending poverty, protecting the environment, and ensuring prosperity for all over a 15-year span. Responsible management of e-waste contributes to the advancement of several SDGs, as outlined below.

Table 3 — Responsible management of e-waste contributes to the advancement of SDGs

SDG 3: Good Health and Wellbeing 	Target 3.9 of the SDGs refers to the substantial reduction of the number of deaths and illnesses caused by hazardous chemicals and air, water and soil pollution and contamination. When treated inadequately, e-waste can pose serious health risks due to the hazardous components of some products. When disposed of incorrectly, these hazardous substances can contaminate air, water and soil, which can ultimately pose a risk to people's health.
SDG 6: Clean Water and Sanitation 	Target 6.1 refers to achieving universal and equitable access to safe and affordable drinking water for all. Target 6.3 aims to improve water quality by reducing pollution, eliminating dumping, and minimising the release of hazardous chemicals and materials. Incorrectly managed e-waste can cause water contamination through the release of hazardous substances into water sources. Responsible e-waste management would help to advance these targets.
SDG 8: Decent Work and Economic Growth 	Target 8.3 promotes development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity, and innovation, and encourages the formalisation and growth of micro-, small-, and medium-sized enterprises. Target 8.8 aims to protect labour rights and promote safe and secure working environments for all workers, including migrant workers - particularly women migrants - and those in precarious employment. E-waste management, when undertaken responsibly, can create new employment opportunities and contribute to economic growth in the recycling and reuse sector. Often e-waste is processed in the informal sector, with many e-waste disposal and recycling jobs being undertaken in an unsafe manner without formal regulation[20]. A shift to formalised, responsible, environmentally sound management of e-waste would allow countries to take advantage of the business opportunities the e-waste management sector has to offer, while additionally promoting safe and secure work environments.

Table 3 — Responsible management of e-waste contributes to the advancement of SDGs (ctd.)

SDG 11: Sustainable Cities and Communities 	Target 11.6 aims to reduce the adverse per capita environmental impact of cities by paying special attention to air quality and to municipal and other waste management. This target specifically relates to waste management within cities. With over half the world's population now living in cities, a significant amount of e-waste will be generated from urban areas. As such, it is especially important to responsibly manage e-waste in urban areas, e.g., through improved collection and recycling rates, to ultimately reduce the amount of e-waste that ends up in landfill.
SDG 12: Responsible Consumption and Production 	Target 12.4 seeks to achieve the environmentally sound management of chemicals and all waste throughout the product's life cycle, in accordance with agreed international frameworks, and to significantly reduce their release into the air, water, and soil to minimise their adverse impacts on human health and the environment. Target 12.5 aims to substantially reduce waste generation through prevention, reduction, repair, recycling, and reuse. The consumption of goods is growing across the planet and it is essential to make production and consumption more sustainable. This is particularly true in the case of e-waste, which is a rapidly growing waste stream wherein hazardous materials and chemicals are involved in their construction. Responsible e-waste management, including reuse and recycling of e-products, can help to advance these targets through more sustainable consumption mechanisms and environmentally sound management of waste products.
SDG 14: Life Below Water 	Target 14.1 aims to prevent and significantly reduce marine pollution, in particular from land-based activities, including marine debris and nutrient pollution. When incorrectly disposed of, e-waste can cause pollution and contamination of land and water, which can negatively impact on the quality of marine environments. Responsible e-waste management can minimise this risk and help advance healthy marine life.
SDG 15: Life on Land 	Target 15.3 aims to combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world. Electrical and electronic products irresponsibly disposed of cause their hazardous components to contaminate soil, leading to land degradation. A sound e-waste management system would allow for avoidance and restoration of degraded land and soil.

JURISDICTIONAL PROFILES HAVE BEEN COMPLETED FOR AUSTRALIA, SPAIN, SWITZERLAND, THE UNITED KINGDOM, JAPAN AND THE REPUBLIC OF KOREA

7

JURISDICTIONAL PROFILES

The research and engagement activities performed by TechCollect NZ Ltd. to prepare this research paper included direct consultation with international e-product stewardship experts, targeted jurisdictional research, and a series of e-product stewardship scheme design workshops to:

- understand technical aspects of product stewardship schemes and extended producer responsibility programmes for e-products in their respective jurisdictions; and
- gather technical insights across global product stewardship schemes and extended producer responsibility programmes informing proposed system design elements for a mandatory e-product stewardship scheme in Aotearoa New Zealand.

In December 2020, TechCollect NZ ran three e-product stewardship design workshops focusing on the following scheme design aspects.

Session One — Recovery/ Operations/ Collection

- Recovery and collection methods/ models across different e-product categories.
- Defining reasonable access requirements for collection and recovery networks.
- Data management and product tracking systems used to help capture and analyse e-product and e-waste flows/management.
- Scheme/programme targets, performance measures and standards (including collection, recovery, transport, repair/refurbishment, treatment, recirculation).
- Funding support required to ensure best practice collection infrastructure.

Session Two — Regulatory/ Finance/ Enforcement

- Defining product scope and liability thresholds (including category and voltage capacity exemptions).
- Influencing and incentivising more circular stewardship (including material selection/de-selection, product repair, refurbishment, direct reuse, scheme/programme fee avoidance).
- External scheme/programme regulatory impacts/measures/ instruments, e.g., Basel Convention, right to repair legislation, landfill bans, prohibiting product sale etc.
- Defining roles and responsibilities across producers, retailers, collectors, transporters, National and Local Government, repair agents, recyclers, consumers etc.
- Financing scheme/programme operations, e.g., advanced disposal fees, visible advanced disposal fees, pay as you put/recover etc.
- Product stewardship organisation models, e.g., multiple PSOs, single PSO, NFP status requirements etc.
- Enforcing scheme/programme compliance (including regulator profiles and penalties/enforcement approaches for non-compliance).

Session Three — Education/ Research/ Awareness/ Campaigns

- Scheme/programme education and awareness models and associated pros and cons.
- Scheme/programme education and awareness focus areas.
- Supporting research, development and demonstration.

Jurisdictional profiles covering product scope, legislative frameworks and e-product management systems in place are summarised in the following sections.

Complete jurisdictional profiles have been completed for Australia, Spain, Switzerland, the United Kingdom, Japan and the Republic of Korea, with other lessons gathered through targeted consultation and jurisdictional research for France, Ireland, Italy and the Netherlands captured and discussed throughout section 8.

7.1

AUSTRALIA

Australian e-product category definitions	
IT Equipment and Televisions Product Stewardship (Televisions and Computers) Regulations, 2011, made under the Product Stewardship Act, 2011	**Category 1:** **IT Equipment and Televisions**
Mobile Phones Mobile Muster voluntary product stewardship programme accredited by the federal government (2014) under the Product Stewardship Act, 2011	**Category 2:** **Mobile Phones**
Batteries - Loose handheld (<5 kg) Battery Stewardship Council voluntary product stewardship scheme authorised by the Australian Competition and Consumer Commission, 2020.	**Category 3:** **Batteries**

Type of PS/EPR framework in place			
Voluntary=V, Co-regulatory=C, Mandatory=M	1	2	3
	C	V	V
PS/EPR framework and scheme/programme implementation			
• Category 1: Product Stewardship (Televisions and Computers) Regulations, 2011, Made under the Product Stewardship Act, 2011 • Category 2: Voluntary industry-led programme established 2000 • Category 3: Voluntary industry-led programme established 2020	1	2	3
	2011	2000	2020

Population and annual e-waste arisings per capita in Australia

E-product categories	1	2
• Population (2019) = 25,500,000 • Average e-waste generation per inhabitant (2019)	3.3 kg	
E-product category		3
• Population (2018) = 25,000,000 • Average e-waste generation per inhabitant (2018)		0.73 kg

Australian scheme/programme targets			
• Minimum Product Recovery Targets by weight (E-product Category 1) — As per Product Stewardship (Televisions and Computers) Regulations, 2011 • Minimum Product Recovery Targets by weight (E-product Category 2-3) — N/A	1	2	3
	68% (2021)	N/A	N/A
• Minimum Product Recycling Targets by weight (E-product Category 1) — As per Product Stewardship (Televisions and Computers) Regulations, 2011 • Minimum Product Recycling Targets by weight (E-product Category 2-3) — N/A	1	2	3
	90%	N/A	N/A

Scheme/programme governance and management structure in Australia

E-product category			1
Governance / management feature:	**YES**	**NO**	**NOTE**
Single Product Stewardship Organisation (PSO) model		X	Four PSOs
Mandatory NFP status for PSO/s		X	Not a scheme/programme feature
Individual Producer Responsibility (IPR) option	X		Liable parties can source and acquit liability through a PSO
Mandatory PSO authorisation	X		Authorisation provided by the federal government regulator

E-product category			2
Governance / management feature:	**YES**	**NO**	**NOTE**
Single Product Stewardship Organisation (PSO) model	X		Voluntary industry-led programme
Mandatory NFP status for PSO/s		X	Not a scheme/programme feature
Individual Producer Responsibility (IPR) option		X	Not a scheme/programme feature
Mandatory PSO authorisation		X	Not a scheme/programme feature

E-product category			3
Governance / management feature:	**YES**	**NO**	**NOTE**
Single Product Stewardship Organisation (PSO) model	X		Voluntary industry-led programme
Mandatory NFP status for PSO/s		X	Not a scheme/programme feature
Individual Producer Responsibility (IPR) option		X	Not a scheme/programme feature
Mandatory PSO authorisation		X	Not a scheme/programme feature

Scheme/programme fees and funding structure in Australia

E-product category			1
Fee/funding feature:	**YES**	**NO**	**NOTE**
Advanced disposal fees		X	Not a scheme/programme feature
Pay as you go funding model	X		Liability calculated on previous year imports, less exports and scaling factor
Visible fees at point of sale (POS)		X	Not a scheme/programme feature
Fee eco-modulation model		X	Not a scheme/programme feature

E-product category			2
Fee/funding feature:	**YES**	**NO**	**NOTE**
Advanced disposal fees		X	Not a scheme/programme feature
Pay as you go funding model	X		Voluntary participant contributions based on imports and standard unit fee
Visible fees at point of sale (POS)		X	Not a scheme/programme feature
Fee eco-modulation model		X	Not a scheme/programme feature

