National E-waste Monitor 2024

UZBEKISTAN

unitar
United Nations
Institute for Training and Research

CSD center

Funded and supervised by:

Federal Ministry
for the Environment, Nature Conservation,
Nuclear Safety and Consumer Protection

Umwelt Bundesamt

National E-waste Monitor 2024

UZBEKISTAN

Colophon

This publication was prepared through a collaborative effort involving the United Nations Institute for Training and Research, the Ministry of Ecology, Environmental Protection and Climate Change of the Republic of Uzbekistan, and the Center "Cooperation for Sustainable Development."

Main authors and contributors:
United Nations Institute for Training and Research: Elise Vermeersch, Cornelis Peter Baldé, Dmitry Yumashev, Ruediger Kuehr.

Ministry of Ecology, Environmental Protection and Climate Change of the Republic of Uzbekistan: Iskandar Qutbiddinov, Umarjon Abdullaev, Numonjon Shakirov, Alisher Akhmedov.

CSD Center: Aliya Yerdvaliyeva, Yuliya Lobuntsova, Vera Mustafina, Aisulu Amantay.

Please cite this publication as:
United Nations Institute for Training and Research/Ministry of Ecology, Environmental Protection and Climate Change of the Republic of Uzbekistan/Center "Cooperation for Sustainable Development." National E-waste monitor 2024 - Uzbekistan, 2024, Bonn / Tashkent / Almaty.

ACKNOWLEDGEMENTS

The authors would like to thank the contributors of the national consultations, the national forum in Uzbekistan, and the follow-up validation process. The following persons are especially acknowledged:

The Republic of Uzbekistan:
Natalia Shivaldova, Alexey Belikov.

German Environment Agency:
Regina Kohlmeyer, Hendrik Freitag.

UNEP:
Tomas Marques, Olzhas Atymtayev, and Aidai Kurmanova.

This project is funded by the German Federal Environment Ministry's Advisory Assistance Program (AAP) for environmental protection in the countries of Central and Eastern Europe, the Caucasus, and Central Asia and other countries neighbouring the European Union (Project number N°167903). It is supervised by the German Environment Agency (UBA).

The responsibility for the content of this publication lies with the authors.

CONTACT INFORMATION

For enquiries, please contact the corresponding author, C.P. Baldé at balde@unitar.org.

DISCLAIMER

The United Nations Institute for Training and Research (UNITAR) is an autonomous body of the United Nations (UN) General Assembly dedicated to generating and transferring knowledge and strengthening capacities relevant to global issues such as human security, development, and welfare.

The designations employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of the United Nations Institute for Training and Research concerning the legal status of any country, territory, city, or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries. Moreover, the views expressed do not necessarily represent those of the United Nations Institute for Training and Research, nor does citing of trade names, companies, schemes, or commercial processes constitute an endorsement.

Funded by:

Federal Ministry
for the Environment, Nature Conservation,
Nuclear Safety and Consumer Protection

In cooperation with:

UN environment programme

Table of contents

List of figures & tables

FIGURES

TABLES

List of abbreviations

ABBREVIATIONS	
CIS	Commonwealth of Independent States
CSD	Center “Cooperation for Sustainable Development”
EAEU/EEU	Eurasian Economic Union
EEE	Electrical and electronic equipment
EPR	Extended Producer Responsibility
ESM	Environmentally Sound Management
EU	European Union
E-waste/WEEE	Waste electrical and electronical equipment
GDP	Gross Domestic Product
ICT	Information and Communication Technology
Inh	Inhabitant
IRENA	International Renewable Energy Agency
HS Code	Harmonised System Code
JSC	Joint-Stock Company
JV	Joint Venture
kg	Kilogram

ABBREVIATIONS	
kt	(Metric) Kiloton, or 1,000,000 kg
LLC	Limited Liability Company
MSW	Municipal Solid Waste
NGO	Non-governmental organisation
POM	(Electrical and electronic equipment) placed on the market
ppi	Pieces per inhabitant
PPP	Purchasing Power Parity
SDGs	Sustainable Development Goals
SMEs	Small and medium-sized enterprises
SSP	Common socioeconomic pathways
UNECE	UN Economic Commission for Europe
UNITAR	United Nations Institute for Training and Research
UNU	United Nations University

Executive summary

With a global generation of 62,000 kilotons (kt) in 2022 [1], e-waste is one of the fastest growing waste streams in the world. E-waste contains both harmful substances and rare and valuable materials, which can lead to environmental, health, and economic problems if not managed in an environmentally sound manner.

According to the *Regional E-Waste Monitor for the CIS + Georgia - 2021* [2], the volume of e-waste generated in Uzbekistan as of 2019 was 139.7 kt per year, or 4.2 kilograms (kg) per person per year. However, the level of official e-waste collection and recycling is very low, around 0.2%. For Uzbekistan, as for many countries of the world, the problem of collecting and recycling e-waste is urgent.

Uzbekistan generated 139.7 kilotons of e-waste in 2019.

Waste and e-waste policies and legislation in Uzbekistan

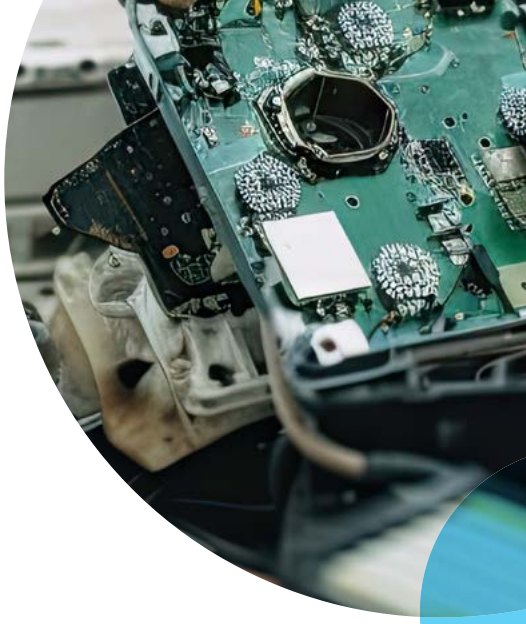
The general national policy of the Republic of Uzbekistan in the field of waste management is defined by the Solid Waste Management Strategy in the Republic of Uzbekistan for the period 2019-2028, approved by the Decree of the President of 17 April 2019 (hereinafter, the Strategy) [3]. One of the Strategy's objectives is to implement methods for the collection and recycling of specific types of municipal solid waste (MSW) (including mercury-containing waste and batteries), by employing economic mechanisms. The Strategy establishes several target indicators for MSW collection, recycling, and disposal. One of these indicators aims for a recycling rate of 25% for specific types of MSW, including mercury-containing waste and batteries, by 2028.

On January 4, 2024, the Presidential Decree "On measures to improve the waste management system and reduce its negative impact on the environmental situation" was adopted [4]. These measures are intended to digitalise the MSW payment system, gradually implement MSW sorting systems in large cities, and introduce "green investments" in the sphere of waste recycling and recovery, including e-waste.

The legislation of Uzbekistan regulates certain types of e-waste, including specific categories of lamps and large-sized household equipments.

The main legal act governing waste management in Uzbekistan is the Law "On Waste" [5], supplemented by several bylaws. While this law regulates waste management relations, it lacks specific provisions dedicated to e-waste in general.

Despite this absence, Uzbekistan's legislation includes regulations concerning certain types of e-waste, such as mercury-containing lamps and devices, energy-saving lamps, scrap, non-ferrous and ferrous metal waste, as well as regulations for the management of large-sized household waste (which covers both large-sized household equipment and office equipment).



Infrastructure for e-waste management in Uzbekistan

Uzbekistan's e-waste management infrastructure is currently underdeveloped. Although there are companies involved in waste collection and recycling, their technical capabilities remain limited, which constrains the efficiency of e-waste management processes.

The advancement of the infrastructure sector needs effective implementation of state programs at the local level and financial support from the government.

E-waste projection out to 2050

The volume of e-waste generated in Uzbekistan is expected to continue to grow. According to UNITAR data, the annual growth of e-waste generation will be approximately 5 kt per year and reach almost 268 kt per annum by 2050 - nearly double the 2019 amount of 139.7 kt. This emphasises the importance of taking decisive measures to improve e-waste management in Uzbekistan as a means for reducing the negative impact on health and the environment and effectively harvest e-waste's many resources.

The amount of e-waste is expected to grow by 5 kt per year and reach almost 268 kt per annum by 2050.

The e-waste management system in Uzbekistan might develop according to one of two scenarios:

- "Business as Usual": no change to the current trends
- "Circular Economy": constant improvement in overall e-waste management

Both scenarios include opportunities and challenges for Uzbekistan, which are determined by their respective impact of hazardous constituents on the environment and human health, reuse of valuable materials, and overall environmental and socioeconomic damage or benefit.

In the "Business as Usual" scenario, the total accumulated amount of unmanaged e-waste from 2023 to 2050 could reach 5,611 kt, while the "Circular Economy" scenario would reduce the total amount of unmanaged e-waste to 3,143 kt, ensuring the recovery and recycling of 1,409 kt of valuable materials and reducing greenhouse gas emissions by 88%.

E-waste management can have significant economic benefits by reducing production costs through the reuse of harvested resources from e-waste, creating revenue opportunities from recycling valuable materials, reducing disposal costs and fines, reducing environmental costs, and stimulating economic growth through sustainable resource use. Realisation of the “Circular Economy” scenario will achieve a positive economic outcome in Uzbekistan’s e-waste management system in the amount of USD $105 million, while the “Business as Usual” scenario may result in costs of USD $735 million between 2023 and 2050.

Thus, results of the “Business as Usual” and “Circular Economy” scenario projections clearly demonstrate the importance of moving toward a sustainable e-waste management system and show that the introduction of measures focused on improving resource efficiency and reducing waste can lead to significant economic, environmental, and social gains.

Measures to develop e-waste management

To achieve such approaches, Uzbekistan needs to take measures to improve legislation and statistics and develop infrastructure and technologies as well as measures to support e-waste collection and recycling and strengthen e-waste prevention and reuse. Important measures as such include an allocation of responsibilities of authorised state bodies in the field of e-waste management; the development of financial incentives for e-waste recycling, including the implementation of extended producer responsibility (EPR); and raising public awareness. This publication presents recommendations and a practical national roadmap for environmentally sound management of e-waste, developed through national stakeholder dialogues.

This publication provides recommendations and a practical national roadmap for environmentally sound management of e-waste.

Chapter 1.
Introduction

A. WHAT IS E-WASTE AND WHY DOES IT NEED ATTENTION?

Electrical and electronic equipment (EEE) includes a wide range of products, including nearly all household or business items with circuitry and electrical components that have a power or battery supply - such as basic kitchen appliances, toys, and devices for listening to music, as well as information and communication technology (ICT) items such as mobile phones, laptops, etc. EEE is also increasingly used in transport, health, and security systems, as power generation equipment, and in more traditional products such as clothing and furniture [1]. Also, photovoltaic systems or heat pumps are categorised as EEE, but electronic components of automotives, batteries, and electronic military equipment are not.

EEE becomes e-waste once it has been discarded by its owner as waste without the intent of reuse [6]. E-waste, also commonly referred to as waste electrical and electronic equipment (WEEE), encompasses a wide range of products that can be categorised in different ways, including by product type or size.

However, in global practice, for statistical purposes, WEEE is classified by similar functions, comparable material composition, average weight, and similar end-of-life attributes. The report *E-waste Statistics Guidelines on Classification, Reporting and Indicators -Second Edition* divides EEE into 54 different product-based categories referred to as UNU-KEYs (Annex 1) [7]. The 54 EEE product categories are grouped into six general categories that correspond closely to their waste management characteristics. This categorisation is compliant with the European Union Directive 2012/19/EU on waste electrical and electronic equipment (WEEE Directive) [8] (Figure 1).

Figure 1. Six categories of EEE that correspond closely to their waste management characteristics

1. Temperature exchange equipment:
more commonly referred to as cooling and freezing equipment. Typical equipment includes refrigerators, freezers, air conditioners, and heat pumps.

2. Screens and monitors:
typical equipment includes televisions, monitors, laptops, notebooks, and tablets.

3. Lamps:
typical equipment includes fluorescent lamps, high-intensity discharge lamps, and LED lamps.

4. Large equipment:
typical equipment includes washing machines and dryers, dishwashing machines, electric stoves, large printing machines, copying equipment, and photovoltaic panels.

5. Small equipment:
typical equipment includes vacuum cleaners, microwaves, ventilation equipment, toasters, electric kettles, electric shavers, scales, calculators, radio sets, video cameras, electrical and electronic toys, small electrical and electronic tools, small medical devices, small monitoring devices, and control instruments.

6. Small IT and Telecommunication equipment:
typical equipment includes mobile phones, GPS devices, pocket calculators, routers, personal computers, printers, and telephones.

E-waste is one of the fastest growing waste streams globally, resulting from the high consumption rate of such equipment, short product life cycles, and lack of repair options. The *Global E-waste Monitor 2024* reports an 82% increase in e-waste globally since 2010, up to 62 million tonnes in 2022 [1].

Hazardous materials in e-waste

This waste stream poses a threat to the environment and can have adverse effects on climate change and human health if not treated properly, as the waste contains many hazardous materials and substances, including heavy metals, chemicals, and flame retardants [1]. For example, gas discharge lamps and older flatscreen displays' backlighting contain mercury, and monitors and televisions with cathode ray tubes contain lead. Temperature exchange equipment, such as refrigerators and air conditioners, contains substances that are harmful to the ozone layer such as chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs) as well as greenhouse gases such as CFCs, HCFCs, hydrofluorocarbons (HFCs), and others. EEE may also contain polyvinyl chloride (PVC) and polytetrafluoroethylene (PTFE), which adversely affect the respiratory mucosa membranes and central nervous and reproductive systems. Printed circuit boards (and other plastic components) contain brominated flame retardants (BFRs) such as tetrabromobisphenol-A (TBPA) or polybrominated diphenyl ethers (PBDEs). Certain EEE may contain beryllium, mercury, cadmium, and/or gallium arsenide (GaAs), substances hazardous to human health and the environment.

Valuable materials in e-waste

However, e-waste also represents an economic and environmental opportunity through the recovery of valuable materials, thus avoiding the waste of natural resources and energy, securing the supply of raw materials for industry, and reducing the environmental impact, all while providing job opportunities. Specifically, e-waste can contain precious metals such as gold, copper, and nickel, as well as rare materials of strategic value such as indium and palladium [1]. As such, it is essential to improve the environmentally sound management of e-waste at the global level.

B. UZBEK CONTEXT

Uzbekistan is a state in Central Asia. The territory's area is 448,978 km^2. According to the Statistics Agency under the President of the Republic of Uzbekistan, the population of the country at the beginning of 2024 was 36.8 million people [9]. The population density is 82 people per 1 km^2. The country's major cities are the capital city of Tashkent as well as Namangan, Samarkand, Andijan, Nukus, Bukhara.

Annually, 7,000 kt of municipal waste is generated in Uzbekistan. Of these, only 1.8 million tonnes (26%) are recycled. As of 2022, there are 307 waste recycling companies in Uzbekistan [10]. The largest enterprise for waste collection and removal - State Unitary Enterprise "Makhsustrans" - operates out of Tashkent. Additionally, the transportation of MSW from enterprises and organisations is provided by the state unitary enterprise "Toza Hudud".

Between 2024 and 2026, Uzbekistan plans to implement a system for sorting waste into "recyclable", "non-recyclable", and "food" in the cities of Tashkent, Angren, Andijan, Bukhara, and Termez, as well as in the Tashkent region [4].

The waste management system in Uzbekistan requires active development. Several challenges exist related to the introduction of separate waste collection, maintenance of specific statistical data on waste types, and other related issues. Official statistical data on e-waste collection and recycling is not available in Uzbekistan, which complicates monitoring and control.

This publication presents UNITAR data on e-waste, which is summarised in Chapter 4.c and Table 5.

C. ABOUT THIS PUBLICATION

This publication is intended for national stakeholders involved in e-waste management in Uzbekistan: public authorities and the economic sector, the interested general public, non-governmental organisations (NGOs), academia, and e-waste stakeholders based in other countries. Chapter 2 provides a brief description of the methodology employed herein. To create long-term projections out to 2050, existing regional statistics from the *Regional E-Waste Monitor for the CIS + Georgia - 2021* [2] on EEE placed on the market, lifespans, e-waste generated, and e-waste collection and recycling were used. The international context of e-waste management is described in Chapter 3. Chapter 4 discusses the current situation of e-waste management in Uzbekistan. Chapter 5 details challenges and opportunities and outlines directions for developing the e-waste management system in Uzbekistan out to 2050 under two contrasting scenarios, focusing on the associated opportunities for preventing environmental and health impacts and recycling valuable materials. The two contrasting scenarios have been developed based on one variant of target indicators of the UNITAR Tool [11]; see Chapter 2.b:

1. The **"Business as Usual" scenario**, which represents current consumption, lifespan, and disposal patterns extrapolated out to 2050, adjusted for economic and demographic factors.
2. The **"Circular Economy" scenario**, in which product lifespans are projected to increase due to more reuse, repair, and remanufacturing, while sharing some equipment becomes more common, and proper e-waste collection and recycling infrastructure is incrementally developed until a 100% recycling rate is reached by 2050.

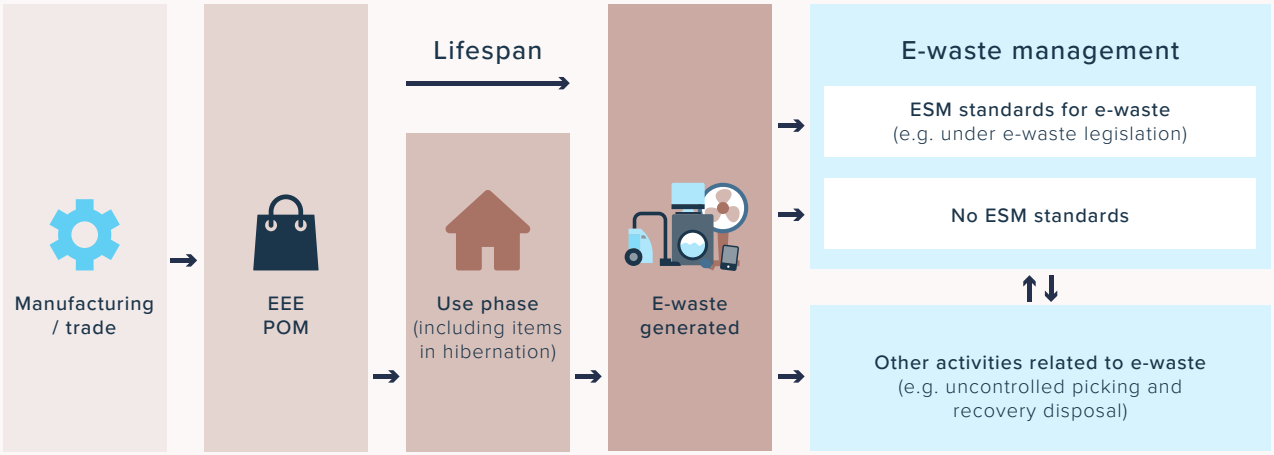
Chapter 6 provides a range of recommendations, focusing on improving legislation and statistics; development of infrastructure, technologies, and measures to support e-waste collection and recycling; financing of the system; as well as capacity-building and awareness-raising, developed through national stakeholder dialogues. The recommendations are translated into a practical national roadmap for the environmentally sound management of e-waste developed as part of national stakeholder dialogues and presented in Chapter 7.