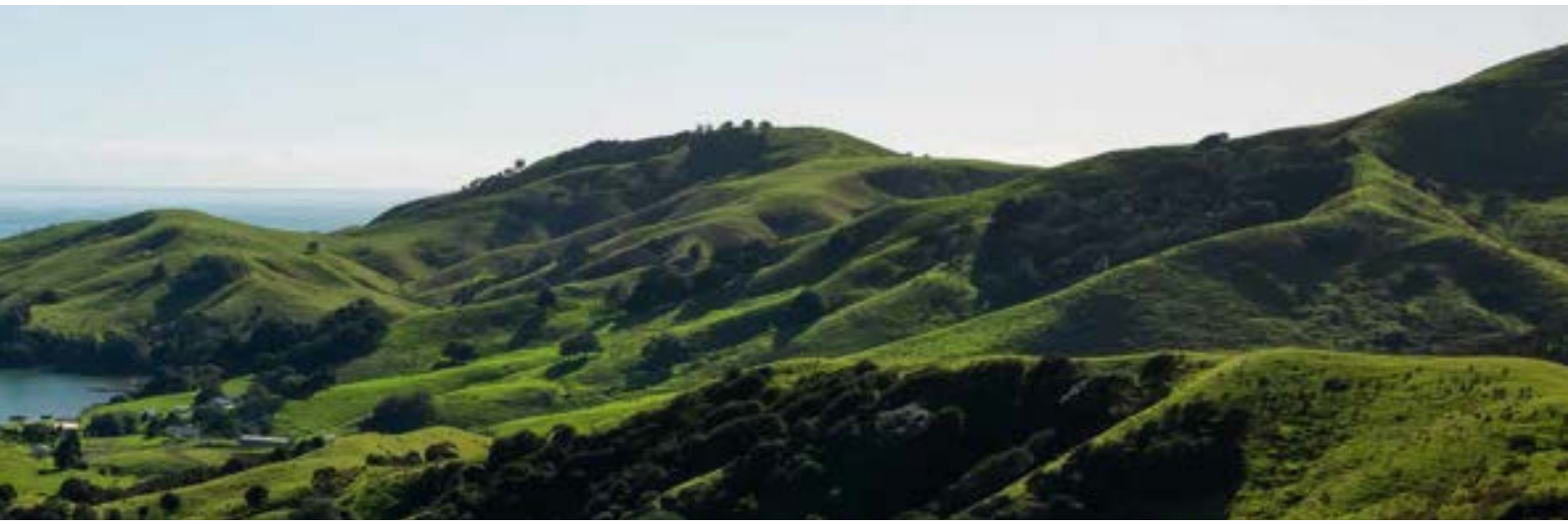
E-product category			3
Fee/funding feature:	**YES**	**NO**	**NOTE**
Advanced disposal fees		X	Not a scheme/programme feature
Pay as you go funding model	X		Voluntary participant contributions based on market share of total scheme costs
Visible fees at point of sale (POS)		X	Not a scheme/programme feature
Fee eco-modulation model		X	Not a scheme/programme feature

Scheme/programme performance standards, training and certification in Australia

E-product category			1
Performance standards, training and certification feature:	**YES**	**NO**	**NOTE**
Mandatory standards for various scheme operations, e.g., collection, storage, transport, treatment	X		AS/NZS 5377 - 2013 Collection, storage, transport and treatment of end-of-life electrical and electronic equipment
Mandatory training for various scheme operations, e.g., collection, storage, transport, treatment		X	Not a scheme/programme feature
Mandatory Code of Conduct (CoC) for various scheme operations, e.g., collection, storage, transport, treatment	X		PSOs must adhere to programme requirements

E-product category			2
Performance standards, training and certification feature:	**YES**	**NO**	**NOTE**
Mandatory standards for various scheme operations, e.g., collection, storage, transport, treatment		X	N/A
Mandatory training for various scheme operations, e.g., collection, storage, transport, treatment		X	N/A
Mandatory Code of Conduct (CoC) for various scheme operations, e.g., collection, storage, transport, treatment		X	N/A

E-product category			3
Performance standards, training and certification feature:	**YES**	**NO**	**NOTE**
Mandatory standards for various scheme operations, e.g., collection, storage, transport, treatment		X	N/A
Mandatory training for various scheme operations, e.g., collection, storage, transport, treatment		X	N/A
Mandatory Code of Conduct (CoC) for various scheme operations, e.g., collection, storage, transport, treatment		X	N/A



7.2

SWITZERLAND

Swiss e-product category definitions, in-scope capacity thresholds and product scope exemptions	
Temperature exchange equipment As per Annex III and IV of the European WEEE Directive 2012/19/EU - noting in-scope capacity thresholds and product scope exemptions as per Article 2 (Scope)	**Category 1:** Temperature exchange equipment
Screens, monitors, and equipment containing screens having a surface greater than 100 cm² As per Annex III and IV of the European WEEE Directive 2012/19/EU - noting in-scope capacity thresholds and product scope exemptions as per Article 2 (Scope)	**Category 2:** Screens and monitors
Lamps As per Annex III and IV of the European WEEE Directive 2012/19/EU - noting in-scope capacity thresholds and product scope exemptions as per Article 2 (Scope)	**Category 3:** Lamps
Large equipment As per Annex III and IV of the European WEEE Directive 2012/19/EU - noting in-scope capacity thresholds and product scope exemptions as per Article 2 (Scope)	**Category 4:** Large equipment
Small equipment As per Annex III and IV of the European WEEE Directive 2012/19/EU - noting in-scope capacity thresholds and product scope exemptions as per Article 2 (Scope)	**Category 5:** Small equipment
Small IT and telecommunications equipment (no external dimension more than 50 cm) As per Annex III and IV of the European WEEE Directive 2012/19/EU - noting in-scope capacity thresholds and product scope exemptions as per Article 2 (Scope)	**Category 6:** Small IT and telecommunications equipment
All types of batteries and accumulators, regardless of their shape, volume, weight, material composition or use As per Articles 2 (Scope) and 3 (Definitions) of the Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators - noting product use exemptions specified.	**Category 7:** Batteries

Type of PS/EPR framework in place in Switzerland							
Voluntary=V, Co-regulatory=C, Mandatory=M	1	2	3	4	5	6	7
	V	V	V	V	V	V	M
PS/EPR framework and scheme/programme implementation							
	1	2	3	4	5	6	7
	1990	1990	1990	1990	1990	1990	unk.

Population and annual e-waste arisings per capita in Switzerland

E-product categories	1	2	3	4	5	6	7
• Population (2018) = 8,484,000 • Average e-waste generation per inhabitant (2018)	23.38 kg						unk.

Scheme/programme targets	1	2	3	4	5	6	7
• Minimum Product Recovery Targets by weight (Categories 1-6) — N/A • Minimum Product Recovery Targets by weight (Category 7) — As per Article 10 (Collection targets) and Annex I of the European Battery Directive 2006/66/EC	N/A	N/A	N/A	N/A	N/A	N/A	45%
• Minimum Product Recycling Targets by weight (Categories 1-7) — N/A	1	2	3	4	5	6	7
	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Scheme/programme governance and management structure in Switzerland

E-product categories	1	2	3	4	5	6
Governance / management feature:	**YES**	**NO**	**NOTE**			
Single Product Stewardship Organisation (PSO) model		X	Three PSOs operating Switzerland's e-waste programme			
Mandatory NFP status for PSO/s		X	NFP status is not mandatory for PSOs			
Individual Producer Responsibility (IPR) option	X		Voluntary system allows for IPR operations			
Mandatory PSO authorisation		X	Voluntary system in place			

E-product category	7
Governance / management feature:	**YES**	**NO**	**NOTE**
Single Product Stewardship Organisation (PSO) model	X		Single PSO in place (InoBat)
Mandatory NFP status for PSO/s		X	InoBat for profit entity
Individual Producer Responsibility (IPR) option	unk.	unk.	Unknown
Mandatory PSO authorisation	X		InoBat single PSO appointed by Swiss Govt (FOEN)

Scheme/programme fees and funding structure in Switzerland

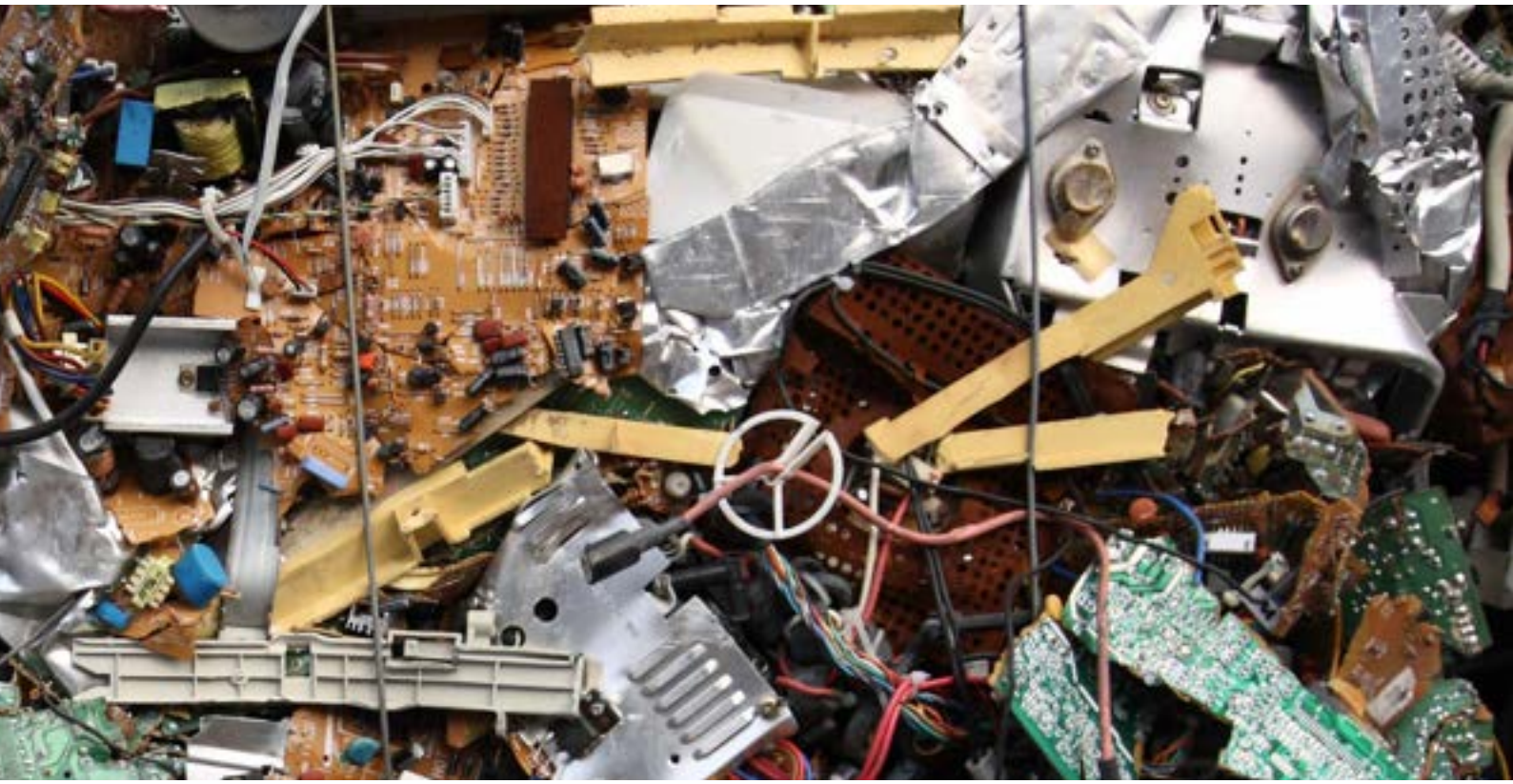
E-product categories	1	2	3	4	5	6
Fee/funding feature:	**YES**	**NO**	**NOTE**			
Advanced disposal fees	X		ADFs are calculated using a defined tariff list of costs (by e-product category)			
Pay as you go funding model		X	Not a scheme/programme feature			
Visible fees at point of sale (POS)	X		Introduced in 1998, based on e-product category			
Fee eco-modulation model		X	Not a scheme/programme feature at present			

E-product category	7
Fee/funding feature:	**YES**	**NO**	**NOTE**
Advanced disposal fees	X		InoBat levies an ADF on behalf of the Federal Office of the Environment (FOEN)
Pay as you go funding model		X	Not a scheme/programme feature at present
Visible fees at point of sale (POS)		X	Not a scheme/programme feature at present
Fee eco-modulation model		X	Not a scheme/programme feature at present

Scheme/programme performance standards, training and certification in Switzerland

E-product categories	1	2	3	4	5	6
Performance standards, training and certification feature:	**YES**	**NO**	**NOTE**			
Mandatory standards for various scheme operations, e.g., collection, storage, transport, treatment	X		Recyclers = CENELEC Standard EN 50625 — must also have an environmental management system in place, e.g., ISO 14001			
Mandatory training for various scheme operations, e.g., collection, storage, transport, treatment		X	N/A — no mandatory training requirements. Mandatory logistics training requirements covered by other official government agencies and corresponding laws, e.g., Federal Office of Transport			
Mandatory Code of Conduct (CoC) for various scheme operations, e.g., collection, storage, transport, treatment	X		Collectors and transporters are required to sign on to a CoC			

E-product category	7
Performance standards, training and certification feature:	**YES**	**NO**	**NOTE**
Mandatory standards for various scheme operations, e.g., collection, storage, transport, treatment	unk.	unk.	Unknown
Mandatory training for various scheme operations, e.g., collection, storage, transport, treatment	unk.	unk.	Unknown
Mandatory Code of Conduct (CoC) for various scheme operations, e.g., collection, storage, transport, treatment	unk.	unk.	Unknown



7.3

SPAIN

Spanish e-product category definitions, in-scope capacity thresholds and product scope exemptions	
Temperature exchange equipment As per Annex III and IV of the Spanish Royal Decree 110/2015 - noting in-scope capacity thresholds as per Article 3 (Definitions) and product scope exemptions as per Annex III and Article 2 (Scope)	**Category 1:** **Temperature exchange equipment**
Screens, monitors, and equipment containing screens having a surface greater than 100 cm² As per Annex III and IV of the Spanish Royal Decree 110/2015 - noting in-scope capacity thresholds as per Article 3 (Definitions) and product scope exemptions as per Article 2 (Scope)	**Category 2:** **Screens and monitors**
Lamps As per Annex III and IV of the Spanish Royal Decree 110/2015 - noting in-scope capacity thresholds as per Article 3 (Definitions) and product scope exemptions as per Article 2 (Scope)	**Category 3:** **Lamps**
Large equipment (any external dimension more than 50 cm) As per Annex III and IV of the Spanish Royal Decree 110/2015 - noting in-scope capacity thresholds as per Article 3 (Definitions) and product scope exemptions as per Article 2 (Scope)	**Category 4:** **Large equipment**
Small equipment (no external dimension more than 50 cm) As per Annex III and IV of the Spanish Royal Decree 110/2015 - noting in-scope capacity thresholds as per Article 3 (Definitions) and product scope exemptions as per Article 2 (Scope)	**Category 5:** **Small equipment**
Small IT and telecommunications equipment (no external dimension more than 50 cm) As per Annex III and IV of the Spanish Royal Decree 110/2015 - noting in-scope capacity thresholds as per Article 3 (Definitions) and product scope exemptions as per Article 2 (Scope)	**Category 6:** **Small IT and telecommunications equipment**
Photovoltaic (PV) panels As per Annex III and IV of the Spanish Royal Decree 110/2015 - noting in-scope capacity thresholds as per Article 3 (Definitions) and product scope exemptions as per Article 2 (Scope)	**Category 7:** **Photovoltaic (PV) panels**
All types of batteries and accumulators, regardless of their shape, volume, weight, material composition or use As per Articles 2 (Scope) and 3 (Definitions) of the Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators - noting product use exemptions specified.	**Category 8:** **Batteries**

Type of PS/EPR framework in place in Spain								
Voluntary=V, Co-regulatory=C, Mandatory=M	1	2	3	4	5	6	7	8
	M	M	M	M	M	M	M	M
PS/EPR framework and scheme/programme implementation in Spain								
	1	2	3	4	5	6	7	8
	2005	2005	2005	2005	2005	2005	2018	2006

Population and annual e-waste arisings per capita in Spain

E-product categories	1	2	3	4	5	6	7	8
• Population (2019) = 46,940,000 • Average e-waste generation per inhabitant (2019)	19 kg							unk.

Scheme/programme targets								
• Minimum Product Recovery Targets by weight (Categories 1 - 7) — As per Annex V, Part 3 of the European WEEE Directive 2012/19/EU, based on average placed on market (POM) figures for preceding three years • Minimum Product Recovery Targets by weight (Category 8) — As per Article 10 (Collection targets) and Annex I of the European Battery Directive 2006/66/EC	1	2	3	4	5	6	7	8
	80%	80%	N/A	85%	75%	75%	85%	45%
• Minimum Product Recycling Targets by weight (Categories 1 - 7) — As per Annex V, Part 3 of the European WEEE Directive 2012/19/EU, based on average placed on market (POM) figures for preceding three years • Minimum Product Recycling Targets by weight (Category 8) — N/A	1	2	3	4	5	6	7	8
	80%	70%	80%	80%	55%	55%	80%	N/A
• Minimum Product Preparation for Reuse Targets by weight (Categories 4 and 6) — As per Annex XVI of the Spanish Royal Decree 110/2015, based on category collection targets set annually	1	2	3	4	5	6	7	8
	N/A	N/A	N/A	3%	N/A	4%	N/A	N/A

Scheme/programme governance and management structure in Spain

E-product categories	1	2	3	4	5	6	7	8
Governance / management feature:		**YES**	**NO**	**NOTE**				
Single Product Stewardship Organisation (PSO) model			X	Multiple PSOs operating Spain's e-waste programme				
Mandatory NFP status for PSO/s		X		NFP status is mandatory for PSOs				
Individual Producer Responsibility (IPR) option		X		Liable parties can opt to acquit own obligation				
Mandatory PSO authorisation		X		PSO authorisation required per stream				

Scheme/programme fees and funding structure in Spain

E-product categories	1	2	3	4	5	6	7
Fee/funding feature:		**YES**	**NO**	**NOTE**			
Advanced disposal fees		X		PSOs forecast fees using POM data and collection targets, charging liable parties annually			
Pay as you go funding model			X	Not a scheme/programme feature			
Visible fees at point of sale (POS)			X	Not a scheme/programme feature			
Fee eco-modulation model			X	Currently investigating EU-wide approach			

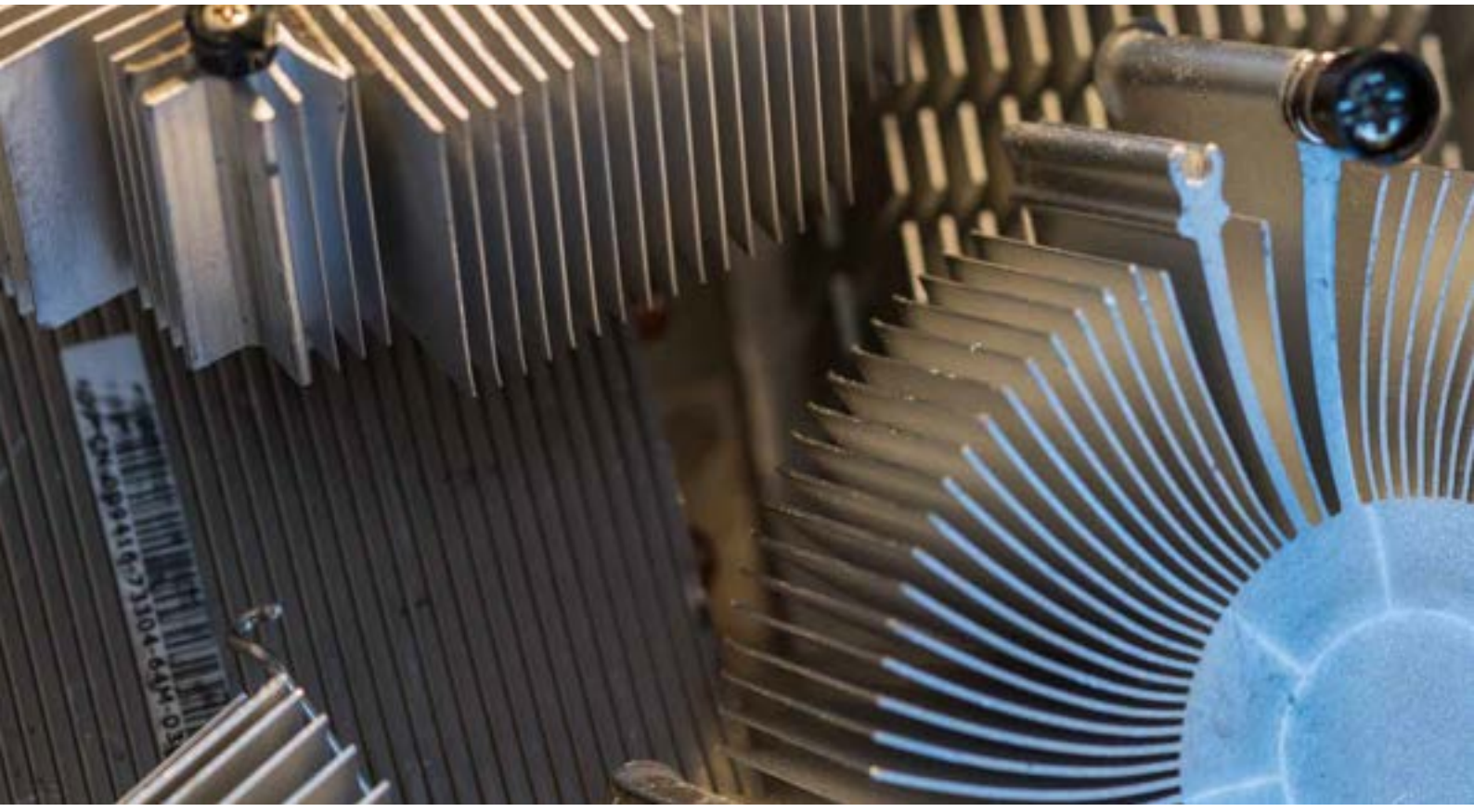
E-product category	8
Fee/funding feature:	
Advanced disposal fees	unk.
Pay as you go funding model	unk.
Visible fees at point of sale (POS)	
Fee eco-modulation model	

YES	**NO**	**NOTE**
unk.	unk.	Unknown
unk.	unk.	Unknown
	X	Not a scheme/programme feature
	X	Currently investigating EU-wide approach

Scheme/programme performance standards, training and certification in Spain

E-product categories	1	2	3	4	5	6	7
Performance standards, training and certification feature:		**YES**	**NO**	**NOTE**			
Mandatory standards for various scheme operations, e.g., collection, storage, transport, treatment			X	Annex XIII, XIV and XV of the Spanish Royal Decree 110/2015 specify mandatory technical requirements for WEEE treatment			
Mandatory training for various scheme operations, e.g., collection, storage, transport, treatment			X	No mandatory training requirements in place			
Mandatory Code of Conduct (CoC) for various scheme operations, e.g., collection, storage, transport, treatment			X	PSO are obliged to follow transparency measures and defined accountability			

E-product category	8
Performance standards, training and certification feature:	**YES**	**NO**	**NOTE**
Mandatory standards for various scheme operations		X	No mandatory standards or certifications required
Mandatory training for various scheme operations		X	No mandatory training requirements in place
Mandatory Code of Conduct (CoC) for various scheme operations	unk.	unk.	Unknown



7.4

UNITED KINGDOM

UK e-product category definitions, in-scope capacity thresholds and product scope exemptions	
Temperature exchange equipment As per Schedules 3 and 4 of the UK Waste Electrical and Electronic Equipment Regulations 2013 — noting in-scope capacity thresholds and product scope exemptions as per PART 2 (Application)	**Category 1:** **Temperature exchange equipment**
Screens, monitors, and equipment containing screens having a surface greater than 100 cm² As per Schedules 3 and 4 of the UK Waste Electrical and Electronic Equipment Regulations 2013 — noting in-scope capacity thresholds and product scope exemptions as per PART 2 (Application)	**Category 2:** **Screens and monitors**
Lamps As per Schedules 3 and 4 of the UK Waste Electrical and Electronic Equipment Regulations 2013 — noting in-scope capacity thresholds and product scope exemptions as per PART 2 (Application)	**Category 3:** **Lamps**
Large equipment As per Schedules 3 and 4 of the UK Waste Electrical and Electronic Equipment Regulations 2013 — noting in-scope capacity thresholds and product scope exemptions as per PART 2 (Application)	**Category 4:** **Large equipment**
Small equipment As per Schedules 3 and 4 of the UK Waste Electrical and Electronic Equipment Regulations 2013 — noting in-scope capacity thresholds and product scope exemptions as per PART 2 (Application)	**Category 5:** **Small equipment**
Small IT and telecommunications equipment (no external dimension more than 50 cm) As per Schedules 3 and 4 of the UK Waste Electrical and Electronic Equipment Regulations 2013 — noting in-scope capacity thresholds and product scope exemptions as per PART 2 (Application)	**Category 6:** **Small IT and telecommunications equipment**
All types of batteries and accumulators, regardless of their shape, volume, weight, material composition or use As per Articles 2 (Scope) and 3 (Definitions) of the Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators — noting product use exemptions specified.	**Category 7:** **Batteries**