Chapter 2.
Methodology

A. E-WASTE STATISTICS

The measurement framework of e-waste projections follows a mass balance approach over the entire EEE life cycle. This approach is consistent with global e-waste statistics guidelines [7][12]. The approach covers production, importing, exporting, placing on the market, e-waste generation, e-waste management, and other e-waste-related activities (Figure 2). It covers any product supplied to the national market for consumption and use by households, businesses, or public authorities. Calculations were made for 54 products - the so-called UNU-KEYs. The UNU-KEYs are a product-based classification system in which each UNU-KEY has a homogeneous lifespan, average weight, material composition, and hazardousness profile. The UNU-KEYs can be linked to the six e-waste categories and are used to measure e-waste statistics (see Annex 1).

Figure 2. E-waste Statistics Framework[1]



Placing EEE on the market

EEE POM is obtained by deducting exports from EEE imported and domestically produced. The market entry includes EEE placed on the market by households, businesses, and the public sector.

Lifespan

A product's lifespan is the period of time from when it is placed on the market until it becomes e-waste (see Figure 2). This includes the hibernation phase - the hoarding time of the equipment prior to actually being discarded at the end of its life - as well as the passing on of the equipment from one owner to another (reuse). EEE's lifespan is expressed as a Weibull function and varies per UNU-KEY, with the shape and scale parameters associated with the average lifespan for each UNU-KEY individually. After a certain lifetime sampled from the Weibull function, the product is disposed of and becomes waste.

E-waste generated and e-waste management

E-waste generated in a country refers to the total weight of e-waste resulting from EEE that had been POM in that country, prior to any other activity, such as collection, preparation for reuse, treatment, or recovery, including recycling and exporting of e-waste. E-waste generated is calculated using EEE POM and lifespan.

In general, e-waste management involves collection, transportation, storage, treatment, recycling, recovery, and disposal of waste, including aftercare of disposal sites. It can be undertaken by an economic actor within a legal framework, but waste handling carried out by informal economic actors (e.g. informal waste-picking) and illegal waste handling also exists. In this context, "waste management" differs from "other waste-related activities", as proposed by the UNECE's Waste Statistics Framework [14]. The "other waste-related activities" include waste dumping, waste-picking and scavenging, disposal, etc. and may include the informal sector. It is vitally important that e-waste undergoes depollution, that hazardous parts are disposed of in an environmentally sound manner, and that recyclable components are properly recycled. This is typically, but not exclusively, performed under the requirements of national e-waste legislation. Therefore, in this publication and in the e-waste statistics guidelines, the e-waste flow is referred to as "e-waste formally collected". This term, also referred to as "e-waste managed environmentally soundly", implies that the e-waste is collected under the specific legislation for e-waste (or in a similar manner).

[1] Environmentally sound management of hazardous waste or other waste means taking all practical steps to ensure that hazardous waste or other waste are managed in a manner that protects human health and the environment against the adverse effects that may result from such waste (Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, art. 2 (8)) [13].

The **e-waste collection rate is** calculated by dividing the mass of collected "e-waste managed in an environmentally sound manner" by the mass of "e-waste generated".

The **e-waste recycling rate** is calculated by the mass of e-waste that is recycled during waste management divided by the collected e-waste.

The **amounts of "unmanaged e-waste"** are calculated as "e-waste generated" minus "e-waste managed environmentally soundly".

Emissions and environmental costs

Economic impact is calculated by a relatively simple cost-benefit analysis of e-waste management. Net economic impact is calculated by adding up benefits and subtracting costs. Projections were made using a 2 percent yearly inflation rate, and all data found in euros were converted into U.S. dollars using that year's exchange rates.

The benefits are assessed by the total value of metals in environmentally soundly managed e-waste and the value of greenhouse gas emissions avoided. The value of metals was calculated by the mass of the individual metals embedded in environmentally soundly managed e-waste multiplied by commodity prices of the individual metals (aluminium, copper, lead, tin, nickel, zinc, gold, platinum, silver, bismuth, cobalt, iron, germanium, indium, iridium, palladium, rhodium, ruthenium, and antimony).

The costs are calculated by the treatment costs of environmentally soundly (i.e. compliantly) managed e-waste and the externalised costs to society. Treatment costs were taken from the UNU-European Energy Research Alliance study on treatment costs, supplemented with internal UNITAR datasets per type of waste [15]. The average amount for compliant treatment of 1 thousand kg of e-waste was USD $372.

Emissions to the environment lead to costs elsewhere in society and are not included in the usual pricing mechanisms. These hidden costs are called "externalised costs" and are estimated based on the environmental and health damage due to emissions of mercury, lead, plastics, and greenhouse gases stemming from other waste-related activities. The externalised average long term socioeconomic cost of unmanaged mercury, lead, plastics, and CO_2 emissions was taken from several publications. The values used in this publication are USD $712 thousand per kg of mercury, USD $20 per kg of lead, USD $8.5 per kg plastics in small equipment, and USD $250 per tonne of CO_2 equivalent emissions.

The compliant system was assessed using the revenues derived from extracted secondary resources, the costs for depollution of e-waste, and the externalised (hidden) economic damages to human health and the environment of unmanaged mercury, lead, and plastic waste/greenhouse gases. A more detailed description of the method is described in the UNITAR's E-waste Collected Tool Manual [16].

B. E-WASTE PROJECTIONS TO 2050

All calculations were made using UNITAR's "E-Waste Collected Tool" for Uzbekistan [11]. This is an Excel-based interactive tool for setting e-waste collection targets to explore the resulting amounts of managed and unmanaged waste, the corresponding recovered and lost materials, their value and the associated compliant recycling costs, and the environmental and socioeconomic impacts (including costs) due to release of hazardous substances and loss of valuable materials. The tool can be used by trained national stakeholders for further assessment and updating. For more technical and methodological information, refer to the E-waste Collected Tool Manual [16].

Projection of EEE placed on the market

EEE POM from 1980 to 2020 was obtained from the readily available country-level data, collected from authorities and e-waste stakeholders as part of the *Regional E-Waste Monitor for the CIS + Georgia - 2021* [2]. The historic solar photovoltaic installation figures for Uzbekistan, which form the fastest-growing part of POM, were downloaded from a global dataset compiled by the International Renewable Energy Agency (IRENA). The EEE POM data has been broken down into relatively detailed product groups (UNU-KEYs; 54 groups in total). The data is projected into the future with an empirical relationship between EEE POM and country-level scenarios for Gross Domestic Product (GDP) purchasing power parity (PPP) per capita, established from the global historic EEE POM and GDP data [1]. We use GDP PPP and population scenario projections from the Shared Socioeconomic Pathways (SSPs), which represent a plausible range of regional and global socioeconomic futures with various degrees of cooperation, competition, urbanisation, education, technological development, and other relevant indicators [17]. The SSP scenarios are described in detail in Annex 2.

The scenarios

The flows of generated e-waste are projected using the same framework as the e-waste statistics described in section 2.a and are split into two scenarios [18]:

- **In the "Business as Usual" scenario**, present-day consumption patterns for EEE goods are projected from 2023 to 2050 with some adjustments according to the underlying economic conditions, population, consumer behaviour, product lifespans, and e-waste management infrastructure (see Table 1).

1. Full or partial obsolescence of EEE POM for selected products by 2050
   A near-complete drop in EEE POM of new video equipment, e.g. video recorders, DVDs, Blu-rays, set-top boxes, and projectors (UNU-KEY 0404), driven by advances in smartphones and internet streaming.
2. Stock saturation constraints per capita
   Household electrical products, such as fridges (UNU-KEY 0108), reaching market saturation in wealthier countries, when it does not make sense for an average household to have more than a certain number of items of a given product, even if they can afford them.
3. The e-waste generated and recycling rate are calculated according to section 2.a.
   The recycling rate in Uzbekistan for 2020 to 2050 is extrapolated from the present-day (2023) base value of 0.2% from the *Regional E-Waste Monitor for the CIS + Georgia - 2021* [2]. In the "Business as Usual" scenario, the recycling rate is kept as a constant of 0.2%.

- **In the "Circular Economy" scenario**, additional behavioural and/or technological changes are assumed to occur between 2023 and 2050 for selected product groups (UNU-KEYs), capturing the main aspects of circular economy transition specific to the EEE sector. These changes (with illustrations for selected UNU-KEYs) include [18]:

1. Full or partial obsolescence of EEE POM for selected products by 2050, as well as stock saturation constraints (see No. 1 and 2 of the "Business as Usual" scenario)
2. Improved durability
   A gradual increase in both designed and user-driven lifespans across most EEE products, including greater product reuse via second-hand markets (included in the lifespans implicitly)
3. Less hoarding
   Products such as laptops (UNU-KEY 0303) and mobile phones (UNU-KEY 0306) either being used for longer periods, reused, or recycled instead of being hoarded, leading to reduced overall stock across households
4. More sharing
   Products such as household tools (UNU-KEY 0601) being shared more, leading to more product use and the associated reduction in lifespan, as well as reduced overall stock across households
5. The e-waste generated and recycling rate are calculated in the same way as in the "Business as Usual" scenario. However, the recycling rate is incrementally increased, linearly with time, from 0.2% to 100% in 2050

Further details on the "Circular Economy" and "Business as Usual" scenarios, including a detailed set of assumptions for each UNU-KEY, are provided in Annex 1 and in Table 1.

The resulting effects of e-waste management are calculated using the material compositions per UNU-KEY category obtained from the ProSUM project [19] for EEE POM in 2018. The environmental impacts of managing e-waste are based on the quantifications of "e-waste managed environmentally soundly" and "unmanaged e-waste" from the *Regional E-Waste Monitor for the CIS + Georgia - 2021* [2]. More information about the SSP and photovoltaic forecasts is given in Annex 2 and Annex 3.

Table 1. E-waste projections under "Business as Usual" and "Circular Economy" scenarios [18]

PARAMETER	1980 - 2023	2023 - 2050 'BUSINESS AS USUAL' SCENARIO	2023 - 2050 'CIRCULAR ECONOMY' SCENARIO
EEE POM	Country-level and product-level (54 UNU-KEY) data was taken from the *Regional E-waste Monitor for the CIS+Georgia - 2021* [2]. Country-level solar photovoltaic data was downloaded from IRENA.	Country-level SSP projections for GDP PPP and population were downloaded from the IIASA SSP Database [17]. This data was adjusted using the World Bank data for historic country-level GDP PPP [20] and in Uzbekistan's population [21]. Further details are provided in the E-Waste Collected Tool Manual [16]. POM projections were derived using country-level empirical correlations between UNU-KEYs and GDP PPP, as described in *The Global E-waste Monitor 2024* [1]. We also factored in full or partial obsolescence of EEE POM for selected products by 2050 and stock saturation constraints.	Same as the "Business as Usual" scenario, except that per UNU-KEYs, additional changes were built in full or partial obsolescence of EEE POM for selected products by 2050, stock saturation constraints, improved durability, less hoarding, and more sharing. The changes result in less EEE POM than in the "Business as Usual" scenario for most UNU-KEYs. Further details are provided in Annex 1.
Lifespan	UNU-KEY-level data for product lifespans was taken from the *Regional E-waste Monitor for the CIS + Georgia - 2021* [2].	Same as 1980 - 2023.	Products become more durable (30% longer lifespans) and/or are reused more (leading to 15% longer lifespans)).
E-waste generated	Calculated from above datasets.	Calculated from above datasets.	Calculated from above datasets.
E-waste recycling rate	Taken from the *Regional E-waste Monitor for the CIS + Georgia - 2021* [2].	The recycling rate for 2023 (0.1%) remained unchanged.	Gradual increase from 0.2% to 100% of waste recycling rate in 2050.

C. STAKEHOLDER CONSULTATIONS AND NATIONAL ROADMAP DEVELOPMENT

A stakeholder consultation method was used to collect various stakeholders' inputs, needs, and interests related to e-waste management processes. The list of stakeholders involved included state agencies, central and local authorities, manufacturers, importers and retailers of EEE, e-waste collectors and recyclers, and the environmental community as represented by non-governmental organisations, universities, and research institutes.

To study the current situation in Uzbekistan, a questionnaire was administered with all stakeholders involved, and individual meetings with stakeholders were conducted to obtain more information and clarify data. A total of 13 face-to-face consultations and meetings were held.

To establish a dialogue between stakeholders, the National Forum "E-waste Management in Uzbekistan: current situation and next steps" was held in Tashkent on November 28-29, 2023. The Forum served as a platform for increasing capacity and strengthening stakeholder interaction, facilitating the exchange of international and regional best practices, and contributing to the development of e-waste management policy in Uzbekistan. The conclusions and recommendations of the consultations and the National Forum are reflected in this publication.

The national roadmap for the environmentally sound management of e-waste, which is integral to this document, is based on the discussion of the working groups organised within the National Forum, as well as the results of questionnaires and meetings with stakeholders, analysis of national legislation, and experience of CIS countries in the field of e-waste management. Specific activities and actions, deadlines, forms of completion, and executors in the national roadmap are defined, taking into account the priorities set by the public, private, and civil sectors.

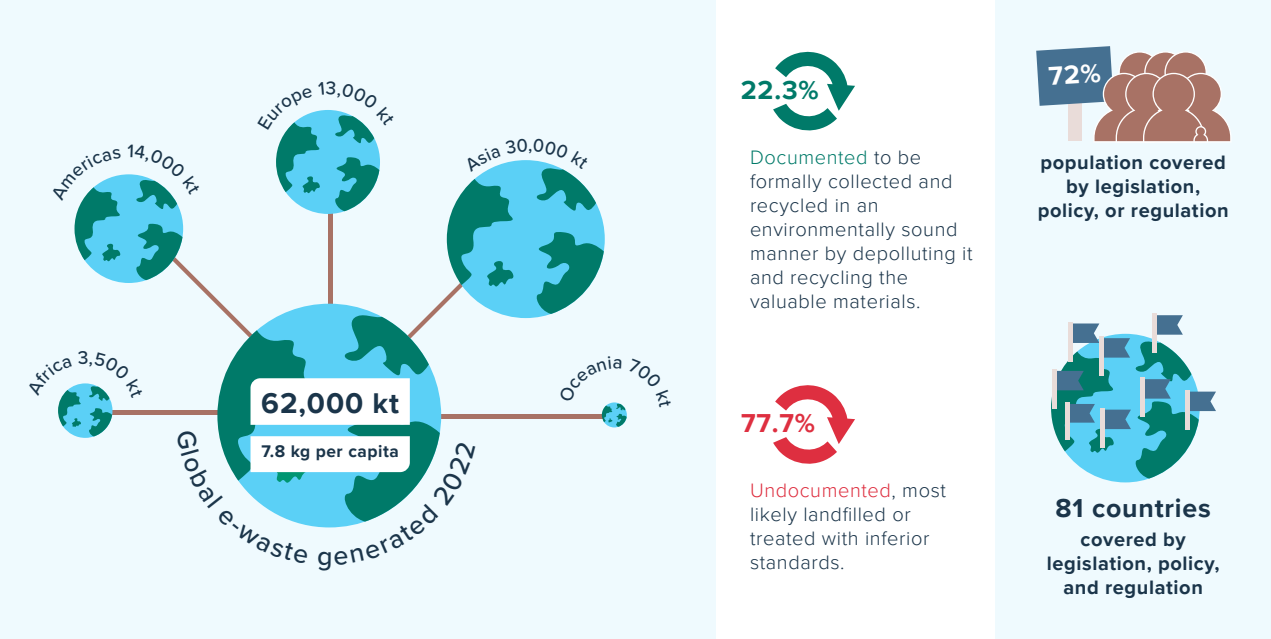
Chapter 3.

International experience of e-waste management

A. GLOBAL E-WASTE STATISTICS

According to *The Global E-waste Monitor 2024*, which provides the most comprehensive update of global e-waste statistics, the world generated 62,000 kt of e-waste in 2022 - an average of 7.8 kg per capita. This amount nearly doubled from 34,000 kt in 2010 and is projected to reach 82,000 kt by 2030. In 2022, Asia was the major producer of e-waste in net weight (30,000 kt), followed by the Americas (14,000 kt), Europe (13,000 kt), Africa (3,500 kt), and Oceania (700 kt). However, looking at generation per capita, Europe is highest with 17.6 kg, followed very closely by Oceania (16.1 kg per capita), the Americas (14.1 kg per capita), Asia (6.4 kg per capita), and Africa (2.5 kg per capita) [1].

Figure 3. Overview of key e-waste statistics 2022 as published in *The Global E-waste Monitor 2024* [1]



Working from data reported by countries, *The Global E-waste Monitor 2024* estimates that only 22.3% (13,800 kt) of e-waste generated was formally collected and recycled in 2022 - an increase of 5,800 kt from 2010. Though the overall amount of e-waste collected has improved, this achievement is overshadowed by the even greater quantity of e-waste generated. The vast majority of e-waste generated in 2022 (77.7% or 48,200 kt) was not formally collected or managed in an environmentally sound manner. This share of undocumented e-waste was most likely mixed in with other waste streams (such as metals and plastics or household waste), inappropriately recycled, sent to landfills, or incinerated, leading to loss of valuable resources and the release of hazardous substances into the environment. There are significant discrepancies among continents in terms of reporting. Europe has the highest reporting rate, with 42.8% of e-waste documented to be formally collected and recycled, followed by Oceania (41.4%), the Americas (30%), Asia (11.9%), and Africa (0.7%) [1].

B. GLOBAL AND REGIONAL POLICY OVERVIEW

To cope with the growing amount of e-waste, governments around the world need to introduce or improve specific legislation and enforcement for environmentally sound management of e-waste. According to *The Global E-waste Monitor 2024*, at the end of 2022, 81 of 193 countries worldwide had a national e-waste policy, legislation, or regulation in place, covering 72% of the world's population[2]. However, in many countries, policies are not legally binding and are not appropriately supported financially, hindering their proper implementation. As well, most legal frameworks focus on improving e-waste management, but not on reducing the volume of e-waste generated, e.g. by supporting eco-design and favouring EEE repair and reuse practices [1].