Type of PS/EPR framework in place in the UK							
Voluntary=V, Co-regulatory=C, Mandatory=M	1	2	3	4	5	6	7
	M	M	M	M	M	M	M
PS/EPR framework and scheme/programme implementation							
• Categories 1-6: European WEEE Directive 2012/19/EU	1	2	3	4	5	6	7
• Category 7: European Battery Directive 2006/66/EC	2007	2007	2007	2007	2007	2007	2010

Population and annual e-waste arisings per capita in the UK

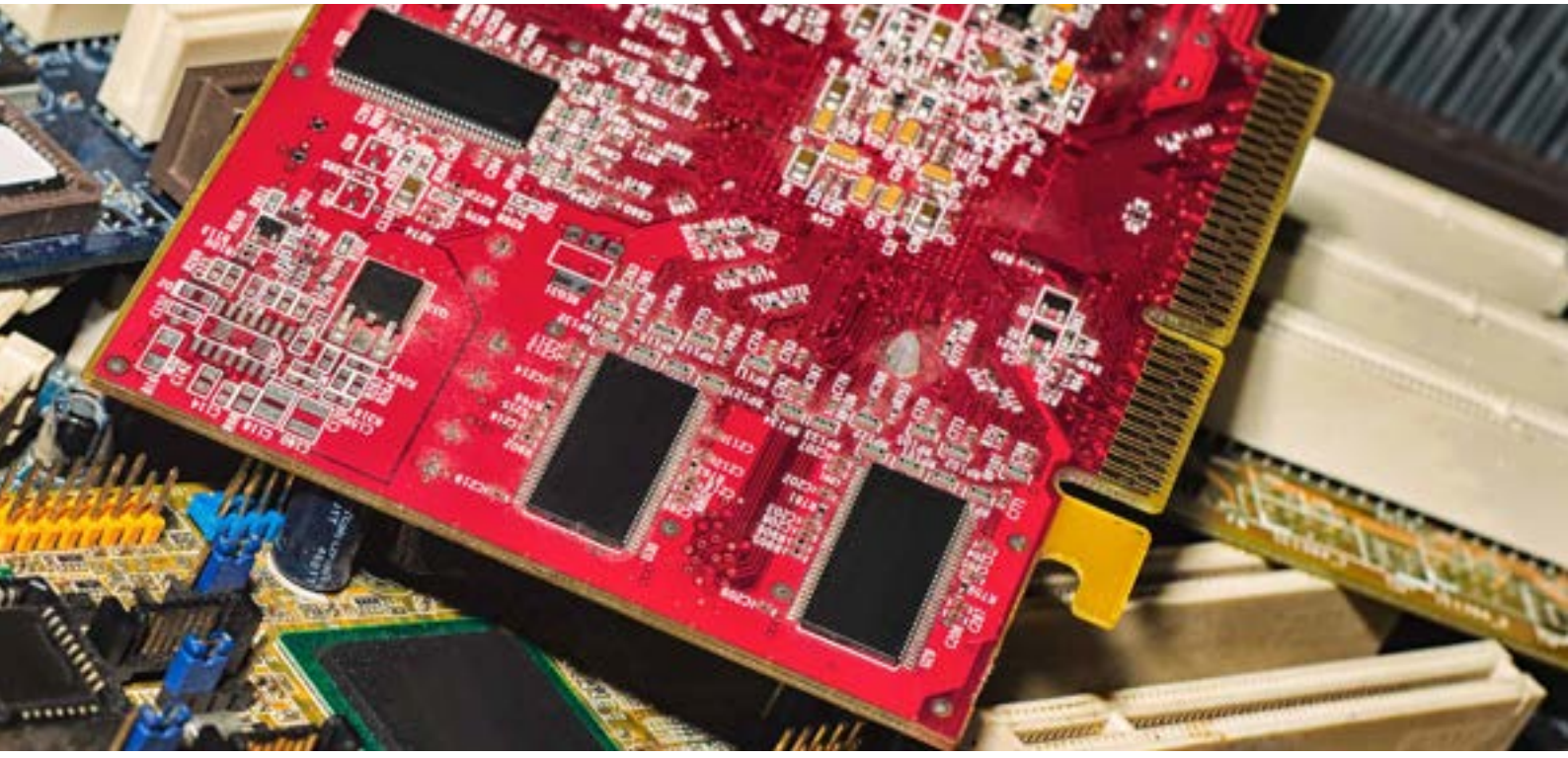
E-product categories	1	2	3	4	5	6	7
• Population (2018) = 66,040,000 • Average e-waste generation per inhabitant (2018)	23.32 kg						unk.

Scheme/programme targets							
• Minimum Product Recovery Targets by weight (Categories 1-6) — As per Annex V, Part 3 of the European WEEE Directive 2012/19/EU, based on average placed on market (POM) figures for preceding three years • Minimum Product Recovery Targets by weight (Category 7) — As per Article 10 (Collection targets) and Annex I of the European Battery Directive 2006/66/EC	1	2	3	4	5	6	7
	85%	80%	N/A	85%	75%	75%	45%
• Minimum Product Recycling Targets by weight (Categories 1-6) — As per Annex V, Part 3 of the European WEEE Directive 2012/19/EU, based on average placed on market (POM) figures for preceding three years • Minimum Product Recycling Targets by weight (Category 7)	1	2	3	4	5	6	7
	80%	70%	80%	80%	55%	55%	N/A

Scheme/programme governance and management structure in the UK

E-product categories	1	2	3	4	5	6
Governance / management feature:	**YES**	**NO**	**NOTE**			
Single Product Stewardship Organisation (PSO) model		X	27 PSOs operating the UK's e-waste programme			
Mandatory NFP status for PSO/s		X	NFP status is not mandatory for PSOs			
Individual Producer Responsibility (IPR) option	unk.	unk.	Unknown			
Mandatory PSO authorisation	unk.	unk.	Unknown			

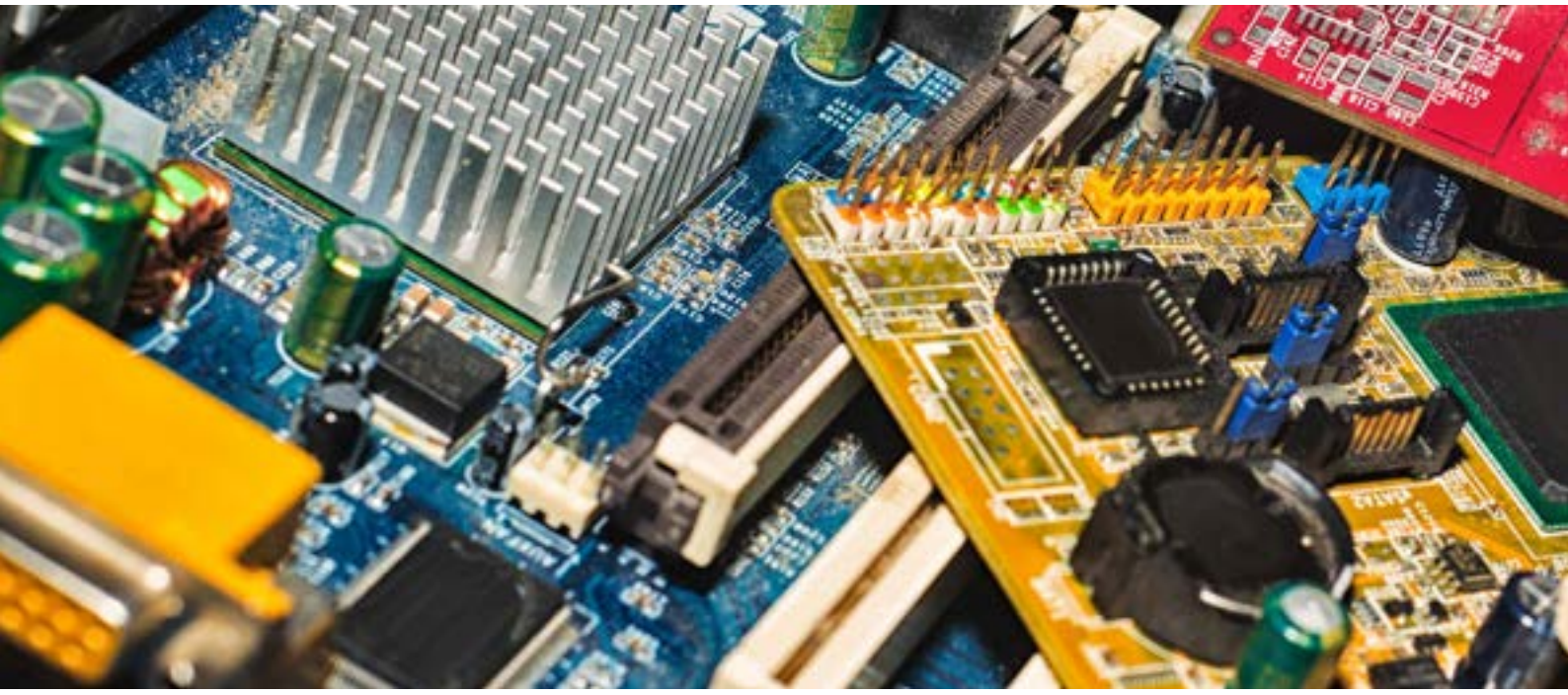
E-product category	7
Governance / management feature:	**YES**	**NO**	**NOTE**
Single Product Stewardship Organisation (PSO) model		X	Five approved Battery Compliance schemes
Mandatory NFP status for PSO/s		X	Not a scheme/programme feature
Individual Producer Responsibility (IPR) option	unk.	unk.	Unknown
Mandatory PSO authorisation	unk.	unk.	Unknown



Scheme/programme fees and funding structure in the UK

E-product categories	1	2	3	4	5	6
Fee/funding feature:	**YES**	**NO**	**NOTE**			
Advanced disposal fees	X		PSOs forecast fees using POM data and collection targets, charging liable parties annually			
Pay as you go funding model		X	Not a scheme/programme feature			
Visible fees at point of sale (POS)		X	Major resistance from UK retail sector noted in 2007			
Fee eco-modulation model		X	Not a scheme/programme feature at present			

E-product category	7
Fee/funding feature:	**YES**	**NO**	**NOTE**
Advanced disposal fees	X		PSOs forecast fees using POM data and collection targets, charging liable parties annually
Pay as you go funding model		X	Not a scheme/programme feature at present
Visible fees at point of sale (POS)		X	Not a scheme/programme feature at present
Fee eco-modulation model		X	Not a scheme/programme feature at present