According to the *Regional E-waste Monitor for the CIS + Georgia - 2021* [2], the twelve countries reviewed[3] have well-developed legal and regulatory frameworks in the field of waste management. As of 2021, Georgia, Moldova, and Ukraine have e-waste-specific legislation or regulation, while Belarus, Kazakhstan, and Russia regulate e-waste through bylaws in the national legislation (i.e. by specifically mentioning e-waste in their general waste laws). All other countries have laws for general waste management, but do not regulate e-waste specifically. There is a regulatory framework for an EPR system for e-waste in six countries (Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, and Russia) with differing levels of implementation, and an EPR system is currently being developed in two countries (Armenia and Ukraine). Furthermore, collection targets are in place in Belarus, Georgia, Kazakhstan, Moldova, and Russia. For more information on each country, refer to the *Regional E-waste Monitor for the CIS + Georgia - 2021* [2].

C. EXAMPLE OF E-WASTE COLLECTION AND RECYCLING TARGETS OF THE EUROPEAN UNION

The European Union is one of the leading regions in terms of e-waste management. This section provides an overview of the minimum targets for e-waste collection and e-waste recovery set up in the EU, which can serve as examples and basis for the development of similar approach in the Uzbek context. Deciding on legal targets is one aspect of a proper e-waste management system (and is necessary in order to use the UNITAR E-waste Collection Tool) but must be complemented by a series of other decisions and actions, such as the introduction of separate collection, a large network of collection points, free return of e-waste, EPR or another financing system, producers' registration and reporting requirements, data and reporting obligations, treatment requirements, and awareness-raising.

In the EU, e-waste is currently regulated by the WEEE Directive. The WEEE Directive sets a collection target and a separate set of recycling, reuse, and recovery targets applicable for each Member State of the EU and applicable for all six categories of e-waste [8], which have been increased over time (the below figure provides the target as per the latest update, and previous collection rates are provided in the footnote). The collection targets are defined in Article 7, and recycling, reuse, and recovery targets are defined in Article 11.

[2] Note: this apparent wide coverage of population is due to the fact that the most populous countries, such as China and India, have national legal instruments in place.
[3] Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan.

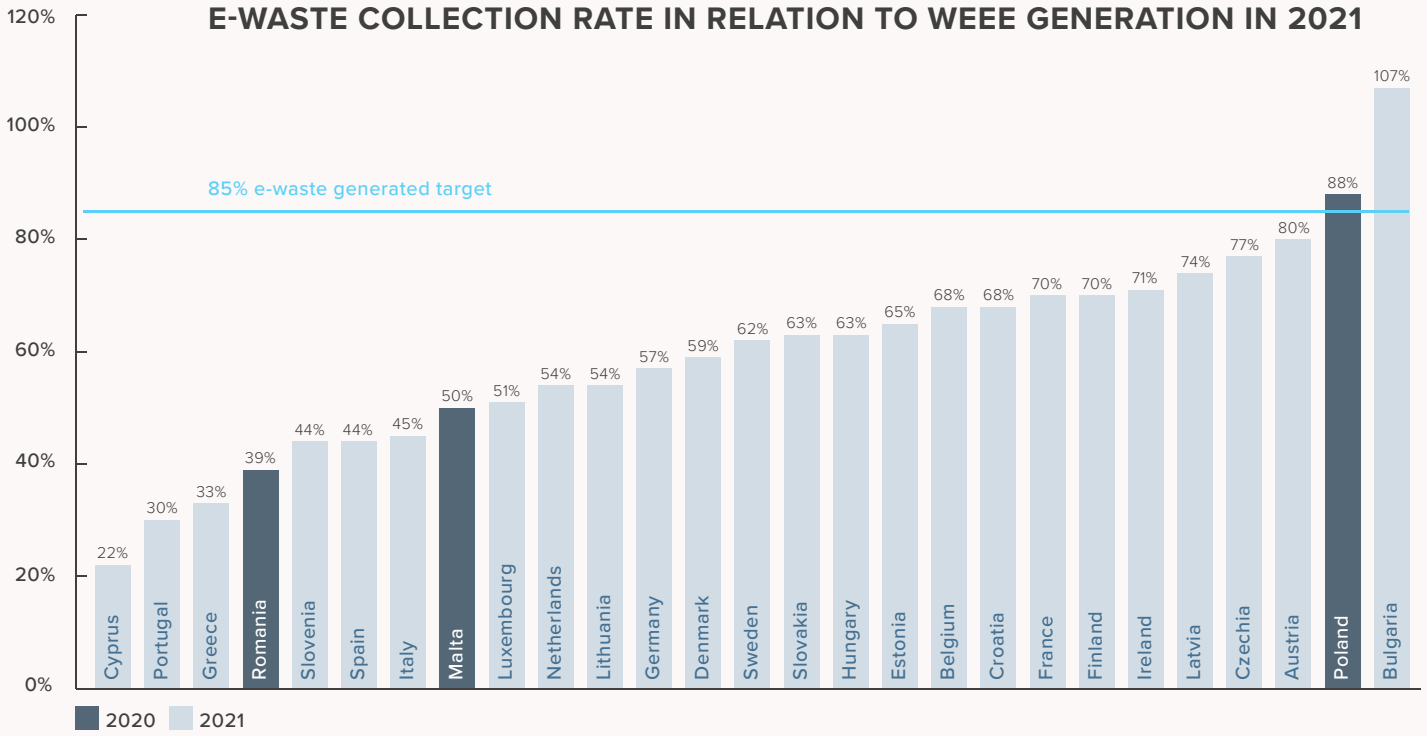
Article 7 of the WEEE Directive states that, starting in 2019, the minimum collection rate to be achieved annually shall be either 65% of the average weight of EEE placed on the market in the three preceding years in the Member State concerned or 85% of WEEE generated on the territory of that Member State[4].

The WEEE Directive provides two methods to calculate the collection rate: the "EEE POM method", calculated as the mass of e-waste collected divided by the average amount of EEE POM in the three preceding years, and the "WEEE Generated method", calculated by mass of e-waste collected divided by the mass of WEEE Generated in the same year. The "WEEE Generated method" is used in this publication.

In 2021, formal collection of e-waste totalled 4,900 kt (11 kg/inhabitant), equating to an average collection rate of 58% [UNITAR database].

While the amount of collected e-waste has significantly increased in recent years, most countries (except for Bulgaria and Poland) are not reaching the collection targets set in the WEEE Directive.

Figure 4. Overview of e-waste collection rate in relation to WEEE Generation for Member States of the EU-27 in 2021 [UNITAR database]



[4] The first version of the EU WEEE Directive (2002/96/EC) requested Member States to achieve by 2006 a minimum rate of separate collection of four kilograms on average per inhabitant per year of e-waste from private households. The recast WEEE Directive (2012/19/EU) kept the same rate until end of December 2015, adding an alternative calculation method consisting of the same amount of weight of WEEE as was collected in that Member State on average in the three preceding years. Starting in 2016, the minimum collection rate was 45% calculated on the basis of the total weight of WEEE collected in a given year in the Member State concerned, expressed as a percentage of the average weight of EEE placed on the market in the three preceding years in that Member State.

A recent study by UNITAR and the WEEE Forum [22] reveals that considerable amounts of e-waste are diverted to other undocumented flows, thus preventing EU countries from reaching the collection targets. It was estimated that:

- 1,400 kt (2.7 kg per capita) was collected with metal scrap and recycled, but not with the same environmental and material efficiency standards as e-waste formally managed
- 800 kt (1.5 kg per capita) was disposed of with mixed residual waste and ended up in incinerators and landfills
- 500 kt (1 kg per capita) was illegally exported outside the EU27, and 600 kt (1.1 kg per capita) was exported for reuse. The exports for reuse and illegal exports are hardly monitored in most countries, partially due to the lack of trade codes for used EEE.

Additionally, the study estimated that 3,000 kt of e-waste is hoarded in households.

The minimum targets for recovery, preparation for reuse, and recycling[5] as set in Article 11 and Annex 5 of the WEEE Directive is displayed in Table 2. The minimum targets are applied to the collected e-waste under the WEEE-Directive to ensure that e-waste is reused, recovered, and recycled at an acceptable standard across the European Union. Most, or even all, countries within the European Union are reaching the recovery, preparation for reuse, and recycling targets laid down in the WEEE Directive, which is in contrast to the collection targets as shown in Figure 4.

Figure 5. Proportion of documented and undocumented e-waste flows in the EU in 2021, in kilotons [22][23][24]

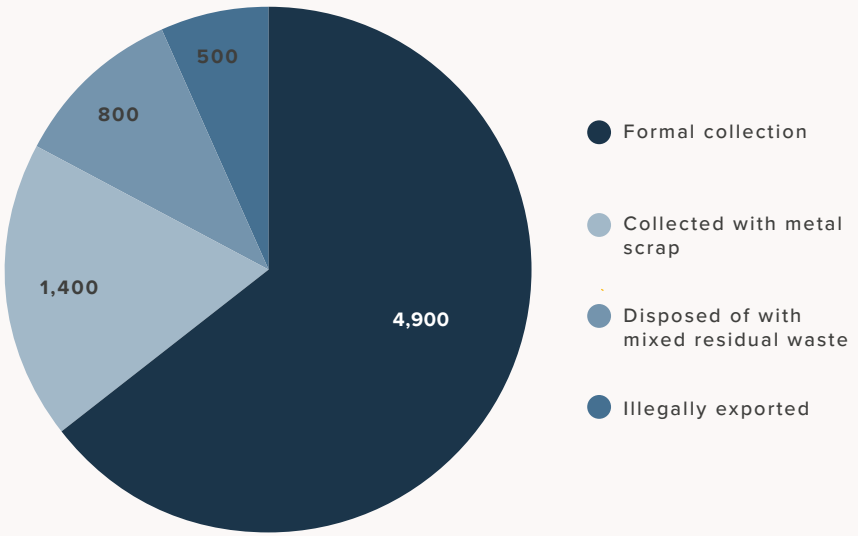


Table 2. Minimum targets for e-waste recovery, preparation for reuse, and recycling applicable to the collected waste under the WEEE Directive - divided according to category of the WEEE Directive

CATEGORY	
1. Temperature exchange equipment 4. Large equipment (any external dimension more than 50 cm)	85% shall be recovered, and 80% shall be prepared for reuse and recycled
2. Screens, monitors, and equipment containing screens with a surface greater than 100 cm^2	80% shall be recovered, and 70% shall be prepared for reuse and recycled
5. Small equipment (no external dimension more than 50 cm) 6. Small IT and telecommunication equipment (no external dimension more than 50 cm)	75% shall be recovered, and 55% shall be prepared for reuse and recycled
3. Lamps	80% shall be recycled

These targets have been updated over time to adapt to the transition from the 10 to 6 e-waste categories and the EU's resource efficiency objectives.

[5] According to the WEEE Directive, "recovery" means any operation whose principal result is waste serving a useful purpose by replacing other materials that would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy; "preparing for reuse" means checking, cleaning, or repairing recovery operations, by which products or components of products that have become waste are prepared so that they can be reused without any other pre-processing; and "recycling" means any recovery operation by which waste materials are reprocessed into products, materials, or substances, whether for original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations.

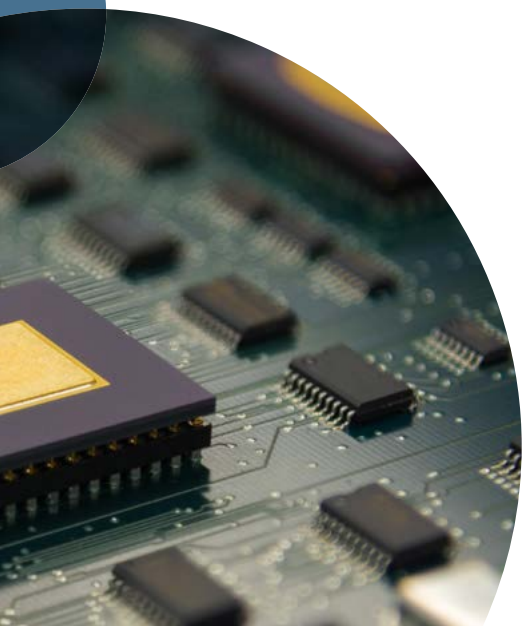
Chapter 4.
Current situation of e-waste management in Uzbekistan

A. CURRENT E-WASTE AND OTHER RELEVANT WASTE POLICIES AND LEGISLATION IN UZBEKISTAN

i. Policy

The general national policy of the Republic of Uzbekistan in the field of waste management is based on the "Solid waste management strategy" for the Republic of Uzbekistan for the period 2019-2028, approved by the Decree of the President on 17 April 2019 [3]. The main purpose of this document is to establish an effective system for the collection, transportation, recovery, recycling, and disposal of MSW.

One of the Strategy's objectives is to implement methods for the collection and recycling of specific types of MSW (including mercury-containing waste and batteries) by employing economic mechanisms in this area.



Such mechanisms include public-private partnership projects, as well as attracting foreign and local investments for the introduction of new technologies and construction of new recycling facilities. These initiatives encompass the construction of waste-sorting points and PET fibre production facilities. The total investment required for the implementation of the Strategy is estimated at approximately USD $2.2 billion.

The Strategy establishes several target indicators for MSW collection, recycling, and disposal. One of these indicators aims for a recycling rate of 25% for specific types of MSW, including mercury-containing waste and batteries, by the year 2028.

As part of the development of the system of separate MSW collection from 2022 to 2025, the installation of five types of containers is planned, including the purchase of 500 containers for hazardous household waste, such as batteries and accumulators, in cities.

Thus, the Strategy aims to ensure environmental protection in the regions, save resources, reduce waste generation, and maximize the use of valuable secondary resources in the country's economy, including through the production of finished products based on secondary raw materials.

On 4 January 2024, the Presidential Decree "On measures to improve the waste management system and reduce its negative impact on the environmental situation" was adopted [4]. These measures are intended to digitalise the MSW payment system, gradually implement MSW sorting systems in large cities, and introduce "green investments" in the sphere of waste recycling and recovery, including e-waste. Starting in 2025, the transportation of certain types of waste - including MSW, industrial waste, and hazardous waste - will be subject to licensing. It was planned to approve the list of goods, the information on recycling of which must be indicated by producers and importers beginning July 1, 2024. To facilitate implementation of these measures, a roadmap for 2024-2026 has been adopted. The Minister of Ecology, Environmental Protection, and Climate Change has been appointed as the responsible minister for organising the Decree's implementation.

Local executive bodies (hokamiyats) are responsible for implementation of government programs at the local level, including improvement of waste management infrastructure, construction of new production facilities and modernisation of existing ones, and implementation of measures on rational use of natural resources. However, these competencies of the hokamiyats are not fully realised.

ii. General legal requirements

The main legal act governing waste management in Uzbekistan is the Law "On Waste", supplemented by several bylaws. The Law "On Waste" [5] regulates relations in the field of waste management. This law defines the competencies of state authorities in waste management, establishes standards for environmental certification of waste, and sets requirements for the storage and treatment of waste. However, this law does not specifically address e-waste, and the term "e-waste" is not defined within its provisions.

Treating industrial and household waste without special technical devices is prohibited by law. As well, disposing of waste for which appropriate recovery technologies exist in Uzbekistan (such as wastes from paper, plastic, and ferrous and non-ferrous metals) is also not permitted.

For transactions involving the purchase and sale of waste, export-import operations, and transportation of hazardous waste, waste owners must undergo environmental certification to ensure compliance with environmental standards in waste management and obtain an environmental certificate.

The Law provides regulations on incentives for waste recovery and the reduction of waste generation. In accordance with the legislation, legal entities and individuals involved in developing and implementing technologies that reduce waste generation and promote waste recovery and that establish enterprises and workshops for producing waste recovery equipment are eligible for incentives. This also extends to individuals who contribute to financing waste recovery and reduction activities.

For instance, companies engaged in the collection, removal, sorting, and recycling of waste are eligible for reduced tax rates. Until January 1, 2026, the tax rate on profit and social tax for these companies is reduced to 1% from the standard rates of 15-20% and 12%, respectively [25].

The Law provides for the principle of EPR in the form of a treatment fee paid by producers and importers related to wheeled vehicles, self-propelled machines, and trailers. Starting July 1, 2024, the EPR mechanism will also cover tires and pneumatic rubber tires. The amount of the treatment fee for vehicles depends on their engines' volume and the weight of their tires (or pneumatic rubber tires) [26]. The Ministry of Ecology plans to expand the list of products subject to the treatment fee.

During the stakeholder consultations, importers of EEE propose calculating the treatment fee based on the cost of the EEE, rather than its weight. Such importers argue that calculating fees based on weight would lead to significant expenses for importers, ultimately resulting in price increases for final products.

Despite the absence of general standards and regulations on e-waste management in the legislation of Uzbekistan, specific regulations exist for certain types of e-waste, such as used mercury-containing lamps and energy-saving lamps and scraps of ferrous and non-ferrous metals (Annex 4).

Waste and defective mercury-containing lamps are collected separately from other waste in special containers at waste collection points. This type of waste should only be transferred to companies authorised for recovery by the Ministry of Ecology. Independent recovery of such waste without authorisation is prohibited [27].

Retail points of sale of mercury-containing lamps, brand stores, and representative offices of producers (importers) are required to accept waste mercury-containing lamps from the public without restrictions and transfer them to producers of energy-saving lamps [28].

Individuals can drop off scrap metal and non-ferrous metal waste for recycling. The legislation [29] specifies a list of acceptable scrap metal and non-ferrous metal waste from individuals, including electronic and household equipment, lamps, and batteries. This waste is collected at specialised collection points of JSC "Uzmetkombinat" and JSC "Uzvtortsvetmet" at a negotiated price. These companies recycle scrap metal. Companies with their own foundries and metal-rolling production facilities are legally allowed to independently process their own scrap metal, including electronic and household equipment, lamps, and batteries.

The legislation also outlines rules for handling large-sized household waste [30]. Certain types of EEE waste, such as large household appliances (refrigerators, washing machines, TVs, etc.) and office equipment (computers, printers, etc.), are classified as large-sized household waste.

Residents are obligated to store large-sized household waste in temporary, specially designated areas and prevent it from being discarded at waste collection points.

Thus, Uzbekistan partially regulates e-waste management, particularly addressing issues related to handling mercury-containing lamps, large equipment, and the acceptance of scrap ferrous and non-ferrous metals from electronic equipment provided by individuals. However, in practice, the legal requirements for managing such waste are not fully complied with. Therefore, further legislative improvements are needed to establish specific requirements for managing all types of e-waste at various stages of the waste life cycle and ensure their enforcement.

iii. Hazardous and toxic waste management

The legislation in Uzbekistan on waste management distinguishes between hazardous[6] and toxic[7] wastes. According to the definition, toxicity is considered one of hazardous waste's properties. Therefore, all toxic waste is hazardous, but not all hazardous waste is necessarily toxic. The Cabinet of Ministers is authorised to approve the list of hazardous waste and waste subject to state regulation for transboundary movement, but the list is currently missing.

However, a classification of hazardousness exists for toxic industrial waste. According to the Hygienic Classifier of toxic industrial waste in the Republic of Uzbekistan, toxic industrial waste is divided into four hazard classes [31].