Scheme/programme performance standards, training and certification in the UK

E-product categories	1	2	3	4	5	6
Performance standards, training and certification feature:	**YES**	**NO**	**NOTE**			
Mandatory standards for various scheme operations, e.g., collection, storage, transport, treatment		X	No mandatory standards or certifications required			
Mandatory training for various scheme operations, e.g., collection, storage, transport, treatment		X	No mandatory training requirements in place			
Mandatory Code of Conduct (CoC) for various scheme operations, e.g., collection, storage, transport, treatment		X	No mandatory CoC requirements in place			

E-product category	7
Performance standards, training and certification feature:	**YES**	**NO**	**NOTE**
Mandatory standards for various scheme operations	X		Mandatory standards set for recyclers
Mandatory training for various scheme operations		X	No mandatory training requirements in place
Mandatory Code of Conduct (CoC) for various scheme operations		X	No mandatory COC requirements in place

7.5

JAPAN

Japanese e-product category definitions, in-scope capacity thresholds and product scope exemptions	
Home air conditioners As per the 'Home appliances specified by cabinet order' section of the Act on the Recycling of Specified Kinds of Home Appliances (Home Appliance Recycling Act)	**Category 1:** **Home air conditioners**
TVs As per the 'Home appliances specified by cabinet order' section of the Act on the Recycling of Specified Kinds of Home Appliances (Home Appliance Recycling Act)	**Category 2:** **TVs (CRT, liquid crystal and plasma TVs)**
Refrigerators and freezers As per the 'Home appliances specified by cabinet order' section of the Act on the Recycling of Specified Kinds of Home Appliances (Home Appliance Recycling Act)	**Category 3:** **Refrigerators and freezers**
Washing machines and clothes dryers As per the 'Home appliances specified by cabinet order' section of the Act on the Recycling of Specified Kinds of Home Appliances (Home Appliance Recycling Act)	**Category 4:** **Washing machines and clothes dryers**
Small electronic and electrical appliances—covering a wide range of electric/electronic appliances excluding categories 1–4 As per the 2012 Law for Recycling of Small Electronic Appliances	**Category 5:** **Small electronic and electrical appliances**
Batteries—covering compact rechargeable batteries (sealed nickel-cadmium, sealed nickel-metal-hydride, lithium) As per the 2000 Act for Promotion of Effective Utilisation of Resource	**Category 6:** **Batteries**

Type of PS/EPR framework in place in Japan						
Voluntary=V, Co-regulatory=C, Mandatory=M	1	2	3	4	5	6
	M	M	M	M	V	V
PS/EPR framework and scheme/programme implementation						
• Categories 1-4: Law for the Recycling of Specified Kinds of Home Appliances (Home Appliance Recycling Law) • Category 5: 2012 Law for Recycling of Small Electronic Appliances • Category 6: 2000 Act for Promotion of Effective Utilisation of Resource	1	2	3	4	5	6
	2001	2001	2001	2001	2013	2001

Population and annual e-waste arisings per capita in Japan

E-product categories	1	2	3	4	5	6
• Population (2019) = 126,300,000 • Average e-waste generation per inhabitant (2019)	20.4 kg					0.59 kg

Scheme/programme targets						
• Minimum Product Recovery Targets by weight (Categories 1-7) - N/A	1	2	3	4	5	6
	N/A	N/A	N/A	N/A	N/A	N/A
• Minimum Product Recycling Targets by weight (Categories 1–4) — As per the 'Recycling' section of the Act on the Recycling of Specified Kinds of Home Appliances (Home Appliance Recycling Act) • Minimum Product Recycling Targets by weight (Category 5) — N/A • Minimum Product Recycling Targets by weight (Category 6) — The Law for the Promotion of Effective Utlisation of Resources sets differing recycling targets for different battery chemistries	1	2	3	4	5	6
	80%	74%	70%	82%	N/A	30% - 60%

Scheme/programme governance and management structure in Japan

E-product categories			1 2 3 4
Governance / management feature:	**YES**	**NO**	**NOTE**
Single Product Stewardship Organisation (PSO) model		X	There are two PSOs that operate under the Home Appliance Recycling Law; Ecology Net Co., and R Station Corporation
Mandatory NFP status for PSO/s		X	There is no evidence that either PSO is NFP
Individual Producer Responsibility (IPR) option		X	Manufacturers are responsible for collecting and managing the recycling of products after use (not a scheme design option)
Mandatory PSO authorisation	X		Manufacturers must recycle appliances whose volume production is over specified thresholds — If production numbers are lower, Designated Corporations must be used to facilitate the recycling

E-product category			5
Governance / management feature:	**YES**	**NO**	**NOTE**
Single Product Stewardship Organisation (PSO) model		X	Different stakeholders have different responsibilities throughout the programme
Mandatory NFP status for PSO/s		X	Voluntary framework
Individual Producer Responsibility (IPR) option		X	Voluntary framework
Mandatory PSO authorisation		X	Voluntary framework

E-product category			6
Governance / management feature:	**YES**	**NO**	**NOTE**
Single Product Stewardship Organisation (PSO) model	X		The Japan Portable Rechargeable Battery Recycling Centre (JBRC) acts as a PSO for the recycling of batteries
Mandatory NFP status for PSO/s		X	Voluntary framework
Individual Producer Responsibility (IPR) option		X	All delivered through JBRC: processes collection requests from retailers and arranges the transportation of these batteries to recycling facilities
Mandatory PSO authorisation		X	Voluntary framework

Scheme/programme fees and funding structure in Japan

E-product categories		1	2	3	4
Fee/funding feature:	**YES**	**NO**	**NOTE**		
Advanced disposal fees		X	Pay as you go system in place		
Pay as you go funding model	X		Consumers pay fees, determined by retailers, for the appliances to be collected and transported and fees are charged by the manufacturer for the recycling		
Visible fees at point of sale (POS)	X		A breakdown of fees is available and consumers are issued with a Recycling Ticket that provides transparency over the recycling process		
Fee eco-modulation model		X	Not a scheme/programme feature at present		

E-product category		5
Fee/funding feature:	**YES**	**NO**	**NOTE**
Advanced disposal fees		X	The national government are responsible for securing funds to support municipalities with the collection of products and the transport to recyclers — Recyclers are expected to make profits from the metals recovered to cover the cost of recycling
Pay as you go funding model		X	Consumers can drop off e-waste for free
Visible fees at point of sale (POS)		X	Not a scheme/programme feature at present
Fee eco-modulation model		X	There is no eco-modulation model; however, manufacturers have an obligation under the law to make efforts to reduce the cost of recycling by improving product design and utilising recycled materials in their production

E-product category		6
Fee/funding feature:	**YES**	**NO**	**NOTE**
Advanced disposal fees	unk.	unk.	Voluntary framework — fee/funding structure unknown
Pay as you go funding model	unk.	unk.	Voluntary framework — fee/funding structure unknown
Visible fees at point of sale (POS)	unk.	unk.	Voluntary framework — fee/funding structure unknown
Fee eco-modulation model	unk.	unk.	Voluntary framework — fee/funding structure unknown

Scheme/programme performance standards, training and certification in Japan

E-product categories			1 2 3 4
Performance standards, training and certification feature:	**YES**	**NO**	**NOTE**
Mandatory standards for various scheme operations, e.g., collection, storage, transport, treatment		X	PSOs make regular on-site inspections of recycling plants under their influence to assess whether processing is at the required standard and to inspect material flows and output destinations — Waste Management contractors must be granted a licence under the Waste Management Law for the handling or transport of products
Mandatory training for various scheme operations, e.g., collection, storage, transport, treatment		X	Not a scheme/programme feature at present
Mandatory Code of Conduct (CoC) for various scheme operations, e.g., collection, storage, transport, treatment		X	No evidence of a mandatory code of conduct across the scheme operators

E-product category			5
Performance standards, training and certification feature:	**YES**	**NO**	**NOTE**
Mandatory standards for various scheme operations, e.g., collection, storage, transport, treatment	X		Only authorised businesses are licensed to recycle products — Certification is done by the Ministry of Environment and a list of certified operators is available online
Mandatory training for various scheme operations, e.g., collection, storage, transport, treatment		X	There is no mandatory training for scheme operators — The Government are responsible for compiling information to support the municipalities with collection, storage and transport
Mandatory Code of Conduct (CoC) for various scheme operations, e.g., collection, storage, transport, treatment		X	No established Code of Conduct across the different scheme operators — However, all recyclers must apply for certification from the Government to recycle products under the Act on Promotion of Recycling of Used Small Electronics

E-product category			6
Performance standards, training and certification feature:	**YES**	**NO**	**NOTE**
Mandatory standards for various scheme operations, e.g., collection, storage, transport, treatment		X	Not a scheme/programme feature at present
Mandatory training for various scheme operations, e.g., collection, storage, transport, treatment		X	Guidance is provided to collection locations on not mixing battery types and on taping terminals to prevent short-circuit
Mandatory Code of Conduct (CoC) for various scheme operations, e.g., collection, storage, transport, treatment	X		The JBRC issues recycling instruction and collection and delivery instructions to the transporters that align to the regional system that is based on the Waste Management Law

7.6

REPUBLIC OF KOREA

South Korean e-product category definitions, in-scope capacity thresholds and product scope exemptions	
Large-scale equipment As per Article 14 of the presidential decree of the South Korean Act on Resource Recirculation of Electrical and Electronic Waste and End of Life Vehicles	**Category 1:** **Large-scale equipment**
Telecommunications devices As per Article 14 of the presidential decree of the South Korean Act on Resource Recirculation of Electrical and Electronic Waste and End of Life Vehicles	**Category 2:** **Telecommunications devices**
Medium equipment As per Article 14 of the presidential decree of the South Korean Act on Resource Recirculation of Electrical and Electronic Waste and End of Life Vehicles	**Category 3:** **Medium equipment**
Small equipment As per Article 14 of the presidential decree of the South Korean Act on Resource Recirculation of Electrical and Electronic Waste and End of Life Vehicles	**Category 4:** **Small equipment**
Cellular phones As per Article 14 of the presidential decree of the South Korean Act on Resource Recirculation of Electrical and Electronic Waste and End of Life Vehicles	**Category 5:** **Cellular phones**

Type of PS/EPR framework in place	1	2	3	4	5
• Voluntary=V, Co-regulatory=C, Mandatory=M	M	M	M	M	M
PS/EPR framework and scheme/programme implementation					
• Categories 1-5: South Korean Act on Resource Recirculation of Electrical and Electronic Waste and End of Life Vehicles	1992	2003	2003	2003	2003

Population and annual e-waste arisings per capita in South Korea

E-product categories	1	2	3	4	5
• Population (2019) = 51,710,000 • Average e-waste generation per inhabitant (2019)	15.8 kg				

Scheme/programme targets	1	2	3	4	5
• Minimum Product Recovery Targets by weight (Categories 1 - 5) — As per Article 16 of the South Korean Act on Resource Recirculation of Electrical and Electronic Waste and End of Life Vehicles	Varies	Varies	Varies	Varies	Varies
• Minimum Product Recycling Targets by weight (Categories 1 - 5) — The annual mandatory recycling rate of each product is determined by the Korea Ministry Of Environment (MOE), based on the target recycling rates over the previous years, the amount of electrical and electronic products shipped from the warehouse, and the recycling market conditions	Varies	Varies	Varies	Varies	Varies

Scheme/programme governance and management structure in South Korea

E-product categories			1	2	3	4	5
Governance / management feature:	**YES**	**NO**	**NOTE**				
Single Product Stewardship Organisation (PSO) model	X		Single PRO system				
Mandatory NFP status for PSO/s	unk.	unk.	Unknown				
Individual Producer Responsibility (IPR) option		X	Not a scheme/programme feature at present				
Mandatory PSO authorisation	unk.	unk.	Unknown				

Scheme/programme fees and funding structure in South Korea

E-product categories			1	2	3	4	5
Fee/funding feature:	**YES**	**NO**	**NOTE**				
Advanced disposal fees	unk.	unk.	Unknown				
Pay as you go funding model	unk.	unk.	Unknown				
Visible fees at point of sale (POS)	unk.	unk.	Unknown				
Fee eco-modulation model	unk.	unk.	Unknown				

Scheme/programme performance standards, training and certification in South Korea

E-product categories			1	2	3	4	5
Performance standards, training and certification feature:	**YES**	**NO**	**NOTE**				
Mandatory standards for various scheme operations, e.g., collection, storage, transport, treatment	unk.	unk.	Unknown				
Mandatory training for various scheme operations, e.g., collection, storage, transport, treatment	unk.	unk.	Unknown				
Mandatory Code of Conduct (CoC) for various scheme operations, e.g., collection, storage, transport, treatment	unk.	unk.	Unknown				

OBSERVATIONS AND LEARNINGS FROM THIS INTERNATIONAL RESEARCH HAVE BEEN DOCUMENTED AND ASSESSED

8

LEARNINGS ACROSS KEY LEGISLATIVE AND PROGRAMME DESIGN ASPECTS

Following the Aotearoa New Zealand Government's General Guidelines for Product Stewardship Schemes for Priority Products Notice 2020[21], observations and learnings from this international research have been documented and assessed across the following focus areas:

- Objectives and intended outcomes
- Fees, funding and cost effectiveness
- Governance
- Targets
- Performance standards, training and certification
- Liability and insurance
- Design for environment
- Reporting and public accountability
- Education and awareness
- Monitoring, compliance and enforcement
- Accessible collection networks/ recovery and collection
- Market development and Government support
- Defined roles and responsibilities — all actors

Nuances, connections and further considerations across the research areas in focus are highlighted and discussed in the following sections.