Table 3. Hazard classes and types of e-waste provided by the Hygienic Classifier of Toxic Industrial Wastes

Hazard class	Name of waste and production	Most toxic components
Class 1 - extremely hazardous	glass from lamp recycling	mercury
Class 2 - highly hazardous	chloride condensation system waste	titanium, vanadium
Class 3 - moderately hazardous	semiconductor production waste materials	mercury
Class 4 - lightly hazardous	semiconductor production waste	mercury, lead

A total of 134 types of toxic industrial waste are included in the Hygienic Classifier, categorised into Class 1 (16 types), Class 2 (52 types), Class 3 (37 types), and Class 4 (28 types).

Toxic industrial wastes are managed at landfills, considering their hazard class, through methods such as incineration, treatment, or disposal.

According to the Regulations on the procedure for state accounting and control in the field of waste management [32], waste is categorised as toxic or non-toxic and as waste subject to secondary recycling or not subject to secondary recycling[8].

Although there is no separate category for e-waste in this classification, based on the definitions provided, e-waste can be classified as toxic, non-toxic, recyclable, or non-recyclable waste.

[6] Hazardous waste is defined as waste that contains substances with at least one hazardous property (such as toxicity, infectivity, explosiveness, fire hazard, high reactivity, or radioactivity) present in quantities and forms that pose a direct or potential danger to life, health of citizens, and the environment, either independently or in contact with other substances [5].
[7] Toxic waste refers to waste that includes harmful substances capable of causing diseases or abnormalities in human health, including subsequent generations, and causing adverse environmental impacts through direct or indirect contact [32].
[8] Waste subject to secondary recycling - waste suitable for industrial processing for reuse as secondary raw materials [32].

Under the Regulations, legal entities that are owners of waste and specialised enterprises engaged in waste collection, transportation, storage, recycling, and recovery must maintain records of toxic and non-toxic waste. They are also required to submit state statistical reports as per the procedure established by law.

State recording for toxic and non-toxic waste, including those subject to recycling, must adhere to the lists specified in Appendices 2 and 3 of the Regulation. The list of toxic and non-toxic wastes, which may include e-waste, is detailed in Table 4.

Table 4. Toxic and non-toxic waste relevant to e-waste

TOXIC WASTE		NON-TOXIC WASTE	
RECYCLABLE	**NON-RECYCLABLE**	**RECYCABLE**	**NON-RECYCLABLE**
mercury-containing waste		scrap and waste of ferrous and non-ferrous metals	waste and defective electric light bulbs
lead		all waste (products, devices, appliances that have lost their consumer properties) containing mercury	used capacitors with trichlorodiphenyl, pentochlorodiphenyl; used transformers with pentochlorodiphenyl; waste of polychlorinated biphenyls and terphenyls, polybrominated biphenyls, as well as waste of substances and products containing them
copper			scrap and waste metal ceramics[9] with ferrous metals
zinc	-		all waste (products, devices, appliances that have lost their consumer properties) containing mercury
			scrap of copper alloys, bronze, brass; sawdust, scrap, shavings of copper alloys, bronze, brass uncontaminated
			scrap and waste of copper alloys, bronze, brass with impurities or contaminated
			waste of lead salts, copper chloride in solid form
			ABS plastic; synthetic cords that have lost their consumer properties

The mentioned Regulations classify some toxic waste as non-toxic, for example, used capacitors and transformers with hazardous substances, contaminated scrap and waste of copper alloys, bronze, and brass. Mercury-containing waste is categorised as both toxic and non-toxic waste, and it may or may not be recyclable.

An environmental certificate is required for transboundary movement of hazardous waste [33]. In accordance with the Basel Convention [13], national legislation establishes a list of wastes subject to environmental certification for importing and exporting. This list was approved by Decision of the Cabinet of Ministers of the Republic of Uzbekistan No. 43 dated January 30, 2021 [34]. It includes types of wastes (List A) whose importing and exporting are regulated by Uzbekistan and requires an environmental certificate in accordance with the national legislation [33].

Therefore, the legislation of Uzbekistan contains general provisions on hazardous waste, but specific norms for the classification of hazardous wastes, other than industrial wastes, are currently missing.

[9] Metal ceramics are composite materials consisting of metals and ceramic components; metal ceramics can be found in electronic chips, circuit boards, etc.

iv. Enforcement of the legislation on waste

State control in the field of waste management is conducted in accordance with the Law "On Waste" [5], regulations on the procedure for state recording and control in the field of waste management, and other relevant legislative acts [32].

This state control encompasses verifying compliance with waste management legislation, coordinating statistical reporting by legal entities, and monitoring waste management practices.

The responsibilities for state control in waste management are delegated to the Ministry of Ecology, Environmental Protection, and Climate Change of the Republic of Uzbekistan, the Ministry of Health, the State Committee for Industrial Safety of the Republic of Uzbekistan, and local authorities.

Specifically, the Ministry of Ecology, Environmental Protection, and Climate Change of the Republic of Uzbekistan oversees the implementation of state waste management programs and approves the statistical reporting of legal entities. The Ministry of Health is responsible for ensuring compliance with established health norms and rules related to waste management. The State Committee for Industrial Safety is responsible for waste management oversight at mining and mining processing enterprises, while local authorities oversee compliance with waste management legislation in their respective jurisdictions. Administrative and criminal liability is established for violations of waste management legislation.

Thus, Uzbekistan has established fundamental legal norms for waste and hazardous waste, which partially address the regulation of e-waste. However, there are several problems and gaps in the legislation, including challenges related to the implementation of the EPR mechanism, the absence of e-waste classification according to the WEEE Directive, and insufficient implementation and enforcement of existing legislation.

B. CURRENT NATIONAL INFRASTRUCTURE FOR MANAGING E-WASTE

Many stakeholders are involved in e-waste management in Uzbekistan: government agencies, local executive bodies, EEE producers, importers and retailers, waste collectors and recyclers, producers of recycled products, NGOs, and the civil sector. The statistics, roles, and activities of the stakeholders are described below.

i. EEE production

In 2023, EEE production amounted to 22.4 trillion soums (USD $1.8 billion) or 3.4% of the total industrial output (655.8 trillion soums [USD $52.5 billion]) [35]. EEE production increased by 28% between 2021 and 2023 (Figure 6).

Imports of EEE related to ICT to Uzbekistan amounted to USD $1.12 billion [36] (Annex 5).

The state supports domestic producers and creates favourable conditions for the development of the electrical industry. This support includes partially or fully covering costs associated with the implementation of international standards in the industry, engagement of international specialists, digitalisation of production processes, and provision of customs privileges [37]. For example, enterprises within the industry, including EEE companies, are exempted from customs duties on imported raw materials, materials, and equipment that are not produced in Uzbekistan until January 1, 2027.

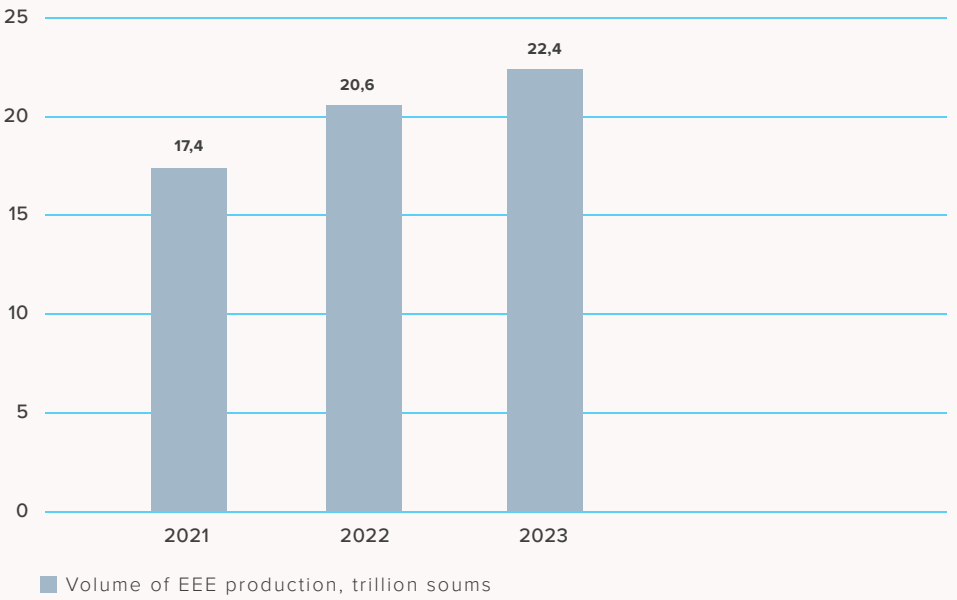
One of the leading manufacturers of electronics is Artel Electronics LLC. The company is involved in the production and sale of electronics and household appliances both domestically and internationally. Over 70% of Artel products are exported to CIS countries [38].

Artel Electronics LLC operates 38 service centres across 14 regions of Uzbekistan, providing warranty service for electronics. Electronic waste generated from these service centres is transferred to specialised companies for proper recovery.

The company organises occasional promotions under its trade-in program, offering customers the opportunity to receive a voucher toward the purchase of new electronic equipment by trading in certain obsolete devices. However, such promotions are infrequent, and buyers often do not take advantage of them.

Other domestic manufacturers such as SAM-FERRE (specialising in household refrigerators, stoves, and commercial refrigeration equipment), TEXNOPARK (producing washing machines, refrigerators, electronic gas meters, and industrial air conditioners), IDEALELECTROLUX (manufacturing gas stoves and electric ovens), and other companies are also prominent in the market. These companies maintain service centres for the repair and maintenance of their manufactured equipment.

Figure 6. Volume of EEE production in Uzbekistan (trillion soums) [35]



However, many EEE manufacturers in Uzbekistan do not adequately address the management of e-waste generated during the production of EEE[10] or after their products have lost their consumer properties. Most manufacturers lack a system for recording the generation and disposal of such waste.

ii. E-waste collection and recycling

There are e-waste collection and treatment companies in Uzbekistan; however, these companies have limited technical equipment and rely primarily on manual sorting technology, which constrains their processing capacity. The extracted non-ferrous and ferrous metals are sent to Uzvtortsvetmet JSC and Uzvtorchermet JSC, respectively. Printed circuit boards are sent to “Almalyk Mining and Metallurgical Combine” JSC, while plastic is transferred to the private sector for recycling reuse in products like hangers.

Certain elements such as freons, glass, and hazardous components of medical equipment are basically not recycled in Uzbekistan. Freons are accumulated in the warehouses of companies that use manual sorting, and glass is disposed of in landfills.

[10] E-waste generated during the production of EEE consists of waste or unneeded electronic components and devices that are produced at various stages of electronics production and assembly (such as discarded components like electronic chips, microchips, plastic scraps, etc).

With the support of state authorities, waste collection companies have initiated efforts to implement a system of separate waste battery collection by installing containers in various districts of Tashkent city.

One of the recycling companies with a well-established regional network has a certain level of infrastructure and is ready to manage e-waste collection and recycling with some adaptation of its infrastructure for e-waste and adequate funding from the government.

In all, Uzbekistan faces challenges with an underdeveloped e-waste management infrastructure. Although there are companies engaged in the collection and recycling of waste, their technical equipment remains at a low level, which limits the efficiency of e-waste management processes. The development of this sector requires financial support from the government and producers. Also, it is important to speed up the implementation of the EPR mechanism and to take other comprehensive measures in developing Uzbekistan's e-waste management system.

iii. Informal sector

In Uzbekistan, companies specialised for e-waste collection and recycling work mainly with legal entities. The collection of e-waste from the population is practically nonexistent, except for waste lamps. Due to the lack of adequate infrastructure and regulation, many people actually turn to the informal sector to dispose of their electronic devices by responding to advertisements of the informal sector that are placed in newspapers or on the Internet. Informal sector workers extract components that are valuable to them, and the rest is disposed of in dumps. Illegal collectors and recyclers may ignore the necessary measures in the e-waste depollution and recycling process, violating environmental legislation, occupational health and safety regulations, including the use of personal protective equipment, as well as using unsustainable ways of handling hazardous components in e-waste.

iv. The environmental community

The environmental community, represented by NGOs, research institutes, and universities, is involved in the development of the e-waste management system in Uzbekistan through outreach and information support, as well as through capacity-building and awareness-raising of their staff. NGOs conduct educational campaigns and actions among the population to raise awareness about e-waste management and its impact on the environment.

Thus, a number of infrastructure challenges remain relevant. These include the almost complete lack of public e-waste collection points, the lack of e-waste treatment and recycling infrastructure and technologies, and the presence of the informal sector. However, a positive trend in the development of e-waste management can be noted in the country through the attempts to establish a system of collection and recycling for some types of e-waste.

C. E-WASTE STATISTICS IN UZBEKISTAN

According to UNITAR [2], the volume of EEE sales in the Uzbek market in 2019 amounted to 5.1 kg per capita, and the volume of e-waste generated amounted to 4.2 kg per capita, or 139.7 kt in total. Assuming an even distribution of e-waste per capita across the regions, and taking into account the different population size in the regions, the largest amount of e-waste was generated in Samarkand (16 kt), Fergana (15.5kt), Kashkadarya (13.5kt), and Tashkent (12.2kt) regions. The lowest amount was generated in Syrdarya (3.5kt), Navoi (4.1kt), Jizzakh (5.7kt), and Khorezm (7.7kt) regions[11].

Table 5. Key data on EEE and e-waste in Uzbekistan in 2019 [2]

INDICATORS	VALUES
EEE placed on the market	169.6 kt 5.1 kg per capita
E-waste generated	139.7 kt 4.2 kg per capita
E-waste collection and recycling	0.3 kt (close to 0 kg per capita)
Environmentally sound collection rate of e-waste, %	0.2 %

According to UNITAR [11], the annual increase in e-waste generation will be approximately 5 kt; thus, by 2050, e-waste generation will reach approximately 268 kt per year, which is nearly twice as high as in 2019.

Official information on e-waste collection and recycling in Uzbekistan is not available, as the country has almost no official reporting or statistics on the matter. This complicates the reporting of e-waste, assessment of its environmental impact, and economic consequences, and makes it difficult to make qualified decisions in the field of e-waste management.

[11] The data is calculated by multiplying the population of each region (based on the population statistics for the regions of Uzbekistan for 2019, published on the official website of the Statistics Agency under the President of the Republic of Uzbekistan https://s tat.uz/ru/ofitsialnaya-statistika/demography and the data provided in the "Regional e-waste monitor CIS + Georgia") by the e-waste generation rate per capita - 4.2 kg

Chapter 5.
Challenges and opportunities of e-waste management in Uzbekistan

A. PROJECTIONS OUT TO 2030 AND 2050: ENVIRONMENTAL IMPACT AND RESOURCE POTENTIAL OF E-WASTE ("BUSINESS AS USUAL" SCENARIO)

E-waste generation

According to the UNITAR E-waste Collection Tool [11], the volume of e-waste generated in Uzbekistan is expected to continue to increase. Figure 7a shows projected managed and unmanaged e-waste generation to 2030 and 2050 in the absence of measures to improve e-waste management in Uzbekistan (the "Business as Usual" scenario, see chapter 2.b). Figure 7b shows the cumulative volumes of managed and unmanaged e-waste to 2030 and 2050 under the "Business as Usual" scenario. As shown in Figure 7a, unmanaged e-waste could reach 169 kt per annum in 2030 and 268 kt per annum in 2050. In the absence of decisive measures to develop e-waste collection and recycling system in Uzbekistan, the total (cumulative) generation of unmanaged e-waste will reach 1,232 kt in 2030 and 5,611 kt in 2050 (Figure 7b).

Figure 7a. Generation of managed and unmanaged e-waste in 2023, 2030, and 2050 under the "Business as Usual" scenario (kt) [11]

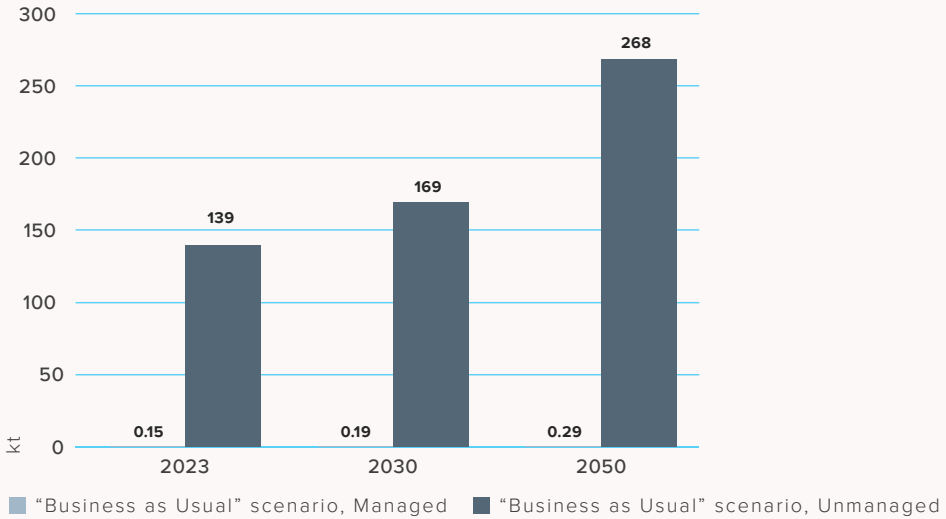
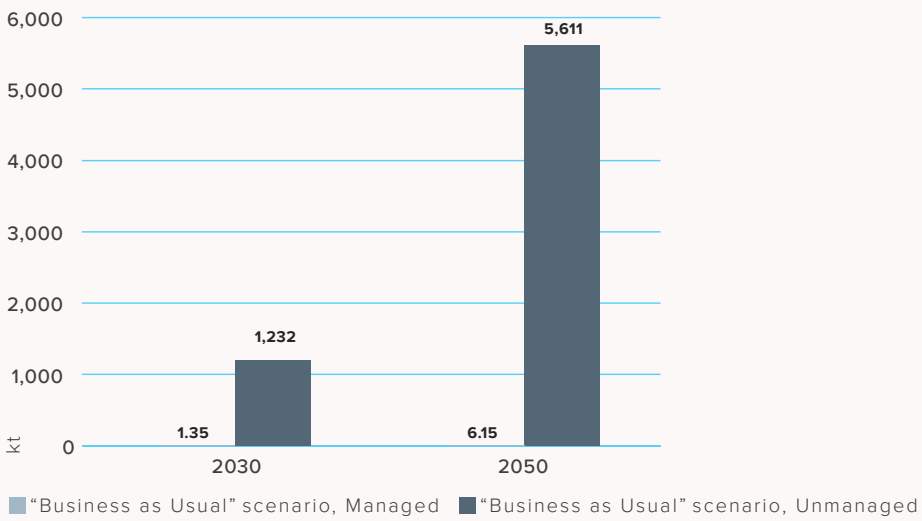


Figure 7b. Total accumulated e-waste volumes from 2023 to 2030 and from 2023 to 2050, under the "Business as Usual" scenario (kt) [11]



Hazardous substances in e-waste

Hazardous substances in e-waste (such as lead, mercury, chlorofluorocarbons, see chapter 1.a) negatively affect human health and pollute the environment. Projections for the accumulated content of select hazardous components in managed/unmanaged e-waste until 2030 and 2050 for the "Business as Usual" scenario are presented in Table 6[12].