8.1

OBJECTIVES AND INTENDED OUTCOMES

The international jurisdictions included in this research and the respective extended producer responsibility programmes and e-product stewardship schemes investigated share three common and overarching goals with respect to implementing shared responsibility approaches for e-products. These include:

1. Preserving, protecting and improving the quality of the environment.
2. Protecting human health.
3. Utilising natural resources responsibly.

Specific objectives and intended outcomes vary by jurisdiction and e-product category. Across European Member States these are principally guided by the shared responsibility frameworks established under the European WEEE and Battery Directives and are specified in corresponding country-specific e-product and e-waste legislation. The key factors that drove the establishment of voluntary and mandatory arrangements for e-products in Japan and the Republic of Korea were the growing need to recapture and recirculate recoverable resources for manufacturing activities, make local supply chains more resilient and limited land or landfills available for waste disposal.

The majority of schemes researched have collection/recovery and material recovery targets to measure a scheme's operational performance in line with objectives and intended outcomes.

Accompanying these targets are aspirational goals around developing and implementing interventions that enable circular economy outcomes and, where possible, incorporate waste prevention, product repair and reuse initiatives.

As noted in the case of Spain's extended producer responsibility programme for e-products in section 7, the Spanish Government is pioneering preparation for reuse as a core element of its extended producer responsibility programme and has specified preparation for reuse targets for categories 4 (large equipment) and 6 (ICT equipment) in the Spanish Royal Decree 110/2015.

8.2

FEES, FUNDING AND COST-EFFECTIVENESS

There are two main funding models used by jurisdictions to fund scheme operations:

1. *Advanced disposal fee models: a fee is charged for each new e-product placed on the market.*
2. *Product recovery and recycling fee models: fees are set for the collection and recycling systems based on actual costs.*

Advanced disposal fees are calculated and charged using POM data (e.g. e-product import data) and corresponding collection and recycling targets for a given e-product category. POM data is either self-reported by those deemed liable and verified by the respective scheme regulator, or a process is established whereby the scheme regulator uses available POM data and assigns liable party obligations directly to those deemed liable or to the nominated PSO appointed to acquit a liable party's confirmed obligation.

In all cases, fees are set across individual product categories that are typically allocated annually, as forecasted by the operational targets that must be met and the corresponding local market costs. These fees generally cover a scheme's operational expenses, e.g., collection, storage, transport, treatment, management, education and awareness. It was noted in the case of Spain's jurisdictional investigations that PSOs reserve the right to review annual fee structures set throughout the year and pass on additional expenses incurred as a result of any major scheme or market related impacts, e.g., COVID-19 related impacts led to increased PSO member fees in 2020.

Under advanced disposal fee mechanisms, visible fees can also be set and promoted at the e-product point of sale. Visible fees aim to provide transparency around the product life-cycle management costs post a product's (initial) useful life cycle and are also used as an educational tool to raise consumer awareness around a scheme's availability. Of the jurisdictions included in this research, Ireland was the only example with visible fees in place and WEEE Ireland, one of the two PSOs, expressed a positive experience with visible fees. However, in the UK it was noted that there was a big push to incorporate visible fee approaches at the beginning of its scheme design process (between 2004 and 2007), which led to major resistance and concerns raised by e-product retailers. They stated that this approach could lead to unrecoverable administrative costs, serious issues around market competition and severely impact the way they market and price their products.

Fee eco-modulation is a relatively new funding approach where those deemed liable provide scaled contributions for a scheme's operation, modulated on the basis of environmental criteria linked with a product's end-of-life management requirements and not giving rise to the transfer of pollution to another stage of the product's life cycle[22]. The modulation criteria are tied in with a products suitability for repair and reuse, depollution, suitability for recycling and waste prevention, and is applied to e-product categories considered high risk due to the material make-up and potential impacts to human health and the environment.

France is the only jurisdiction researched that has implemented an eco-modulated funding model for its e-product extended producer responsibility programme in Europe. There are specific environmental criteria for all refrigerators and freezers, washing machines, dishwashers, vacuum cleaners, kettles, computers, tablets, printers, telephones, televisions, lamps, electric drills and gaming consoles. These criteria provide a framework to (a) penalise non-conformity with requirements set through increased fee contributions and (b) reward or incentivise circular and environmentally friendly product design through reduced fee contributions.

The Republic of Korea's extended producer responsibility programme for e-products also charges those deemed liable through an advance disposal fee mechanism for products which contain hazardous substances, are difficult to recycle, or are likely to cause significant management problems. This targeted fee approach works to promote and incentivise e-product designs that are easier to dismantle and recycle, and contain fewer harmful substances. This fee also helps to internalise management costs for smaller waste streams which would be too costly to run take-back services otherwise.

Although all of the international experts consulted were supportive of fee eco-modulation approaches in-principle, and noted that fee eco-modulation may lead to effective stewardship interventions from the top of the waste hierarchy, the following themes and ongoing developments were identified:

- Fees must cover real costs for end-of-life waste management and fee modulation must provide true incentives for producers.
- While the philosophy is good and well-intended, fee eco-modulation approaches are difficult to apply in practice and accurately measure.
- It may not be fair or reasonable to waive certain costs for some e-products and not others. Measurable criteria supported by a robust evidence base, are essential.
- Modulated fee criteria should be simple, auditable and enforceable and must be enforced.
- Modulated fee criteria must be defined in close consultation with the relevant stakeholders, in particular with producers.
- Fee eco-modulation makes the most sense if a harmonised approach is followed. Disparate approaches towards fee eco-modulation can lead to inconsistent criteria across different jurisdictions, making compliance too complex for producers operating in a global market.
- There should be sufficient implementation time for producers to adapt their processes, particularly the design of e-products.
- A European taskforce has been established through the WEEE Forum which is currently exploring the best options for a harmonised fee eco-modulation approach across Europe.

Under product recovery and recycling fee models, PSOs charge members to cover scheme costs for the actual volume collected and recycled in a certain period, as driven by scheme targets set. PSOs charge members directly and, like in the case of the advanced fee mechanism, POM data is used to determine corresponding scheme targets by e-product category. Funding models for voluntary or industry-led schemes generally follow the product recovery and recycling fee models, noting that voluntary arrangements, in most cases, are not underpinned by operational or performance based targets.

It was noted that product recovery and recycling fee models may be more appropriate for e-product categories and streams that have a long life cycle expectancy and lengthy periods between selling a product and the product being collected for recycling. In the case of PV panels this can be between 15–45 years due to the long product lifespan. The cost of recycling a PV panel now is likely to be very different to the cost of recycling at the end of its life. There have been examples in Europe where PSOs with advanced disposal fees end up accumulating large cash reserves because the future costs of collection and recycling have not been estimated accurately, in part due to fluctuating commodity prices.

In the United Kingdom there is an alternate means of compliance to support the delivery of the UK WEEE regulations. If a scheme operator misses collection targets for a given e-product category, it can pay into a compliance fee fund. The fee is based on how far the target is missed and effectively recovers the costs associated with the uncollected volume. The fund is then used to support projects that are in the interest of the e-waste sector. Historically, activities funded span from programme education and awareness campaigns to technical studies that seek to address the impact of persistent organic pollutant (POP) plastics in e-products and the development of protocols for battery fire prevention.

Japan's 2012 Law for Recycling of Small Electronic Appliances, which covers a wide range of small e-products from personal computers to other IT and communication technologies, no programme fees are set, as e-product recyclers are expected to profit from the valuable and rare earth metals recovered, e.g., gold, silver copper and palladium.

For e-product categories captured by Japan's Act on the Recycling of Specified Kinds of Home Appliances (as noted in section 7), an 'after-use system' or user pays approach is followed, where consumers pay fees at the point of product disposal related to post-consumer life-cycle management activities. The payment after-use system has been implemented to firstly enable the collection of recycling fees and secondly, to consider the long usage periods of appliances during which the collection cost and recycling process might change, therefore reflecting the true cost of recycling to consumers. Consumers pay both a collection/transportation fee, which is set by the retailers, and a recycling fee which is set by the manufacturers. Collection fees depend on the transportation distance as well as the type and size of the waste home appliances. Different manufacturers charge different recycling fees, and these are subject to regular review[23].

8.3

GOVERNANCE

The degree of governance for the schemes investigated differ by jurisdiction, e-product category and whether the system is voluntary or regulatory in nature.

Regulated scheme governance

Of the regulatory systems assessed, governance aspects are specified in legislation and there are clearly defined roles and responsibilities across the actors noted. Regulatory systems are also subject to regular reviews where scheme governance aspects are assessed and updated as necessary.

Many regulatory systems also provide options for IPR approaches whereby those deemed liable (e.g. producers) can opt to coordinate their own stewardship efforts rather than through a PSO. This can include outsourced IPR services to suitable market service providers, while complying with the key requirements that must be met e.g., product collection and material recovery targets and governance requirements. IPR approaches provide flexibility in the way a liable party can address their own obligation and deliver programmes that achieve the specified requirements.

In order for scheme governance structures and requirements to be effective, strong enforcement of requirements is vitally important and will ensure a level playing field for all actors, whilst providing assurances that all recovered products are managed in a safe and environmentally sound manner. As noted in section 8.10, programme and scheme compliance monitoring and enforcement activities are typically led by a government agency designated to be the scheme regulator; however, they are often coordinated in collaboration with PSOs.

In all cases, there are separate programmes, programme operators and corresponding legislation specific to managing end-of-life and waste batteries. Batteries and other e-product PSOs in some cases trade recovered products between schemes, especially where e-products have embedded batteries or when e-waste collections are contaminated with loose batteries (which are out of scope).

Voluntary scheme governance

For voluntary or industry led arrangements, there can be robust governance systems and effective stewardship programmes in place. However, this is not guaranteed, and governance arrangements vary by jurisdiction and respective voluntary or industry-led programmes.

In Australia the Recycling and Waste Reduction Act 2020 provides for accreditation of voluntary product stewardship schemes that demonstrate they are designed to meet the objectives of the Recycling and Waste Reduction Act 2020 and other criteria, including governance frameworks.