Table 6. Projected content of hazardous substances in managed/unmanaged e-waste for 2023-2030 and 2023-2050, under the "Business as Usual" scenario [11]

HAZARDOUS SUBSTANCES	CUMULATIVE 2023 - 2030, TONNES		CUMULATIVE 2023 - 2050, TONNES	
	Managed	Unmanaged	Managed	Unmanaged
CFC-12	0.02	20.28	0.03	27.41
HCFC-22	1.96	1,789	6.63	6,047
HC (R600a)	0.09	81.20	0.42	380
HFC-134a	0.05	49.01	0.11	104
HFC-32	0.02	15.27	0.08	71.52
HFC-410A	0.42	379	1.94	1,774
Mercury (Hg)	0	2.60	0.01	5.54
Lead (Pb)	0.70	643	1.52	1,382

Valuable materials in e-waste

In addition to hazardous components and toxic substances, e-waste contains valuable materials such as steel, copper, aluminium, precious, and other types of metals and plastics. Incurrent mining practices, primary extraction of raw materials often causes significant negative impacts on the environment. Fluctuations in market prices, material shortages, and raw material supply risks create the need to introduce methods for extracting secondary raw materials and reducing pressure on primary raw materials. In this respect, e-waste is an important source of secondary raw materials [1].

Table 7 presents the forecast of the content of valuable materials in the total generation of e-waste for 2023-2030 and 2023-2050 for the "Business as Usual" scenario.

Table 7. Projected content of valuable materials in managed/unmanaged e-waste for 2023-2030 and 2023-2050, under the "Business as Usual" scenario [11]

VALUABLE MATERIALS	CUMULATIVE 2032 - 2030, TONNES		CUMULATIVE 2023 - 2050, TONNES	
	Managed	Unmanaged	Managed	Unmanaged
Plastic	225	205,267	656	598,061
Glass	0.56	507	94.25	85,959
Iron (Fe)	513	467,403	2,273	2,072,735
Aluminum (Al)	85.96	78,400	376	343,337
Copper (Cu)	51.02	46,532	233	212,547
Silver (Ag)	0.02	21.10	0.10	91.39
Gold (Au)	0	4.16	0.02	17.40
Platinum (Pt)	0	0.02	0	0.10
Palladium (Pd)	0	1.36	0.01	5.59

Lack of progress in the development of e-waste management in Uzbekistan may result in the loss of potential secondary raw materials cumulatively amounting to 3,300 kt by 2050.

[12] This table includes 6 refrigerants that are found in refrigerators, air conditioners, etc., and 2 heavy metals that are found in printed circuit boards, CRT monitors, etc.

Environmental costs of pollution by e-waste

Table 8 provides the economics of e-waste management in 2023, 2030, and 2050 under the "Business as Usual" scenario. According to UNITAR, in the current (2023) e-waste management system in Uzbekistan:

- The environmental and social costs of unmanaged e-waste are estimated at USD $707 million. For the methodology, see chapter 2.a. These costs are due mainly to uncontrolled releases of greenhouse gases and hazardous substances (mercury, lead); the costs amount to 0.8% of GDP in 2023[13]
- The revenue from processing valuable materials from environmentally soundly managed e-waste amounts to USD $140,000

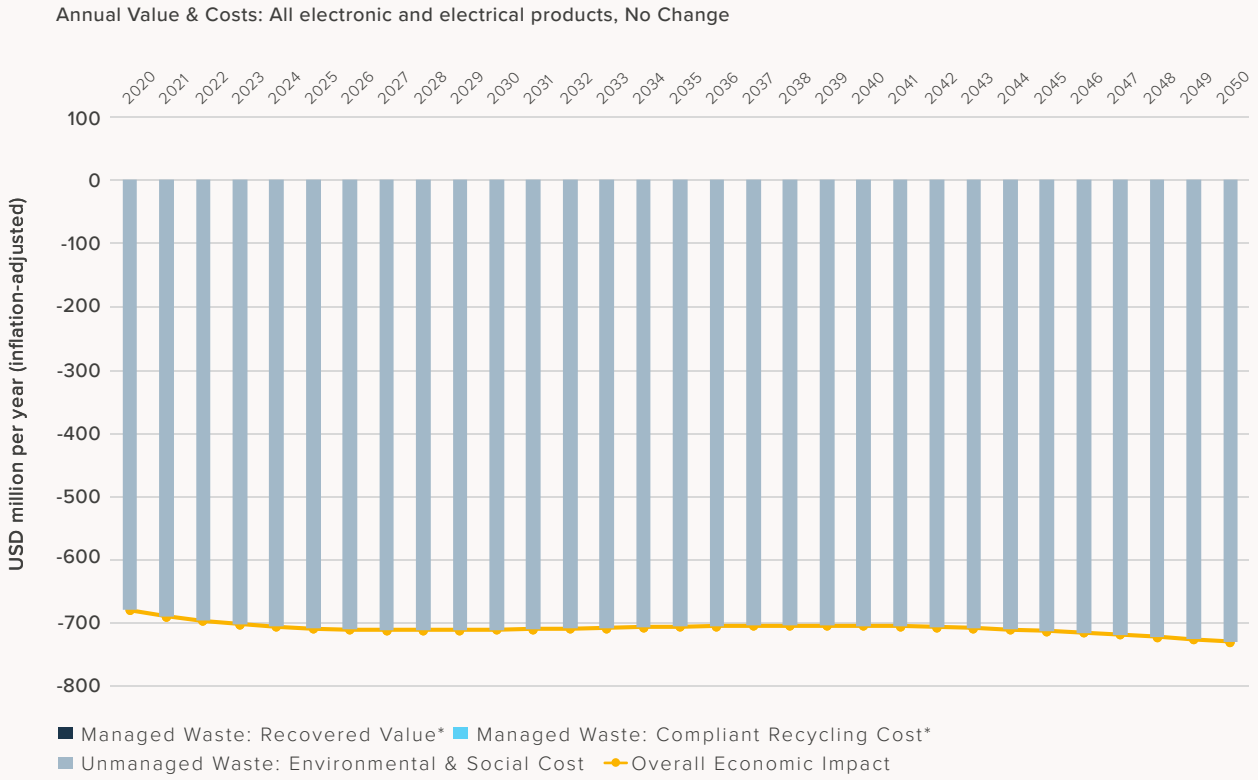
Table 8. Economic revenues and losses in 2023, 2030, and 2050, under the "Business as Usual" scenario [11]

ECONOMIC INDICATORS, MILLION USD PER YEAR			
	2023	2030	2050
Environmental and social costs of unmanaged e-waste	-707.61	-716.31	-735.21
Cost of environmentally soundly managed e-waste	0.06	0.08	0.18
Revenue from managed e-waste recycling	0.14	0.19	0.42
Total economic effect	-707.53	-716.21	-734.97

With no change to e-waste collection and recycling rates and taking into account the corresponding inflation rates, the following consequences are expected by 2050 (Table 8, Figure 8):

- The environmental and social losses will amount to USD $735 million per year
- The revenue from processing valuable materials will amount to USD $420,000

Figure 8. Dynamics of environmental and socioeconomic impacts of e-waste management, under the "Business as Usual" scenario [11]



* The numbers for these parameters are so little that they do not appear in the Figure.

With the development of the e-waste management system according to the "Business as Usual" scenario, the loss of valuable materials and the release of hazardous constituents and toxic substances contained in e-waste will have significant environmental and economic consequences for Uzbekistan by 2030 and 2050.

The predicted negative impact highlights the need to take consistent action to improve the e-waste management system in accordance with a clearly defined system development scenario and specific targets that will help track its growth and development.

[13] According to the Statistics Agency under the President, Uzbekistan GDP for 2023 amounted to USD $90.8 billion at an average exchange rate of 11,741 soum.

B. INTERACTION BETWEEN E-WASTE COLLECTION AND RECYCLING AND THE SUSTAINABLE DEVELOPMENT GOALS

In September 2015, all United Nations Member States adopted the ambitious 2030 Agenda for Sustainable Development and identified 17 Sustainable Development Goals (SDGs) and 169 targets aimed at ending poverty, protecting the planet, ensuring prosperity, and fostering peace through global partnership.

Considering the issues and opportunities associated with e-waste, improving e-waste management would contribute to the achievement of several SDGs related to environmental protection and health, employment, and economic growth, as detailed below.

Figure 9. 17 Sustainable Development Goals (SDGs) [39]

Environmental protection and health

The hazardousness inherent to e-waste leads to various environmental and health-related issues, including the pollution of air, water, and soil, if the e-waste is mismanaged. Under SDG 12 on responsible consumption and production, target 12.4 intends to achieve the environmentally sound management of chemicals and all waste throughout the life cycle in accordance with agreed-upon international frameworks, and to significantly reduce their release into air, water, and soil in order to minimise their adverse impacts on human health and the environment. Target 12.5 addresses the issue of over-consumption of goods and over-production of waste and aims to substantially reduce waste generation through prevention, reduction, repair, recycling, and reuse. Under SDG 12, more specific sub-indicators have been recognised for monitoring growth in e-waste - i.e. e-waste has been included in the work plan and the documentation around indicator 12.5.1 on the national recycling rate and tonnes of material recycled, and under indicator 12.4.2 on hazardous waste generated per capita and proportion of hazardous waste treated by type of treatment.

SDG 3 on good health and well-being, and more specifically Target 3.9, tackles the number of deaths and illnesses caused by hazardous chemicals and air, water, and soil pollution and contamination. Under SDG 6 on clean water and sanitation, Target 6.1 is focused on achieving universal and equitable access to safe and affordable drinking water for all, and Target 6.3 is focused on reducing pollution, eliminating dumping, and minimising release of hazardous chemicals and materials into the environment. SDG 14 on life below water and Targets 14.1 and 14.2 refer to marine pollution and the protection of the marine ecosystem.

Most e-waste is generated in cities, so it is particularly important to improve collection and recycling rates in urban areas. Under SDG 11 on sustainable cities and communities, target 11.6 is intended to reduce the adverse environmental impact of cities per capita by paying special attention to air quality and municipal and other waste management.

Employment and economic growth

Solid waste management and recycling employs between 19 and 24 million women and men worldwide, of which four million work in the formal waste and recycling sector [40]. For now, e-waste is often processed in the informal sector, which is associated with work safety and security issues. However, due to the presence of valuable materials, the management of e-waste can be an opportunity for entrepreneurs to create sustainable businesses and green jobs and to contribute to economic growth in the recycling and refurbishing sector. Under SDG 8 on decent work and economic growth, Target 8.3 is intended to promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity, and innovation and to encourage the formalisation and growth of micro-, small-, and medium-sized enterprises. Target 8.8 calls for the protection of labour rights and promotes safe and secure working environments for all workers, including migrant workers - particularly women migrants - and those in precarious employment.

C. POSSIBLE WAYS OF DEVELOPING AN E-WASTE MANAGEMENT SYSTEM IN UZBEKISTAN ("CIRCULAR ECONOMY" SCENARIO)

Given the potential environmental, social, and economic impacts on the environment and economy of Uzbekistan, as well as the lack of a reliable e-waste management system in the country, it is clear that improving e-waste management in Uzbekistan must be carried out in accordance with the principles of a circular economy.

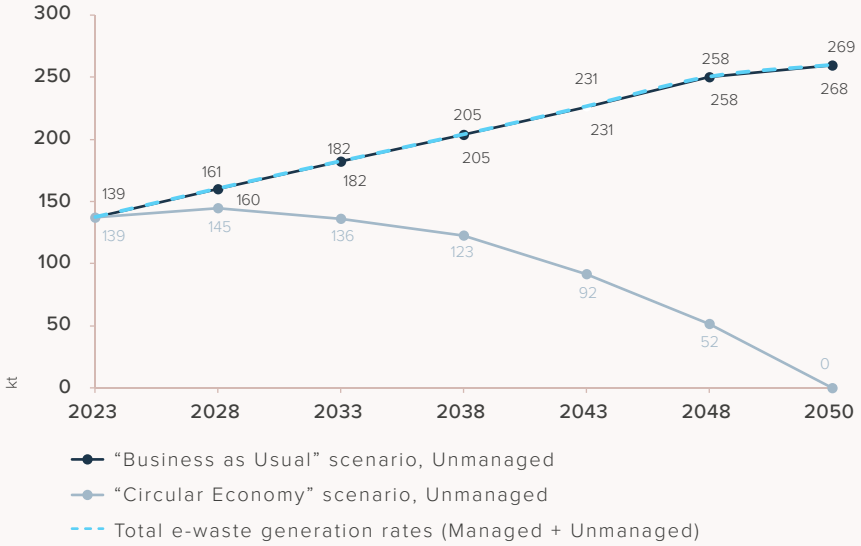
E-waste management within the "Circular Economy" scenario can be implemented in various ways. To assess the forecast for this scenario, this publication uses target indicators demonstrating an intensive increase in the share of e-waste collection and recycling in Uzbekistan from 0.2% in 2023 to 100% in 2053 (Table 9).

Table 9. Proposed e-waste collection and recycling targets[14] (managed e-waste) for the "Circular Economy" scenario

	2023 (current level)	2028	2033	2038	2043	2048	2053
Indicator value	0.2%	10%	25%	40%	60%	80%	100%

Comparing the forecast results for the two scenarios shows a significant difference in the volume of unmanaged e-waste, which has serious negative impacts on the environment and human health (Figure 10).

Figure 10. Projections of unmanaged e-waste generation under two scenarios of e-waste management [11]



[14] The e-waste recycling target is calculated by the mass of e-waste that is recycled during waste management divided by the collected e-waste.

The “Circular Economy” scenario would reduce the total amount of unmanaged e-waste by more than 1.5 times by 2050, from 5,611 kt to 3,143 kt, by incorporating it into the “managed” e-waste system through collection and recycling (Figure 11).

Figure 11. Total volumes of accumulated e-waste under two scenarios of e-waste management [11]

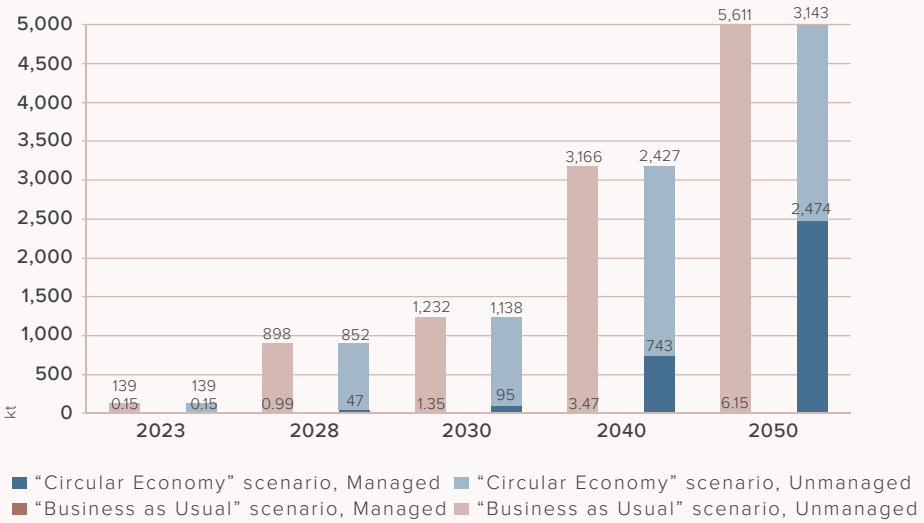


Table 10 presents UNITAR’s projections of hazardous constituents in e-waste if there is no progress in developing e-waste management (the “Business as Usual” scenario) as well as if Uzbekistan makes significant progress in e-waste management and improves collection rates (the “Circular Economy” scenario).

Table 10. Projected content of hazardous substances in managed/unmanaged e-waste for 2023-2050, under two scenarios of e-waste management [11]

HAZARDOUS INGREDIENTS	“BUSINESS AS USUAL” SCENARIO, CUMULATIVE 2023 - 2050, TONNES		“CIRCULAR ECONOMY” SCENARIO, CUMULATIVE 2023 - 2050, TONNES	
	Managed	Unmanaged	Managed	Unmanaged
CFC-12	0.03	27.41	3.58	23.86
HCFC-22	6.63	6,047	2,273	3,780
HC (R600a)	0.42	380	168	213
HFC-134a	0.11	104	27.08	76.75
HFC-32	0.08	71.52	31.59	40.01
HFC-410A	1.94	1,774	783	992
Mercury (Hg)	0.01	5.54	1.46	4.09
Lead (Pb)	1.52	1,382	404	980

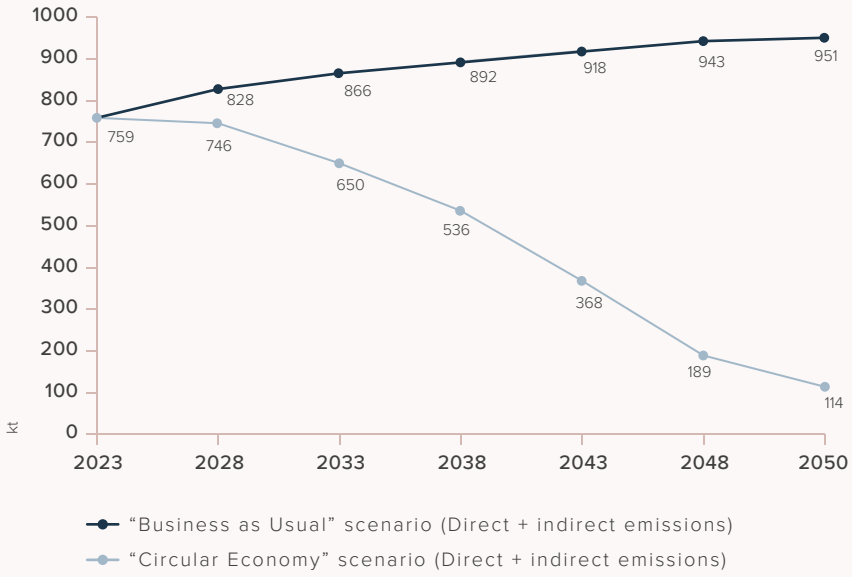
By 2050, implementation of the "Circular Economy" scenario will allow 1,409 kt of valuable materials to be extracted and processed from e-waste (including 903 kt of iron, 148 kt of aluminium, and 207 kt of plastic) (Table 11). These materials can be reused as secondary resources for the production of EEE, building materials, vehicles, etc.

Table 11. Projected content of valuable materials in managed/unmanaged e-waste for 2023-2050, under two scenarios of e-waste management [11]

VALUABLE MATERIALS	"BUSINESS AS USUAL" SCENARIO, CUMULATIVE 2023 - 2050, TONNES		"CIRCULAR ECONOMY" SCENARIO, CUMULATIVE 2023 - 2050, TONNES	
	Managed	Unmanaged	Managed	Unmanaged
Plastic	656	598,061	206,544	392,173
Glass	94.25	85,959	58,806	27,248
Iron (Fe)	2,273	2,072,736	902,930	1,172,078
Aluminum (Al)	376	343,337	147,763	195,951
Copper (Cu)	233	212,547	93,241	119,539
Silver (Ag)	0.10	91.39	39.44	52.05
Gold (Au)	0.02	17.40	7.38	10.03
Platinum (Pt)	0	0.10	0.04	0.06
Palladium (Pd)	0.01	5.59	2.37	3.23

Recycling e-waste can significantly reduce greenhouse gas emissions. When e-waste is recycled, a significant portion of its components can be recovered or recycled, reducing the need to manufacture new parts, and thus reducing greenhouse gas emissions associated with the extraction and production of new materials. Also, many components, such as metals and plastics, can be recycled and used repeatedly, which also reduces greenhouse gas emissions. Direct and indirect greenhouse gas emissions from the e-waste management system in Uzbekistan will increase under the "Business as Usual" scenario and could reach 951 kt by 2050. The development of an e-waste management system according to the "Circular Economy" scenario will prevent 60% of greenhouse gas emissions by 2043, amounting to 368 kt, and 88% by 2050, amounting to 114 kt (Figure 12).

Figure 12. Projections of direct and indirect greenhouse gas emissions from e-waste management in CO_2-equivalents [11]



Managing e-waste can have a significant economic impact by reducing production costs, creating revenue opportunities from recycling valuable materials, reducing disposal costs and fines, and stimulating economic growth through the sustainable use of resources. The implementation of the "Circular Economy" (Figure 13) scenario will achieve a positive economic impact of USD $105 million in e-waste management in Uzbekistan by 2050, mainly due to revenues from e-waste recycling and production of secondary raw materials, while the "Business as Usual" scenario could result in losses of USD $735 million due to the environmental and social costs of unmanaged e-waste.

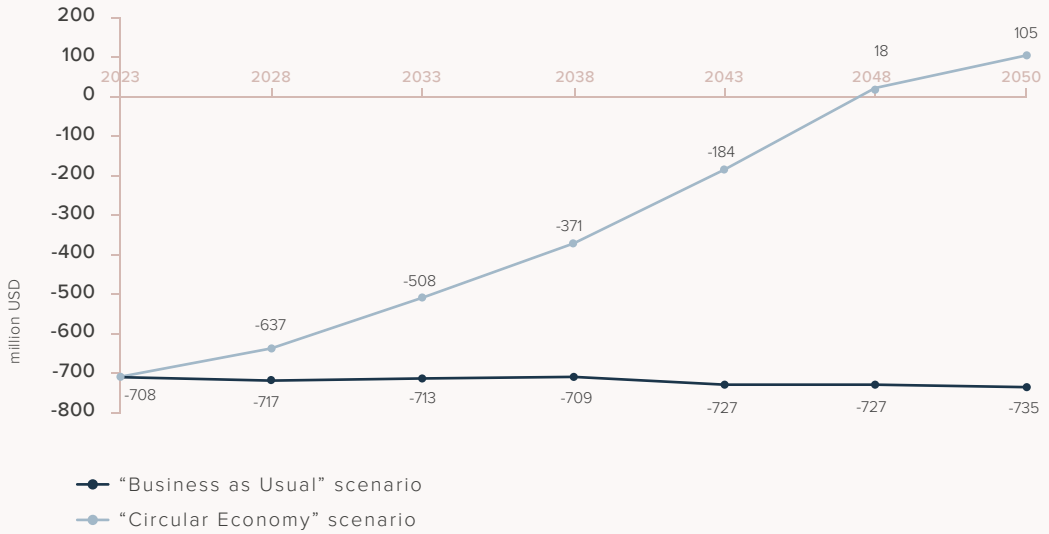
Table 12. Economic revenues and losses in 2023, 2030, and 2050, under two scenarios of e-waste management [11]

ECONOMIC INDICATORS, MILLION USD PER YEAR	CURRENT YEAR	"BUSINESS AS USUAL" SCENARIO	"CIRCULAR ECONOMY" SCENARIO
	2023	2050	2050
Environmental and social costs of unmanaged e-waste	-707.61	-735.21	-88.32
Recycling costs of managed e-waste	0.06	0.18	-142.19
Revenues from managed e-waste recycling	0.14	0.42	335.76
Overall economic effect	-707.53	-734.97	105.25

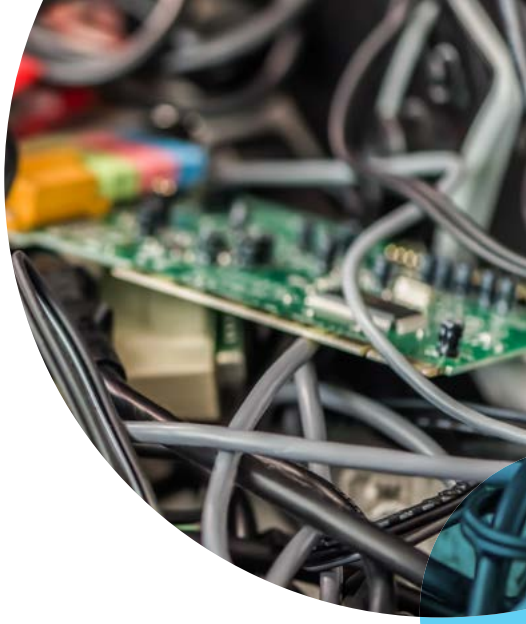
* Negative values represent costs/negative impacts on the environment and society.

As shown in Figure 13, the "Circular Economy" scenario will achieve a positive economic effect as early as 2048, which will grow as the volume of recycled waste increases and with the development of recycling and reuse technologies and rising prices for valuable materials.

Figure 13. Total economic effect of e-waste management system under two e-waste management scenarios, in million USD [11]



Thus, the results of forecasts for the "Business as Usual" scenario and the "Circular Economy" scenario clearly demonstrate a significant difference in the future development of waste management in Uzbekistan. The "Business as Usual" scenario assumes that unmanaged e-waste will continue to grow, resulting in increased environmental and health impacts and the loss of valuable resources and economic benefits. By contrast, the "Circular Economy" scenario envisions reducing unmanaged waste, reducing greenhouse gas emissions and pollution, and increasing economic benefits through improved resource efficiency. The results of the forecasts for the "Business as Usual" and "Circular Economy" scenarios clearly ascertain the importance of the transition to sustainable e-waste management. Implementing measures to improve resource efficiency and reduce waste could provide significant economic, environmental, and social benefits to Uzbekistan.



Chapter 6.
Future directions of development of the e-waste management system in Uzbekistan

The results of forecasting the environmental and socioeconomic impacts of the existing e-waste management system in Uzbekistan, the relationship between e-waste collection and recycling and sustainable development goals, and the international and regional agreements to which Uzbekistan has acceded all emphasise the need to take decisive measures to improve the e-waste management system. The necessary measures in the actual directions of development of the e-waste management system in Uzbekistan were identified based on international regional experience and results of the national dialogue of stakeholders within the framework of consultations and the National Forum in Tashkent, held with stakeholders on November 28-29, 2023. The implementation of these measures is inextricably linked to the collective efforts of all stakeholders, including governmental authorities, manufacturers, and importers of electronic equipment and machinery, assemblers, e-waste recyclers, and all other stakeholders.

A. IMPROVEMENT OF LEGISLATION ON THE REGULATION OF E-WASTE

One of the main directions in the development of the e-waste management system is the improvement of legislation. To improve the legislative situation, it is necessary to:

- Set national targets for e-waste collection and recycling in Uzbekistan's strategic documents. Set binding targets on:
  - e-waste collection. From a specific year, the minimum collection rate to be achieved annually shall comply with a specific target (%) of e-waste generated on or a set of gradual increasing targets over time
  - e-waste recovery of the amounts of e-waste formally collected. The achievement of the targets shall be calculated, for each category, by dividing the weight of e-waste after proper treatment in accordance with national legislation on recovery or recycling, by the weight of separately collected e-waste of each category received at the recovery or recycling/preparation for reuse facility, and expressed as a percentage
- Introduce amendments and additions to the Law of the Republic of Uzbekistan "On Waste", which will contain:
  - mandatory requirements for handing over used e-waste for further recovery, recycling, and safe disposal by specialised enterprises
  - classification of e-waste as hazardous/non-hazardous, toxic/non-toxic waste
  - reporting requirements for collection, recycling of e-waste, and other key requirements for e-waste management
- Introduce amendments and additions to improve the system of collection and processing of data on e-waste collection and recycling
- Develop a bylaw establishing requirements in the field of e-waste management
- Introduce mechanisms to monitor and control compliance with e-waste management legislation
- Toughen liability for non-compliance with legislative requirements in the field of e-waste management
- Establish a system of licensing or certification in accordance with international standards for e-waste collection, dismantling, and recycling activities
- Ensure that information concerning core e-waste statistics is annually published for at least six e-waste categories, covering as a minimum:
  - EEE Placed on Market
  - e-waste generated
  - e-waste separately collected in accordance with the legislation
- Include and legalise informal sector activities in the field of e-waste collection by introducing registration and other instruments for handing over collected e-waste to certified e-waste recyclers for safe and environmentally sound management of e-waste
- Ensure effective interaction between stakeholders and decision-makers in order to develop joint measures to improve policy and legislation in Uzbekistan.

B. IMPROVEMENT OF THE STATISTICAL DATA COLLECTION AND PROCESSING SYSTEM FOR E-WASTE GENERATION, COLLECTION, AND RECYCLING

Improving statistics on e-waste collection and recycling is important for monitoring progress in waste management, policy making, and legislation. As such, the following key actions should be taken:

- Implement the e-waste classification system according to the WEEE Directive, for uniform application and reporting of e-waste categories in the framework of regional and national monitoring, which is also the global standard for measuring e-waste.
- Ensure uniform recording, availability, completeness, and monitoring of e-waste data on an annual basis and introduce and improve official statistics on e-waste; the statistics should comply with international standards developed in the UN Partnership for Measuring ICT for Development [7] and should annually measure and publish:
  - the amounts of EEE Placed on the Market (using the apparent consumption methodology from the UNITAR EEE POM tool, or national register data)
  - e-waste generated
  - formal e-waste collection under the EPR system
  - e-waste collection rate
- Improve the capacity of state statistical agencies in the field of e-waste statistics
- Introduce the use of the e-waste Collection Tool [11] developed by UNITAR to monitor e-waste generation volumes, as well as to forecast the socioeconomic and environmental impact of e-waste collection and recycling over a certain period of time up to 2050
- Increase the capacity of specialised enterprises and small and medium-sized enterprises (SMEs) to collect and process data in the field of e-waste management and, subsequently, on reporting, completion of reporting forms, and deadlines

C. DEVELOPMENT OF INFRASTRUCTURE AND IMPROVED TECHNOLOGY FOR E-WASTE COLLECTION AND RECYCLING

Infrastructure and technologies for e-waste collection and recycling are one of the most important links in the e-waste management system, as they directly influence the provision of safe waste management and the reduction of environmental and health impacts. As such, the following key measures should be taken:

- Develop a network of e-waste collection points (including opening branches of waste collection companies in all regional centres, installation of containers in public places, etc.), including Uzvtorcvetmet
- Develop schemes for the location of collection points and processing facilities for e-waste and its individual components
- Develop a transportation system to ensure safe and efficient transportation of collected e-waste to waste recycling companies
- Launch technological lines for neutralisation of hazardous e-waste components, including lithium-ion batteries (in the next 5 years), as well as recycling of photovoltaic panels (in the next 10 years)
- Develop and implement the best-available technologies on e-waste recycling
- Establish cooperation and logistics with international recyclers to transfer certain parts of e-waste abroad for recycling and recovery

D. NECESSARY MEASURES TO SUPPORT THE E-WASTE COLLECTION AND RECYCLING SECTOR

The e-waste collection and recycling sector is challenging in terms of economic benefits, as it requires significant investments in infrastructure and technology. The following key measures should be taken to support this sector:

- Develop mechanisms to incentivise and finance manufacturers and importers to set up their own e-waste collection system
- Provide favourable investment conditions for the creation and development of e-waste collection and recycling enterprises, attracting necessary technical specialists and introducing modern technologies in this area
- Introduce mechanisms of state support for e-waste collection and recycling enterprises at the level of central government authorities, including such instruments as additional tax incentives, subsidies, and other forms of financial assistance
- Establish a direct dialogue between collectors, recyclers, and state authorities to strengthen cooperation and transparency of the parties' activities

E. FINANCING THE SYSTEM OF E-WASTE COLLECTION AND RECYCLING, INCLUDING IMPLEMENTATION OF AN EPR SYSTEM

To fully develop the e-waste management system in Uzbekistan, specific financing instruments are needed. The following measures should be taken:

- Develop and implement an EPR mechanism in the form of a collective liability system for manufacturers and importers
- Develop means to support and finance the development of infrastructure and the structural financing of source separation of e-waste at collection points
- Set up development of governance bodies and practical tools to finance the environmentally sound management of source-separated e-waste
- Allocate structural finances to increase competence of the public, private, and civil sectors to strengthen their capacities to manage e-waste, as well as to utilise the opportunities of international and national grants, business accelerators, start-up support, and other tools in the field of innovative approaches to the development of an e-waste management system in the country

F. PARTNERSHIP BETWEEN THE FORMAL AND INFORMAL SECTOR OF E-WASTE COLLECTION AND RECYCLING

The informal sector plays an important role in e-waste collection and recycling in Uzbekistan, where formal waste management systems are not yet developed. Developing cooperation between the formal and informal sectors is important at this stage. As such, the following actions should be taken:

- Raise awareness of the informal sector on the benefits of running a legal recycling business, existing legal requirements and support measures, and improper e-waste management's impact on human health
- Develop incentives for the informal e-waste sector for participants to transfer waste to specialised enterprises
- Establish partnership programs focused on providing the informal sector with access to resources and infrastructure for waste collection and recycling
- Consider providing financial support to the informal sector to purchase necessary infrastructure
- Develop joint formal and informal sector initiatives for e-waste collection and recycling

G. CAPACITY-BUILDING AND STAKEHOLDER AWARENESS ON E-WASTE MANAGEMENT AND COMMUNITY OUTREACH

Awareness of e-waste management among all stakeholders contributes to the support and development of all elements of the e-waste management system and serves as an important standalone element of the system. As such, the following actions should be taken:

- Strengthen information work with the population and stakeholders on environmentally sound e-waste management
- Introduce courses on environmentally sound e-waste management, separate collection, and recycling into the curricula of educational institutions
- Create resources (e.g. websites, leaflets, and brochures) providing information on the nearest collection points and on the collection and recycling process of e-waste
- Increase the culture of consumer behaviour in favour of extending the life of EEE
- Develop incentive mechanisms to encourage consumers to collect and hand over e-waste to specialised companies

Taking into account the abovementioned measures, a roadmap for environmentally sound e-waste management was developed.

Chapter 7.

National roadmap for environmentally sound management of e-waste for 2024 - 2028

N°	ACTIVITIES	DEADLINES	STATUS	PERFORMERS
1. Improvement of legislation in the field of e-waste management				
1.1	Inclusion of goals and targets for e-waste collection and recycling in the Strategy for Solid waste management in the Republic of Uzbekistan for the period 2019-2028 and other strategic documents of the Republic of Uzbekistan	2025	Updated Decree of the President of Uzbekistan, dated April 17, 2019 No. PP-4291	Ministry of Ecology, Environmental Protection and Climate Change International and national experts
1.2	Introduction of amendments and additions to the Law of the Republic of Uzbekistan “On Waste”, including: - mandatory requirements for handing over used e-waste for their further recovery and recycling by specialised enterprises - classification of e-waste - reporting requirements for collection, recycling of e-waste, and other key requirements for e-waste management	2024 - 2025	Updated Law “On Waste”	Ministry of Ecology, Environmental Protection, and Climate Change
1.3	Development and approval of changes aimed at introduction and implementation of the EPR mechanism for e-waste	2026	Updated Law “On Waste” Bylaw aimed at the implementation of the EPR mechanism	Ministry of Ecology, Environmental Protection, and Climate Change International and national experts Industry business associations Other interested state authorities
1.4	Carrying out the ratification procedure of the Agreement on cooperation of the CIS member states in the field of electronic and electrical equipment waste management dated June 1, 2018	2025 - 2026	Adoption of mechanisms for the implementation of the Agreement on the territory of the Republic of Uzbekistan	Ministry of Foreign Affairs Ministry of Ecology, Environmental Protection, and Climate Change
2. Improvement of the collection and processing system of statistical data on e-waste generation, collection, and recycling				
2.1	Inclusion in the Hygienic Classifier of toxic industrial waste in the conditions of the Republic of Uzbekistan (SRfI of the RUz No. 0128-02 dated July 29, 2002) or in another regulatory legal act of e-waste classification according to the European Union Directive 2012/19/EU for united application and recording of e-waste categories in the framework of regional and national monitoring	2026	Updated Hygienic Classifier	Ministry of Ecology, Environmental Protection, and Climate Change Ministry of Health Statistical Agency under the President of Republic of Uzbekistan
2.2	Use of the “Tool for calculating the impact of collected e-waste” developed by UNITAR, state authorities to forecast, track and monitor the generation, collection, and recycling of e-waste, as well as to analyse the socioeconomic and environmental impact of e-waste in the country	2025 - 2028	Reports	Ministry of Ecology, Environmental Protection, and Climate Change Statistical Agency under the President of the Republic of Uzbekistan
2.3	Inclusion of amendments and additions to statistical reporting forms in accordance with international standards developed within the framework of the UN Partnership on Measuring ICT for development (indicating volumes of EEE placed on the market, volumes of e-waste generated, and e-waste collection rate)	2027 - 2028	Updated statistical reporting forms	Statistical Agency under the President of the Republic of Uzbekistan Ministry of Ecology, Environmental Protection, and Climate Change