New Zealand's Waste Minimisation Act 2008 also provides a formal process to accredit voluntary product stewardship schemes. Presently there are three voluntary accredited schemes for e-products in Aotearoa New Zealand, including the Fuji Xerox Zero Landfill Scheme, the New Zealand Telecommunications Forum RE:mobile programme and Sharp's Comprehensive Waste Reduction Scheme.

Multiple PSOs governance

Governance structures and PSO requirements vary greatly across the jurisdictions, programmes and schemes investigated. PSO models and requirements can range from mandating a single PSO with NFP status, right through to more than 25 PSOs operating in a single market with a mix of NFP and for profit organisations (refer to section 7).

Some of the difficulties noted in consultation across governance arrangements in systems where there are multiple PSOs operating in a single market are:

- Scheme targets can be difficult to meet when there are multiple PSOs targeting the same e-products, and this can lead to ineffective enforcement of compliance requirements if the scheme regulator cannot identify who is at fault.
- Where PSOs compete on price and are solely profit driven, they can compromise on the objectives and intended outcomes of the scheme. In some cases, this has led to fraudulent behaviour where volume is sourced from offshore markets or recycling certificates are falsely created.
- The size and scale of a jurisdiction's market may not warrant or benefit from a multiple PSO model. In the example of the Netherlands, its scheme started with a single PSO structure, shifted to a multiple PSO model, and is now in the process of moving back to a single PSO model.
- Multiple PSOs in a single market can lead to overlapping collection networks or duplication of scheme access points, particularly in areas with high population density.

Codes of conduct and contractual arrangements

Service agreements and contracts with terms and conditions and codes of ethical conduct are also used as a tool by PSOs to establish governance arrangements. For example, Swiss-based PSO SENS eRecycling has developed a code of ethical conduct that all programme service providers are mandated to sign on to. This code of conduct aims to clearly specify what is expected of service providers across their programme network and develops principles of conducting business operations in accordance with all applicable laws and in a socially responsible manner. Known violations or non-compliance with the terms specified can be enforced in various ways, i.e., issuing official warnings or terminating a collection partner or service agreement altogether. All forms of corruption, extortion and embezzlement are strictly prohibited.

Australian-based PSO ANZRP has developed a site licence agreement for collection site partners and a recycling services agreement for recyclers. Both of these agreements include requirements to conduct business operations in accordance with applicable laws and standards, requirements for independent auditing and various reporting processes.

8.4

TARGETS

There are two fundamental performance measures that underpin the objectives and intended outcomes of each scheme researched — e-product collection/ recovery targets, i.e., a minimum amount of e-products that must be collected for recycling (tonnes) and material recovery targets, i.e., a minimum amount of a total product by weight that must be recovered through recycling activities (percentage). As noted in section 8.2, these targets are typically informed by POM data, either for individual e-product categories or across the full scope of e-products included, and, in some cases, they can be increased over time.

It was noted that scaling factors can be applied to e-product collection targets, accounting for market leakage where e-products are exported from one jurisdiction or are not available for recycling at the end of their first life as they are reused, repaired or refurbished. Recycling targets also need to take into account the capacity and capability of the local recycling market in the jurisdiction, or accessibility of offshore recycling markets.

Australia's National Television and Computer Recycling Scheme (NTCRS) adjusts POM data by scaling factors to calculate waste arising. The scaling factors take into account that not all new e-product imports result in available e-waste to the NTCRS in the same year due to (a) product being exported for reuse and (b) the fact that not all purchases of new products are replacement purchases. There are different scaling factors for televisions, computers, printers and parts/peripherals. The scaling factors were last updated in 2018 (based upon Australian Bureau of Statistics export data).

Corresponding collection and material recovery targets for the jurisdictional profiles researched are specified in section 7.

Over and above e-product collection/ recycling and material recovery targets, some regulatory systems also establish complementary targets which are intended to enable equitable access to scheme collection points, or support life cycle extension initiatives that align with principles of a circular economy.

Australia's NTCRS requires PSOs to achieve reasonable access targets for metropolitan, inner-regional, outer-regional and remote areas as follows:

- **Metropolitan areas:** For each metropolitan area, the number of collection services provided in each financial year must at least equal the population of that area divided by 250,000 and rounded up to the closest whole number.
- **Inner regional areas:**
  - At least one service must be provided for every town of 10,000 people or more in each financial year.
  - A service will be provided to a town if the service is available within 100km of the centre point of that town.
- **Outer regional areas:**
  - At least one service must be provided for every town of 4,000 people or more in each financial year.
  - A service will be provided to a town if the service is available within 150km of the centre point of that town.
- **Remote areas:**
  - At least one service must be provided for every town of 2,000 people or more, once every 2 financial years.
  - A service will be provided to a town if the service is available within 200km of the centre point of that town.

Australia's NTCRS was the only product stewardship scheme investigated that has specific targets for reasonable access in place and this speaks to the large geographical distances to cover and remoteness of different areas to scheme access and service points. Collection service options include:

- Programmes under which consumers can submit in-scope products for recycling by mail or courier.
- Events at which consumers may submit in-scope products for recycling.
- Collection stations established solely for consumers to submit in-scope products for recycling.
- Locations where consumers may submit in-scope products for recycling, but which are also used for other purposes.
- Programmes under which consumers may register in-scope products for collection at a designated point within a specified time.

The NTCRS has experienced some challenges in the governance of the reasonable access target, namely the utilisation of loopholes in the regulations by some PSOs to minimise the services they provide in more expensive areas (e.g., remote locations). To address this issue such targets need to have clear minimum requirements. There is also the situation where inefficient duplication occurs in some locations due to services being provided by competing PSOs. This could be addressed through an allocation model or having services provided by a third party and costs equitably shared by PSOs based on market share.

As noted in the case of Spain's extended producer responsibility programme for e-products in section 7, the Spanish Government is pioneering preparation for reuse as a core element of their extended producer responsibility programme and have specified preparation for reuse targets for categories 4 (large equipment) and 6 (ICT equipment) in Spanish Royal Decree 110/2015. The point of distinction between direct reuse and preparation for reuse is made around the disposal action from the e-product owner. If the e-product is unwanted and is disposed of in a scheme collection point but is still in good working order, then it can be diverted by a programme collector from recycling channels and treated for reuse. If the unwanted e-product is still in good working order and is gifted or donated for direct reuse, then the e-product does not meet the criteria for this target. It was noted in consultation with Spanish PSO Ecotic, that it can be difficult to verify this point of distinction and the two e-product categories where these targets apply were determined by Spain's Ministry for Environment.

Unlike other European Member States with regulatory systems following the frameworks set by the European WEEE and Battery Directives, Spain has extracted PV panels from category 4 and has created a dedicated category for these e-products. This approach acknowledges that PV panels are only beginning to reach their end of life and enter the national waste stream in large quantities, and as a life cycle of up to 45 years can be expected, it can be almost impossible to meet recovery targets set under category 4. This new category also acknowledges that PV panel repair services are relatively non-existent and therefore are not subject to the preparation for reuse targets that apply for other large equipment under category 4.

As noted in section 8.2, there is an alternate means of compliance to support the delivery of the UK WEEE regulations. If a scheme operator misses collection targets for a given e-product category, they can pay into a compliance fee fund. The fee is based on how far the target is missed and effectively recovers the costs associated with the uncollected volume. The fund is then used to support projects that are in the interest of the e-waste sector. Historically, activities funded span from programme education and awareness campaigns to technical studies that seek to address the impact of POP plastics in e-products and the development of protocols for battery fire prevention.

Voluntary arrangements, in most cases, are not underpinned by operational or performance based targets. However, where programme targets do apply for industry-led stewardship schemes investigated, they have been noted for the jurisdictional profiles included in section 7.

8.5

PERFORMANCE STANDARDS, TRAINING AND CERTIFICATION

Performance standards and certifications are a key aspect of many regulatory systems, as they can ensure best practice approaches in the prevention and reduction of harm to people and the environment across different elements of a programme or scheme's operational delivery.

The most common stage where performance standards and certifications are mandated relate to recycling (also called treatment) activities. However, not all systems, regulatory or otherwise, have mandatory requirements for standards or certifications to be in place at different stages of an e-product's life-cycle management chain. Where standards and certifications are mandatory for different jurisdictions and respective programmes, they are noted in section 7 and further summarised below.

- Product recovery and collection: None of the jurisdictions and respective schemes assessed mandate specific standards or certifications for product recovery and collection activities.
- Product transportation: None of the jurisdictions and respective schemes assessed mandate specific standards or certifications for product transportation activities.
- Product repair and refurbishment: None of the jurisdictions and respective schemes assessed mandate specific standards or certifications for product repair and refurbishment activities.
- Product recycling:
    - Australia — AS/NZS 5377:2013: Collection, storage, transport and treatment of end-of-life electrical and electronic equipment.
    - Switzerland — EN 50625: Collection, logistics and treatment requirements for WEEE.
    - Republic of Korea — KEA CE-3500: Standards for the Recycling Rate of Parts and Materials to Calculate Recyclability Rate of electrical and electronic equipment.
    - Japan: Only authorised businesses are licensed to recycle products under the regulated scheme and certification is performed by the Ministry of Environment.

While there are no mandatory standards or certifications required in the Spanish system, there are technical requirements set in Spanish Royal Decree 110/2015 for collection and transport, preparation for reuse and recycling activities. Some e-product repair agents engaged for preparation for reuse activities are also certified to EN 50614: Requirements for the preparing for reuse of waste electrical and electronic equipment; however, certification to this standard is voluntary.

As mentioned in section 8.3, service agreements, contracts and codes of ethical conduct are also used as a tool by PSOs to establish terms and conditions across the operational elements of a programme or scheme's delivery.

There were no requirements for training for the schemes or jurisdictions investigated.

8.6

LIABILITY AND INSURANCE

Of the regulatory systems assessed, parties deemed liable are specified in legislation and there are clearly defined roles and responsibilities across the actors noted, including the level of liability for various actors. Regulatory systems can also specify requirements to hold and obtain insurance policies for certain system actors.

In the case of Spain's regulatory system, producers are obliged to establish insurance policies that cover 25% of their total collection objectives. The initial obligation set in Spanish Royal Decree 110/2015 stipulated that 100% of a producer's confirmed obligation needed to be covered; however, was lowered to 25% in the most recent update to the Spanish Royal Decree 110/2015, i.e., Royal Decree 27/2021.

PSOs can also require product transporters and recyclers to be insured for their activities associated with the management of in-scope e-waste items.

An emerging risk is unauthorised access of data stored on e-products (e.g. on disk drive, storage media or other digital media) during collection, storage, transport and recycling/treatment activities. In Australia, the mandatory standard for recycling is being updated to include chain of custody requirements to prevent unauthorised access to data and some PSOs require recyclers to hold cyber insurance.

8.7

DESIGN FOR ENVIRONMENT

In general, design for environment (DfE) approaches are complementary to extended producer responsibility and product stewardship legislation for e-products. In Europe, there is an Eco-Design Directive (Directive 2009/125 /EC) that establishes a framework for setting eco-design requirements for energy-related products. It was noted in several cases that certain e-product producers have a strong view that waste legislation should not be used to drive product design decisions and separate legislation specific to eco-design should be developed. Fee eco-modulation was also flagged as an effective tool to stimulate DfE approaches, as reduced recycling costs and associated fees for liable parties can be a powerful incentive for circularity in a products design.

Common DfE approaches include:

- Avoiding the use of hazardous materials wherever possible
- Product labelling, informing consumers on how best to manage an e-product at different stages of its life cycle
- Making spare parts and e-product manuals available for e-product repair and refurbishment
- Designing an e-product with ease of repair, upgrade, disassembly and resource recirculation in mind
- Closing the loop on recovered resources by using material outputs from recycling activities in the manufacture of new e-products
- Ongoing dialogue between e-product producers and recyclers to understand where further DfE opportunities exist and can be targeted at the design stage of an e-product's life cycle.