N°	ACTIVITIES	DEADLINES	STATUS	PERFORMERS
2.4	Annual publication of e-waste statistics for six categories of e-waste, including data on EEE placed on the market, e-waste generated, separately collected e-waste according to legislation	2027 - 2028	Information on the official website of the Statistical Agency under the President of the Republic of Uzbekistan	Statistical Agency under the President of the Republic of Uzbekistan Ministry of Ecology, Environmental Protection, and Climate Change
2.5	Training in the field of e-waste statistics for state statistical authorities to increase their capacities	2025 - 2026	Reports on training events	Statistical Agency under the President of the Republic of Uzbekistan Ministry of Ecology, Environmental Protection, and Climate Change International and national experts
2.6	Conducting information campaigns for representatives of businesses operating in the field of e-waste collection and recycling on preparation and submission of departmental and statistical reporting forms	2025 - 2026	Protocols of events Reports on events	Ministry of Ecology, Environmental Protection, and Climate Change Statistical Agency under the President of the the Republic of Uzbekistan Collectors/recyclers Industry business associations
3. Development of infrastructure and improvement of technologies for e-waste collection and recycling				
3.1	Creation of a network of e-waste collection points (including opening of branches of waste collection companies in all regional centres, installation of containers in public places, etc.), including on the basis of Uzvtorcvetmet JSC	2025 - 2026	Map of the network of e-waste collection points Reports of state authorities on opening of e-waste collection points	Local executive authorities (khokimiats) Producers/importers Collectors/recyclers Uzvtorcvetmet JSC
3.2	Creation of modern technological enterprises for e-waste recycling	2025 - 2026	Map of the network of enterprises Reports of state authorities on establishment of enterprises	Local executive authorities (khokimiats) Producers/importers Recyclers

N°	ACTIVITIES	DEADLINES	STATUS	PERFORMERS
4. Necessary support measures for the e-waste collection and recycling sector and financing				
4.1	Development of recommendations to encourage producers and importers to switch to their own e-waste recycling system in the country	2025 - 2026	Recommendations	Producers/importers Industry business associations NGOs
4.2	Elaboration and implementation of targeted investment programs for the creation and development of e-waste collection and recycling enterprises, attraction of necessary technical specialists to the country and introduction of modern technologies in the field	2025 - 2028	Report on the implementation of investment programs	Ministry of Investment and Foreign Trade Ministry of Ecology, Environmental Protection, and Climate Change Collectors/recyclers Industry business associations
4.3	Conducting training and consulting meetings for stakeholders in the field of e-waste collection and recycling on how to develop business plans, attract investments, and receive subsidies and soft loans	annually	Protocols of events Reports of events	Ministry of Ecology, Environmental Protection, and Climate Change Collectors/recyclers NGOs
4.4	Organisation of consultative seminars, round tables for the public, private, and civil sector on the use of international and national grants, business accelerators, startup support, and other tools in the field of innovative approaches to the development of the e-waste management system in the country	annually	Protocols of events Reports on events	Ministry of Ecology, Environmental Protection, and Climate Change International and national experts Industry business associations NGOs
5. Partnership between the formal and informal sector for e-waste collection and recycling				
5.1	Develop measures to legalise the informal sector and include it in the e-waste management system	2026	List of measures	Local executive authorities (khokimiats)
5.2	Develop measures to upgrade working conditions of the informal sector, including ensuring safe working conditions in the field of e-waste management	2026	List of measures	Local executive authorities (khokimiats) Ministry of Ecology, Environmental Protection and Climate Change
5.3	Conduct a study on informal sector activities, assess their needs and build synergies	2026	Research report	International organisations National experts
5.4	Development and implementation of incentive measures, including partnership programs aimed at transferring e-waste collected by the informal sector to the formal recycling system	2026	List of incentive measures	Ministry of Ecology, Environmental Protection, and Climate Change Financial institutions Sectoral business associations
5.5	Conducting consultation seminars, round tables for informal sector representatives on legalisation of waste recycling business, legal literacy, licensing, obtaining subsidies, etc.	annually	Protocols of events Reports on events	Ministry of Ecology, Environmental Protection, and Climate Change International and national experts Collectors/Recyclers NGOs

N°	ACTIVITIES	DEADLINES	STATUS	PERFORMERS
6. Capacity-building and education of stakeholders on e-waste management and public outreach				
6.1	Holding consultative seminars, roundtables for state authorities on environmentally sound e-waste management, familiarisation with international directives and initiatives on e-waste management and other issues	2024 - 2025	Protocols of events Reports on events	Ministry of Ecology, Environmental Protection, and Climate Change International and national experts Sectoral business associations NGOs
6.2	Conducting training seminars on capacity-building of EEE producers and suppliers, industry associations, e-waste generators, specialised waste management companies	annually	Protocols of events Reports on events	Producers/importers All stakeholders
6.3	Public awareness campaigns on the negative environmental and health impacts of e-waste on the environment and human health	annually	Protocols of events Reports on events	Producers/importers All stakeholders

Chapter 8.
List of Sources

[1] Baldé C.P., Kuehr R., Yamamoto T., McDonald R., D'Angelo E., Althaf S., Bel G., Deubzer O., Fernandez-Cubillo E., Forti V., Gray V., Herat S., Iattoni G., Khetriwal D. S., Luda di Cortemiglia V., Lobuntsova Y., Nnorom I., Pralat N., Wagner M. (2024). International Telecommunication Union (ITU) and United Nations Institute for Training and Research (UNITAR). 2024. Global E-waste Monitor 2024. Bonn/Geneva. https://ewastemonitor.info/the-global-e-waste-monitor-2024/

[2] Baldé C.P., Iattoni G., Luda V., Nnorom I.C., Pecheniuk O., Kuehr R., 2021. Regional E-waste Monitor for the CIS + Georgia - 2021. United Nations University (UNU) / United Nations Institute for Training and Research (UNITAR) - co-hosting the SCYCLE Programme, Bonn, Germany. https://ewastemonitor.info/regional-E-waste-monitor-cisgeorgia-2021/

[3] Decree of the President of the Republic of Uzbekistan of 17.04.2019 N° PP-4291 "On Approval of the Strategy for Solid Waste Management in the Republic of Uzbekistan for the period 2019-2028" https://lex.uz/docs/4291733

[4] Decree of the President of the Republic of Uzbekistan from 04.01.2024 N° UP-5 "On measures to improve the system of waste management and reduce their negative impact on the environmental situation" https://lex.uz/ru/docs/6733912

[5] Law of the Republic of Uzbekistan dated 05.04.2002, No. 362-II "On Waste" https://lex.uz/acts/44872

[6] Step Initiative, 2014. One Global Definition of E-waste. White Paper. https://www.step-initiative.org/files/_documents/whitepapers/StEP_WP_One%20Global%20Definition%20of%20E-waste_20140603_amended.pdf

[7] Forti V., Baldé C.P., and Kuehr R., 2018. "E-waste Statistics Guidelines on Classification, Reporting and Indicators". Edited by ViE - SCYCLE United Nations University. Bonn, Germany. https://www.scycle.info/e-waste-statistics-guidelines/

[8] European Parliament. 2012. "Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 on Waste Electrical and Electronic Equipment (WEEE)". (consolidated text as of 4 July 2018). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02012L0019-20180704

[9] Data of the Statistical Agency under the President of the Republic of Uzbekistan on the number of permanent population https://www.stat.uz/ru/ofitsialnaya-statistika/demography

[10] Online edition of kun.uz. https://kun.uz/ru/news/2022/08/06/v-uzbekistane-yejyegodno-obrazuyetsya-7-millionov-tonn-bytovyx-otxodov-tolko-26-iz-nix-pererabatyvayutsya

[11] Yumashev D., Baldé C.P., 2023. "Electrical and Electronic Equipment: E-Waste Collected Tool." United Nations Institute for Training and Research (UNITAR) the SCYCLE Programme. Bonn, Germany https://www.scycle.info/toolkit-to-assess-environmental-economic-impact-of-e-waste-management-from-2020-to-2050/

[12] Baldé C.P., Kuehr R., Blumenthal K., Fondeur Gill S., Kern M., Micheli P., Magpantay E. and Huisman J., 2015. E-waste Statistics: Guidelines on Classifications, Reporting and Indicators. United Nations University, IAS-SCYCLE, Bonn, Germany. https://i.unu.edu/media/ias.unu.edu-en/project/2238/E-waste-Guidelines_Partnership_2015.pdf

[13] The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal of 22 March 1989 https://www.basel.int/TheConvention/Overview/TextoftheConvention/tabid/1275/Default.aspx

[14] United Nations Economic Commission for Europe, 2021. Task Force on Waste Statistics - Conference of European Statisticians. UNECE, Geneva, 2021 under approval (United Nations Economic Commission for Europe, UNECE).

[15] Magalini, F. and Huisman, J. 2018. WEEE Recycling Economics - The shortcomings of the current business model. United Nations University and European Electronics Recyclers Association

[16] Yumashev D., Baldé C.P., 2023. "Electrical and electronic equipment: E-waste Collected Tool Manual." / United Nations Institute for Training and Research (UNITAR) / Bonn, Germany https://www.scycle.info/toolkit-to-assess-environmental-economic-impact-of-e-waste-management-from-2020-to-2050/

[17] Riahi K., Van Vuuren D. P., Kriegler E., Edmonds J., O'Neill B. C., Fujimori S., & Tavoni M., 2017. The shared socioeconomic pathways and their energy, land use, and greenhouse gas emissions implications: an overview. Global Environmental Change, 42, 153-168. https://www.sciencedirect.com/science/article/pii/S0959378016300681

[18] United Nations Environment Programme and United Nations Institute for Training and Research (2023). 2050 Electronic and Electrical Waste Outlook in West Asia. Nairobi and Bonn, Kenya and Germany. https://unitar.org/sites/default/files/media/file/RZ_EWaste_Asian_Outlook_Web.pdf

[19] Huisman, J., Leroy, P., Tertre, F., Ljunggren Söderman, M., Chancerel, P. Cassard, D. Løvik, A.N., Wäger, P., Kushnir, D., Rotter, V.S., Mählitz, P., Herreras, L., Emmerich, J., Hallberg, A., Habib, H., Wagner, M., Downes, S., 2017. Prospecting Secondary Raw Materials in the Urban Mine and mining wastes (ProSUM) - Final Report, ISBN: 978-92-808-9060-0 (print), 978-92-808-9061-7 (electronic), December 21, 2017, Brussels, Belgium. DOI: 10.13140/RG.2.2.10451.89125

[20] Worldbank open data https://data.worldbank.org/

[21] United Nations Department of Economic and Social Affairs Population Division. https://www.un.org/development/desa/pd/data-landing-page

[22] Baldé C.P., Iattoni G., Xu C., Yamamoto T., 2022. Update of WEEE Collection Rates, Targets, Flows, and Hoarding - 2021 in the EU-27, United Kingdom, Norway, Switzerland, and Iceland, 2022, SCYCLE Programme, United Nations Institute for Training and Research (UNITAR), Bonn, Germany. https://weee-forum.org/wp-content/uploads/2022/12/Update-of-WEEE-Collection_web_final_nov_29.pdf

[23] Eurostat: Waste statistics - electrical and electronic equipment. (Data of 2021) https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Waste_statistics_-_electrical_and_electronic_equipment

[24] Waste electrical and electronic equipment (WEEE) by waste management operations - open scope, 6 product categories (from 2018 onwards). https://ec.europa.eu/eurostat/databrowser/view/env_waseleeos/default/table?lang=en

[25] Internet publication Spot https://www.spot.uz/ru/2022/08/15/waste-removal/

[26] Decree of the Cabinet of Ministers of the Republic of Uzbekistan from 02.06.2020 N° 347 "On introduction of treatment fee on certain types of goods" https://lex.uz/docs/4844263

[27] Decree of the Cabinet of Ministers of the Republic of Uzbekistan of 23.10.2000 N° 405 "On streamlining the activities of enterprises for the use and treatment of mercury-containing lamps and devices" https://lex.uz/ru/docs/381659

[28] Decree of the Cabinet of Ministers of the Republic of Uzbekistan of 21.09.2011 N° 266 "On approval of the provision on the organization of collection and treatment of used mercury-containing lamps" https://lex.uz/uz/docs/1870039

[29] Decree of the Cabinet of Ministers of the Republic of Uzbekistan of 06.06.2018 N° 425 "On measures to improve the procedure for handling scrap, waste of non-ferrous and ferrous metals" https://lex.uz/ru/docs/3769614

[30] Decree of the Cabinet of Ministers of the Republic of Uzbekistan of 06.02.2019 N° 95 "On approval of regulatory legal acts in the field of waste management" https://lex.uz/docs/4191469

[31] Hygienic Classifier of Toxic Industrial Waste in the Conditions of the Republic of Uzbekistan SanPiN RUz N 0128-02, approved by the Chief State Sanitary Doctor of the Republic of Uzbekistan on 29.07.2002. https://kadrovik.uz/ru/doc?id=185904_gigienicheskiy_klassifikator_toksicheskih_promyshlennyh_othodov_v_usloviyah_respubliki_uzbekistan_(sanpin_ruz_n_0128-02)_(utverjden_glavnym_gosudarstvennym_sanitarnym_vrachom_29_07_2002_g_)&prodid=1_vse_zakonodatelstvo_uzbekistana

[32] Decree of the Cabinet of Ministers of the Republic of Uzbekistan of 27.10.2014 N° 295 "On Approval of the Regulations on the procedure for the implementation of state recording and control in the field of waste management" https://lex.uz/ru/docs/2489798?ONDATE=05.04.2022

[33] Decision of the Cabinet of Ministers of the Republic of Uzbekistan N° 75 of 16.02.2021 "On measures to further improve the order of importation of environmentally hazardous products and wastes into the territory of the Republic of Uzbekistan and their exportation from the territory of the Republic" https://lex.uz/acts/5293781

[34] Decision of the Cabinet of Ministers of the Republic of Uzbekistan No. 43 of 30.01.2021 "On Approval of Lists of Objects of Confirmation of Conformity, the conformity of which is subject to confirmation in the Republic of Uzbekistan." https://lex.uz/acts/5249376#5250585

[35] Data of the Statistical Agency under the President of the Republic of Uzbekistan on production of industrial output by types of economic activity https://www.stat.uz/ru/ofitsialnaya-statistika/industry

[36] Data of the Statistical Agency under the President of the Republic of Uzbekistan on import of certain types of EEE https://www.stat.uz/ru/ofitsialnaya-statistika/merchandise-trade

[37] Decree of the President of the Republic of Uzbekistan of 30.05.2019 N° PP-4348 "On additional measures to create favourable conditions for further development of the electrical industry and increase the investment and export potential of the industry" https://lex.uz/ru/docs/4360787

[38] Website of LLC "Artel Electronics" https://artelgroup.org/export/

[39] United Nations Department of Economic and Social Affairs. sdgs.un.org

[40] ILO, 2019. Decent work in the management of electrical and electronic waste (E-waste). Issues paper for the Global Dialogue Forum on Decent Work in the Management of Electrical and Electronic Waste (E-waste) (Geneva, 9-11 April 2019). GDFEEW/2019. https://www.ilo.org/wcmsp5/groups/public/---ed_dialogue/---sector/documents/publication/wcms_673662.pdf

[41] Van Straalen V.M, Roskam A.J., & Baldé C.P., 2016. Waste over Time [computer software]. The Hague, The Netherlands: Statistics Netherlands (CBS). URL: http://github.com/Statistics-Netherlands/ewaste

[42] Decree of the Cabinet of Ministers of the Republic of Uzbekistan, of 20.10.2015 N° 299 "On measures to expand domestic production of energy-saving lamps" https://lex.uz/docs/2792714

Chapter 9.
Annexes

Annex 1. UNU-KEYs linked to e-waste categories and “Business as Usual” scenario settings.

UNU KEY	UNU KEY DESCRIPTION	E-WASTE CATEGORY	POM TARGET RELATIVE (FULL OR PARTIAL OBSOLESCENCE) = FRACTION OF THE PRESENT-DAY POM PROJECTED TO REMAIN BY 2050	MAXIMUM STOCK IN PIECES PER INHABITANT. (SATURATION) = PROJECTED MAXIMUM NUMBER OF PIECES OF EQUIPMENT PER INHABITANT TO BE REACHED IN STOCKS AT SOME POINT BETWEEN PRESENT AND 2050
0001	Central Heating (household-installed)	Large Equipment		0.1
0002	Photovoltaic Panels (incl. inverters)	Large Equipment - PV panels		
0101	Professional Heating & Ventilation (excl. cooling equipment)	Large Equipment		0.0015
0102	Dishwashers	Large Equipment		0.4

UNU KEY	UNU KEY DESCRIPTION	E-WASTE CATEGORY	POM TARGET RELATIVE (FULL OR PARTIAL OBSOLESCENCE) = FRACTION OF THE PRESENT-DAY POM PROJECTED TO REMAIN BY 2050	MAXIMUM STOCK IN PIECES PER INHABITANT. (SATURATION) = PROJECTED MAXIMUM NUMBER OF PIECES OF EQUIPMENT PER INHABITANT TO BE REACHED IN STOCKS AT SOME POINT BETWEEN PRESENT AND 2050
0103	Kitchen equipment (e.g. large furnaces, ovens, cooking equipment)	Large Equipment		0.6
0104	Washing Machines (incl. combined dryers)	Large Equipment		0.4
0105	Dryers (washdryers, centrifuges)	Large Equipment		0.15
0106	Household Heating & Ventilation (e.g. hoods, ventilators, space heaters)	Large Equipment		0.8
0108	Fridges (incl. combi-fridges)	Temperature Exchange Equipment		0.7
0109	Freezers	Temperature Exchange Equipment		0.15
0111	Air Conditioners (household-installed and portable)	Temperature Exchange Equipment		0.6
0112	Other Cooling equipment (e.g. dehumidifiers, heat pump dryers)	Temperature Exchange Equipment		0.06
0113	Professional Cooling equipment (e.g. large air conditioners, cooling displays)	Temperature Exchange Equipment		0.5
0114	Microwaves (incl. combined, excl. grills)	Small equipment		0.4
0201	Other small household equipment (e.g. small ventilators, irons, clocks, adapters)	Small equipment		
0202	Equipment for food preparation (e.g. toaster, grills, food processing, frying pans)	Small equipment		6
0203	Small household equipment for hot water preparation (e.g. coffee, tea, water cookers)	Small equipment		
0204	Vacuum Cleaners (excl. professional)	Small equipment		0.7
0205	Personal Care equipment (e.g. toothbrushes, hair dryers, razors)	Small equipment		2