In Japan, the Law for Promotion of Effective Utilisation of Resources (2000) encourages producers to voluntarily help recycle goods and reduce the generation of waste. It encourages producers to prevent waste management through eco-design, extending the life of e-products, designing e-products for recycling, reducing recycling costs and creating an information-sharing mechanism. The law aims to establish a recycling-based economic system by reusing parts of collected e-products, strengthening collection methods, and introducing new measures to reduce waste and extending e-product life spans[24].

In 2008, the Republic of Korea introduced an Eco-Guarantee system which mandates that producers create environmentally friendly products with environmentally sustainable components to ensure that their products can be recycled effectively (UNDP 2019). Article 12.2 of the Republic of Korea's Act for Resource Recycling of Electrical and Electronic Equipment and Vehicles states that recyclers can provide feedback and propose measures to the government regarding improvements for equipment and structure of devices to make them more efficient and environmentally friendly when they become waste and need to be recycled.

8.8

REPORTING AND PUBLIC ACCOUNTABILITY

Reporting on a scheme's performance and the achievement of operational targets set is an important aspect for any system of shared responsibility. Regular and transparent reporting raises awareness of a scheme's availability and highlights the benefits realised through coordinating efforts to address the identified e-product impacts or market failures.

There are varying levels of reporting requirements across the jurisdictions and respective schemes investigated, with PSOs most commonly accountable for reporting on the scheme's intended outcomes. In most cases PSOs are required to publish annual reports that cover the outcomes achieved in the preceding 12-month period, the liable parties who are members of the PSO, programme partners and available access points. Some annual reports also document the cost of product recovery and recycling activities for different product categories, especially in the case of schemes with advanced disposal fee mechanisms. Before being published, annual reports are submitted to the respective scheme regulator who verifies the information reported. In some cases, PSOs are also required to engage an independent auditor to assess the financial performance of their programme.

Where there are schemes with multiple PSOs, the scheme regulator may be required to summarise each PSO's annual report and prepare a whole-of-scheme performance report.

Liable parties are generally required to report POM data to inform liable party obligations, and there are several approaches across the jurisdictions and respective schemes investigated. As mentioned in section 8.2, POM data is either self-reported by those deemed liable and verified by the respective scheme regulator, or a process is established whereby the scheme regulator uses available POM data (e.g. e-product import records) and assigns obligations directly to those deemed liable. POM reporting can be required quarterly or annually and can be used to inform scheme targets for future years.

Mandatory reporting requirements and the roles and responsibilities across different scheme actors for the jurisdictions profiled are provided in section 7.

8.9

EDUCATION AND AWARENESS

Education and awareness are important aspects of a scheme to achieve community and industry participation and to achieve a scheme's intended outcomes.

The responsibility for such activities tends to fall to the PSOs although there can be a degree of support or formal involvement of other actors. Most of the PSOs researched employed staff whose responsibilities included developing formal communication and education programmes and campaigns. In Spain, the local and regional governments are heavily involved in both funding and approving any campaigns and require the competing PSOs to work collaboratively with them in campaign delivery. In countries where there is no funding support or formal government involvement, the level of activity can be variable and uncoordinated which leads to lack of clear messaging and community confusion. In the United Kingdom, where PSO communication activity was minimal, the national government recently invested £3M into a 'Recycle Your Electricals' campaign. In Japan and the Republic of Korea, the PSOs are not expected to undertake this task and all education and awareness is funded and delivered by the national governments.

The target group for education and awareness is large and diverse so most activities are focused on specific audiences and/or product groups. Unfortunately, in some countries this has led to consumer confusion about which products can be accepted. The most important target group is schools, typically the primary school level, and nearly all programmes have dedicated initiatives that combine education and awareness with promotional events, competitions and collections.

To ensure messaging is appropriate, many PSOs undertake regular consumer research. This has proven to be vital in understanding market sentiment and also level of programme and scheme-user understanding. The issue of data security is consistently raised and is seen to be a main driver to 'hoarding' activity. A recent Belgian survey estimated 51 million un-used e-products being stored in homes, equating to 4.4 items per person.

The key messages that are disseminated through education and awareness activities include:

- What is e-waste?
- Why is it important to recycle?
- How and where do you recycle e-waste?
- What happens to the e-waste sent to be recycled?

The levels of understanding of even these basic questions remain disappointingly low in many jurisdictions, which reinforces the need for ongoing clear and consistent messaging. To help with the dissemination of this information, PSOs have utilised trusted community members such as firefighters (Czech Republic) and soccer teams (Slovenia). The use of traditional print and television media is on the decline in favour of social media platforms, including the increasing use of promotional and informative videos.

The funding of education and awareness activities can be by the PSOs or national government as noted above. Spain and Poland mandate a minimum level of expenditure each year, with Poland requiring that a minimum of 5% of annual PSO expenditure is committed to education and awareness.

8.10

MONITORING COMPLIANCE AND ENFORCEMENT

Programme and scheme compliance monitoring and enforcement activities are typically led by a government agency designated to be the scheme regulator; however, are often coordinated in collaboration with PSOs. Enforcement of scheme requirements are fundamental to ensuring an even playing field between PSOs, service providers (e.g. recyclers, collectors and transporters) and liable parties. As such, robust compliance monitoring programmes are required by the scheme regulator.

Liable parties that do not meet their obligations can be issued with civil penalties, injunctions or financial sanctions. Some regulatory systems also provide for civil penalties and sanctions when a PSO fails to meet the outcomes required, including improvement notices or cancelation of a PSO's authorisation. However, it is essential to consider the legal framework and government structures in place.

For Spain's system, although the legal framework is set at the national level, monitoring and enforcement activities are performed by regional authorities and there are 19 individual regional authorities across Spain. Previously, PSOs required authorisations in each region to operate an e-product programme or scheme; however, this was simplified in recent years and the regional authorities have transferred this competence to the regional authority in which the PSO is based.

In the Republic of Korea's system, compliance and enforcement activities are led by the PSO. They are tasked with checking and monitoring invoices and receipts of the producers and importers to ensure that targets are met. If producers and importers do not fulfil the mandatory recycling rates, then they are required to pay a fine. The fee charge is the amount of recycling shortage multiplied by 115-130% of the standard recycling cost, as set by the Ministry of Environment. They can also face an additional recycling charge.

In Australia, the scheme regulator reviews PSO target achievement annually via the annual reporting process and reviews the PSOs' compliance with the regulations once every five years. However, as recycler compliance is not monitored by the scheme regulator (apart from whether or not the recyclers are certified to the mandatory standard), PSOs implement their own monitoring programmes, such as engaging consultants to perform independent audits, performing desktop audits over material recovery rate reports and using GPS trackers. State and Territory authorities regulate recyclers for compliance with work health and safety and environment protection regulations.

In a review of the Australian scheme completed in 2020, it was recommended that the Australian Government consider options for improving the outcomes, administration and compliance of the NTCRS, including through cost recovery and creation of a clearinghouse[25]. The Government responded that it was supportive of this recommendation and that it will continuously review departmental processes to reduce the administrative burden for participants in the scheme from the 2020–21 scheme year onwards and that it will pursue improved compliance outcomes through a new compliance framework and guidance[26].

Monitoring, compliance and enforcement requirements and the roles and responsibilities across different programme and scheme actors for the jurisdictions are profiled in section 7.

8.11

ACCESSIBLE COLLECTION NETWORKS

E-product collection networks vary by jurisdiction, scheme and the e-product categories that are in scope. These aspects are often dictated by the ease or suitability of consolidated collection networks, treatment pathways and other special handling requirements for certain e-products, like mercury containing lamps, which are usually collected in special containers to avoid breakage and the release of mercury.

For some systems, retailers play a key role in establishing equitable access to scheme drop off points and it was noted that this concept supports convenience and ease of access for scheme users. For the Irish programme, operated by WEEE Ireland, more than 60% of the total volume collected comes from retail channels. There are stipulations in legislation that mandate retailers to provide unwanted and end-of-life product take back services for the e-products they offer to the market. This can both be on a like for like basis when a consumer purchases a new e-product, or without the requirement for a new e-product purchase at all. In this example, the PSO makes safe handling provisions and reimburses retail collection partners for their collection and storage activities. In Spain, higher reimbursements are provided to retail collection partners if product categories are sorted and separated before collection. However, not all regulatory systems specify product recovery responsibilities for retailers and, in Australia, the roles and responsibilities of different actors under the NTCRS are currently under review which may extend collection responsibilities to e-product retailers in future, noting the benefits and increased scheme access expected through their direct involvement.

As noted in section 8.4, Australia's NTCRS was the only product stewardship scheme investigated that has specific targets for reasonable access in place. This speaks to the large geographical distances to cover and remoteness of different areas to scheme access and service points. All other jurisdictions and respective schemes assessed do not specify reasonable access targets; however, in some cases, a clearing house system is established whereby multiple PSOs in a single system share collection points and the associated service costs, based on market share calculations across the participating PSOs and their liable party member obligations.

In Spain, there has been a clearing house system in place since 2007. OfiRaee is a voluntary agreement among competing PSOs who appoint a private and independent enterprise to manage the daily functions on behalf of the collective. OfiRaee collects POM data from each PSO and calculates the product recovery targets that must be met. OfiRaee then manages the allocation of collection requests from municipal collection points as they are received. It also serves as central point to run communication and educational campaigns, and as a lobbying platform.

The main, and most common, programme and scheme collection channels include:

- Municipal collection points
- Retail channels
- Business to business collections
- Business to customer collections

Under Japan's Law for the Promotion of Effective Utilization of Resources, the collection network for personal computers takes place through a network of 20,000 post offices nationwide. Japan Post also provides a service to collect e-products from private residences.

Product tracking systems are also used for some schemes to help capture and analyse e-product market and material flows. This enables PSOs to monitor their progress in meeting product recovery targets in real time and creates clear oversight of all operational activities that help to inform scheme performance reporting. For Spain, Royal Decree 110/2015 requires the implementation of product tracking systems using radio-frequency identification (RFID) devices from the point of collection; however, this only applies to e-product categories 1, 2, 4 and 7 individually. Most other PSOs establish their own online data management and product tracking systems independently and it is important to understand where the stocks and flows of these products are to develop the most effective solutions for managing them.

8.12

MARKET DEVELOPMENT AND GOVERNMENT SUPPORT

Financial support was available for collection and recycling infrastructure at the start of many programmes. In Spain, this support came from regional authorities though, for many other European programmes, the accrued revenue from visible fees was used. In the UK, retailers could opt-out of providing collection services by paying a fee which was then used to support other collection infrastructure.

Most ongoing support from government comes from more general research and development and industry development programmes. In Japan and the Republic of Korea the government has programmes that support new infrastructure through technical advisory services and provision of low-interest loans, though these programmes are not specific to e-waste.

In Europe there are many European Commission funded programmes that have been accessed by PSOs, collection services and recyclers.

In Australia there are many grants available to support innovation, research and infrastructure development to address priority waste streams (including e-waste) and to implement circular economy approaches.

In the UK the WEEE Fund (www.weeefund.uk), now called Material Focus, was established and resourced from WEEE Compliance Fee penalties paid by PSOs who do not meet collection targets. Over £10M has been made available to date to support technical research, communications, behaviour change activities and local projects.

Municipal collection sites can often receive support directly from PSOs through direct rebates and provision of collection units (e.g. Australia and many European programmes). Some programmes are using incentive payments to municipalities to encourage filling of collection units to reduce logistics costs per kg.

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