UNU KEY	UNU KEY DESCRIPTION	E-WASTE CATEGORY	POM TARGET RELATIVE (FULL OR PARTIAL OBSOLESCENCE) = FRACTION OF THE PRESENT-DAY POM PROJECTED TO REMAIN BY 2050	MAXIMUM STOCK IN PIECES PER INHABITANT. (SATURATION) = PROJECTED MAXIMUM NUMBER OF PIECES OF EQUIPMENT PER INHABITANT TO BE REACHED IN STOCKS AT SOME POINT BETWEEN PRESENT AND 2050
0301	Small IT equipment (e.g. routers, mice, keyboards, external drives & accessories)	Small IT		2
0302	Desktop PCs (excl. monitors, accessories)	Small IT	0.1	
0303	Laptops (incl. tablets)	Screens and monitors		1.5
0304	Printers (e.g. scanners, multi-functionals, faxes)	Small IT		0.4
0305	Telecommunication equipment (e.g. [cordless] phones, answering machines)	Small IT	0	
0306	Mobile Phones (incl. smartphones, pagers)	Small IT		2
0307	Professional IT equipment (e.g. servers, routers, data storage, copiers)	Large Equipment		0.05
0308	Cathode Ray Tube Monitors	Screens and monitors	0	
0309	Flat Panel Display Monitors (LCD, LED)	Screens and monitors		0.2
0401	Small Consumer Electronics (e.g. headphones, remote controls)	Small equipment		4
0402	Portable Audio & Video (e.g. MP3, e-readers, car navigation)	Small equipment	0	
0403	Music Instruments, Radio, Hi-Fi (incl. audio sets)	Small equipment	0.2	
0404	Video (e.g. Video recorders, DVD, Blu-Ray, set-top boxes) and projectors	Small equipment	0.1	
0405	Speakers	Small equipment		1.25
0406	Cameras (e.g. camcorders, photo & digital still cameras)	Small equipment	0	
0407	Cathode Ray Tube TVs	Screens and monitors	0	
0408	Flat Panel Display TVs (LCD, LED, Plasma)	Screens and monitors		1

UNU KEY	UNU KEY DESCRIPTION	E-WASTE CATEGORY	POM TARGET RELATIVE (FULL OR PARTIAL OBSOLESCENCE) = FRACTION OF THE PRESENT-DAY POM PROJECTED TO REMAIN BY 2050	MAXIMUM STOCK IN PIECES PER INHABITANT. (SATURATION) = PROJECTED MAXIMUM NUMBER OF PIECES OF EQUIPMENT PER INHABITANT TO BE REACHED IN STOCKS AT SOME POINT BETWEEN PRESENT AND 2050
0501	Small lighting equipment (excl. LED & incandescent)	Small equipment		
0502	Compact Fluorescent Lamps (incl. retrofit & non-retrofit)	Lamps	0	
0503	Straight Tube Fluorescent Lamps	Lamps	0.5	
0504	Special Lamps (e.g. professional mercury, high & low pressure sodium)	Lamps		1
0505	LED Lamps (incl. retrofit LED lamps)	Lamps		
0506	Household Luminaires (incl. household incandescent fittings & household LED luminaires)	Small equipment		60
0507	Professional Luminaires (offices, public space, industry)	Large equipment		6
0601	Household Tools (e.g. drills, saws, high-pressure cleaners, lawn mowers)	Small equipment		3
0602	Professional Tools (e.g. for welding, soldering, milling)	Large equipment		0.05
0701	Toys (e.g. car racing sets, electric trains, music toys, biking computers, drones)	Small equipment		10
0702	Game Consoles	Small IT		0.4
0703	Leisure equipment (e.g. sports equipment, electric bikes, juke-boxes)	Large equipment		
0801	Household Medical equipment (e.g. thermometers, blood pressure meters)	Small equipment		
0802	Professional Medical equipment (e.g. hospital, dentist, diagnostics)	Large equipment		
0901	Household Monitoring & Control equipment (alarm, heat, smoke, excl. screens)	Small equipment		
0902	Professional Monitoring & Control equipment (e.g. laboratory, control panels)	Large equipment		
1001	Non-cooled Dispensers (e.g. for vending, hot drinks, tickets, money)	Large equipment		0.0015
1002	Cooled Dispensers (e.g. for vending, cold drinks)	Temperature Exchange Equipment		0.005

UNU-KEYs linked to e-waste categories and “Circular Economy” scenario settings.

UNU KEY	UNU KEY DESCRIPTION	E-WASTE CATEGORY	CIRCULAR ECONOMY OBSOLESCENCE POM TARGET RELATIVE	CIRCULAR ECONOMY SATURATION STOCK PPI TARGET ABSOLUTE	MODEL SETTINGS APPLIED IN THE CALCULATIONS (X MEANS THAT IT HAS BEEN APPLIED)		
					CIRCULAR ECONOMY IMPROVED DURABILITY	CIRCULAR ECONOMY REDUCED HOARDING	CIRCULAR ECONOMY INCREASED SHARING
0001	Central Heating (household-installed)	Large Equipment	0		X	X	
0002	Photovoltaic Panels (incl. inverters)	Large Equipment - PV panels			X		
0101	Professional Heating & Ventilation (excl. cooling equipment)	Large Equipment			X		
0102	Dishwashers	Large Equipment			X	X	
0103	Kitchen equipment (e.g. large furnaces, ovens, cooking equipment)	Large Equipment			X		
0104	Washing Machines (incl. combined dryers)	Large Equipment			X	X	X
0105	Dryers (washdryers, centrifuges)	Large Equipment			X	X	X
0106	Household Heating & Ventilation (e.g. hoods, ventilators, space heaters)	Large Equipment			X	X	
0108	Fridges (incl. combi-fridges)	Temperature Exchange Equipment			X	X	
0109	Freezers	Temperature Exchange Equipment			X	X	
0111	Air Conditioners (household-installed and portable)	Temperature Exchange Equipment			X	X	
0112	Other Cooling equipment (e.g. dehumidifiers, heat pump dryers)	Temperature Exchange Equipment			X	X	
0113	Professional Cooling equipment (e.g. large air conditioners, cooling displays)	Temperature Exchange Equipment			X		
0114	Microwaves (incl. combined, excl. grills)	Small equipment			X	X	
0201	Other small household equipment (e.g. small ventilators, irons, clocks, adapters)	Small equipment		4	X	X	
0202	Equipment for food preparation (e.g. toaster, grills, food processing, frying pans)	Small equipment		3	X	X	
0203	Small household equipment for hot water preparation (e.g. coffee, tea, water cookers)	Small equipment		1.25	X	X	

UNU KEY	UNU KEY DESCRIPTION	E-WASTE CATEGORY	CIRCULAR ECONOMY OBSOLESCENCE POM TARGET RELATIVE	CIRCULAR ECONOMY SATURATION STOCK PPI TARGET ABSOLUTE	MODEL SETTINGS APPLIED IN THE CALCULATIONS (X MEANS THAT IT HAS BEEN APPLIED)		
					CIRCULAR ECONOMY IMPROVED DURABILITY	CIRCULAR ECONOMY REDUCED HOARDING	CIRCULAR ECONOMY INCREASED SHARING
0204	Vacuum Cleaners (excl. professional)	Small equipment			X	X	
0205	Personal Care equipment (e.g. toothbrushes, hair dryers, razors)	Small equipment			X	X	
0301	Small IT equipment (e.g. routers, mice, keyboards, external drives & accessories)	Small IT			X	X	
0302	Desktop PCs (excl. monitors, accessories)	Small IT			X	X	
0303	Laptops (incl. tablets)	Screens and monitors			X	X	X
0304	Printers (e.g. scanners, multi functionals, faxes)	Small IT			X	X	X
0305	Telecommunication equipment (e.g. [cordless] phones, answering machines)	Small IT				X	
0306	Mobile Phones (incl. smartphones, pagers)	Small IT			X	X	
0307	Professional IT equipment (e.g. servers, routers, data storage, copiers)	Large Equipment			X		
0308	Cathode Ray Tube Monitors	Screens and monitors				X	
0309	Flat Panel Display Monitors (LCD, LED)	Screens and monitors			X	X	
0401	Small Consumer Electronics (e.g. headphones, remote controls)	Small equipment			X	X	
0402	Portable Audio & Video (e.g. MP3, e-readers, car navigation)	Small equipment				X	
0403	Music Instruments, Radio, Hi-Fi (incl. audio sets)	Small equipment			X	X	
0404	Video (e.g. Video recorders, DVD, Blu-Ray, set-top boxes) and projectors	Small equipment			X	X	
0405	Speakers	Small equipment			X	X	
0406	Cameras (e.g. camcorders, photo & digital still cameras)	Small equipment			X	X	
0407	Cathode Ray Tube TVs	Screens and monitors			X	X	
0408	Flat Panel Display TVs (LCD, LED, Plasma)	Screens and monitors			X	X	
0501	Small lighting equipment (excl. LED & incandescent)	Small equipment			X	X	

UNU KEY	UNU KEY DESCRIPTION	E-WASTE CATEGORY	CIRCULAR ECONOMY OBSOLESCENCE POM TARGET RELATIVE	CIRCULAR ECONOMY SATURATION STOCK PPI TARGET ABSOLUTE	MODEL SETTINGS APPLIED IN THE CALCULATIONS (X MEANS THAT IT HAS BEEN APPLIED)		
					CIRCULAR ECONOMY IMPROVED DURABILITY	CIRCULAR ECONOMY REDUCED HOARDING	CIRCULAR ECONOMY INCREASED SHARING
0502	Compact Fluorescent Lamps (incl. retrofit & non-retrofit)	Lamps				X	
0503	Straight Tube Fluorescent Lamps	Lamps			X	X	
0504	Special Lamps (e.g. professional mercury, high & low pressure sodium)	Lamps			X	X	
0505	LED Lamps (incl. retrofit LED lamps)	Lamps			X	X	
0506	Household Luminaires (incl. household incandescent fittings & household LED luminaires)	Small equipment			X	X	
0507	Professional Luminaires (offices, public space, industry)	Large equipment			X		
0601	Household Tools (e.g. drills, saws, high pressure cleaners, lawn mowers)	Small equipment			X	X	X
0602	Professional Tools (e.g. for welding, soldering, milling)	Large equipment			X		X
0701	Toys (e.g. car racing sets, electric trains, music toys, biking computers, drones)	Small equipment			X	X	
0702	Game Consoles	Small IT			X	X	
0703	Leisure equipment (e.g. sports equipment, electric bikes, juke-boxes)	Large equipment			X	X	X
0801	Household Medical equipment (e.g. thermometers, blood pressure meters)	Small equipment			X	X	X
0802	Professional Medical equipment (e.g. hospital, dentist, diagnostics)	Large equipment			X		
0901	Household Monitoring & Control equipment (alarm, heat, smoke, excl. screens)	Small equipment			X	X	
0902	Professional Monitoring & Control equipment (e.g. laboratory, control panels)	Large equipment			X		
1001	Non-cooled Dispensers (e.g. for vending, hot drinks, tickets, money)	Large equipment			X		
1002	Cooled Dispensers (e.g. for vending, cold drinks)	Temperature Exchange Equipment			X		

Annex 2. Socioeconomic pathways underpinning the scenarios.

The “Business as Usual” and “Circular Economy” scenario projections for PM and e-waste have been calculated using the Shared Socioeconomic Pathways (SSPs) for GDP PPP, population, technology, energy, land use, and other socioeconomic indicators, which were developed by IPCC to perform climate change and broader sustainability assessments [17]. The SSPs capture a range of plausible world futures and include multiple underlying trends that both characterise and affect the crucial aspects of humanity’s development, including how material goods are consumed and recycled.

The plausible futures described by the SSPs range according to sub-national and international levels of cooperation, competition, government regulation, wealth distribution, education, urbanisation, technological development, energy use, land use, and so on. We note that gender only features in the modelled age pyramids explicitly, though both the GDP and population projections implicitly depend on the assumed levels of emancipation of women in the underlying OECD macroeconomic models from which these projections have been derived [17].

In this publication, we use the SSP projections for GDP PPP and population individually in Uzbekistan to explore the effects of long-term socioeconomic changes on EEE POM and e-waste generated in the region out to 2050. For both the “Business as Usual” and “Circular Economy” scenarios, the three most contrasting SSP scenarios (SSP1, SSP3, and SSP5) were calculated and averaged:

- SSP1, which provides medium-level projections for both GDP PPP and population, with the underlying drivers being associated with a broad sustainability and Circular Economy transition across much of the economy and society
- SSP3, which represents a world with high population growth, regional rivalries, material-intensive consumption, and sluggish economic development across the board
- SSP5, which is characterised by rapid economic growth, fast technological progress, high energy and resource consumption, and moderate population increases

Annex 3. Projections for Solar Photovoltaic Panels.

Solar photovoltaic panels form a relatively recent but a fast-growing stream of EEE, and though they are not yet generating considerable quantities of e-waste, they are being placed on the market in large quantities and with accelerating rates [1]. Modelling future growth in photovoltaic panels among EEE POM is difficult due to rapidly evolving economic and geopolitical conditions underpinning climate change mitigation. In this publication, we use the solar photovoltaic projections from the energy transition component of the SSP scenarios out to 2050 as a basis, adjusting them according to trends in the CIS+ region from recent history (dataset of the International Renewable Energy Agency). There is a considerably different Circular Economy in the projected photovoltaic capacity under the SSP1-19 pathway compatible with the 1.5C target from the Paris Agreement, and all other SSP pathways, such as SSP2-34, SSP3-34, SSP4-26, and SSP5-60 (the suffixes in the scenario names represent target anthropogenic radiative forcing levels in 2100). Our adjusted photovoltaic projections broadly capture the differences in the underpinning SSP scenarios for solar photovoltaic installations, while also being aligned both with the relevant historic data and the IEA projections for the CIS+ region.

The projected annual installed photovoltaic capacities for each scenario in the CIS+ countries have been converted to EEE POM by calculating the annual changes of the cumulative installed capacity. The changes were converted to EEE POM by using recent global statistics for average output and weight of a single photovoltaic panel [1]. In this publication, the latest technical parameters - of approximately 300 W and 20 kg per panel - were extrapolated to 2050, assuming that the bulk of the efficiency gains in photovoltaics had already taken place over the past 20 years. The photovoltaic lifespans were modelled based on the latest e-waste data from the EU [41]. The datasets are allocated to UNU-KEY 0002 Photovoltaic Panels (incl. inverters).

Annex 4. List of subordinate regulatory acts of the Republic of Uzbekistan in the field of management of certain types of e-waste.

A RESOLUTION OF THE CABINET OF MINISTERS	ENTRY INTO FORCE	KEY POINTS
On streamlining the activities of enterprises for the use and treatment of mercury-containing lamps and devices [27]	23.10.2000	All entities, including institutions and organisations, regardless of departmental affiliation and forms of ownership, must deliver used and defective mercury-containing lamps to enterprises and organisations that have the appropriate permits from the State Committee for Ecology and Environmental Protection (currently the Ministry of Ecology, Environmental Protection, and Climate Change) for the treatment or demercurisation of mercury-containing products. Self-treatment by entities without this authorisation is not allowed.
On the approval of the regulation on the organisation of collection and treatment of used mercury-containing lamps [28]	21.09.2011	According to the Provision, the accumulation of used mercury-containing lamps should be separate from other waste in a designated place. For this purpose, special containers are used to prevent damage to the lamps and mercury leakage into the environment. Waste lamps are stored in special containers at waste collection points. Consumers of mercury-containing lamps (except for the population) must keep a register of mercury-containing lamps turnover, including notes on the transfer of waste lamps for treatment. Trade outlets selling mercury-containing lamps, as well as company stores and representative offices of manufacturers (importers), are obliged to accept waste mercury-containing lamps from the public without restrictions and transfer them to manufacturers of energy-saving lamps. Also, the buyer receives a 10% discount when buying a new energy-saving lamp of domestic production if returning an old mercury-containing lamp, regardless of its manufacturer. Treatment of waste mercury-containing lamps is performed by treatment organisations. Waste mercury-containing lamps accepted through points of sale, as well as waste mercury-containing lamps of domestic production collected in organisations are treated free of charge. Mercury-containing lamps of imported origin are treated on a paid basis. Waste treatment organisations are funded through revenues from the sale of secondary raw materials obtained during treatment processes, as well as from providing paid treatment services. Financing may also be supported by grants and other lawful sources.
On measures to organise production and a phased transition to the use of energy-saving lamps [42]	20.10.2015	The Resolution introduces a ban from July 1, 2016 on the placement on market, and from January 1, 2017 - on the sale in Uzbekistan of incandescent lamps with a power of more than 40 W, except in cases where manufacturers of special equipment have established mandatory requirements for their use. The Resolution also contains a list of domestic producers of energy-saving lamps, including the Association of Electrotechnical Enterprises of Uzbekistan (Uzeltekhsanoat Association), JV LLC “EGL NUR”, JV LLC “YorqinChiroqlar”. For these enterprises, the production volumes of energy-saving lamps for the period 2015-2019 were set. The total production volume for 2019 was set at 15.7 million energy-saving lamps, which was fully treated by the mentioned enterprises.

A RESOLUTION OF THE CABINET OF MINISTERS	ENTRY INTO FORCE	KEY POINTS
On measures to improve the procedure for handling scrap, waste of non-ferrous and ferrous metals [29]	06.06.2018	Within the framework of this Resolution, the Provision on the procedure for handling scrap, waste of non-ferrous and ferrous metals (hereinafter - the Provision) was approved. The Provision establishes a specific list of scrap and waste of non-ferrous metal from household applications, authorised for acceptance from individuals. This list includes electronic and household appliances, lamps, and batteries. Collected scrap metal should be transferred for processing to specific organisations (manufacturers) - JSC “Uzmetkombinat” and JSC “Uzvtorcvetmet”, which accept scrap metal at a contractual price. At the same time, companies that have their own foundries and metal-rolling production facilities have the right to independently process their own scrap metal. The procurer is obliged to check incoming scrap metal for radioactive and chemical safety, as well as explosion hazard. Scrap metal is accepted at specialised collection points of the procurer. The acceptance of scrap metal from legal entities is carried out on the basis of concluded contracts and acceptance certificate according to the established form of the procurer, from individuals - on the basis of acceptance certificate. Persons handing over scrap metal bear administrative and criminal responsibility for violation of the requirements of the Provision, including destruction and damage of scrap metal, removal to a landfill and its illegal sale.
On approval of regulatory legal acts in the field of waste management [30]	06.02.2019	The Resolution determines the rules and procedure for the provision of services for the collection and removal of solid and liquid domestic waste, and the requirements for its collection, storage, and removal. It also regulates the rules for handling large household waste. Some types of EEE, such as large household appliances (refrigerators, washing machines, TVs, etc.) and office equipment (computers, printers, etc.) are classified as such waste. Residents are obliged to store large household waste in temporary, specially designated places, and not discard it into containers at garbage collection points. The Resolution also establishes rules for handling used mercury-containing lamps. These rules are identical to the requirements specified in the Provision on the organisation of collection and treatment of used mercury-containing lamps.

Annex 5. Imports of EEE related to ICT to the Republic of Uzbekistan for 2022 [36].

HS CODE 4 CHARACTERS	EEE CATEGORY ACCORDING TO THE WEEE DIRECTIVE	UNU-KEYS	PRODUCT CATEGORY	PRODUCT NAME	COST, THOUSAND USD
8443	**6**	**0304**	Computer and peripheral equipment	Printers, fax machines, copiers	**42,769**
8470-8473	**2, 4, 5, 6**	**0301 0302 0303 0307 0403**	Computer and peripheral equipment	Cash registers, counting machines, memory devices, etc.	**326,510**
8517-8519	**5, 6**	**0305 0401 0402**	Communication equipment, Household electronic equipment	Telephone sets, loudspeakers, headphones, microphones, sound reproduction equipment, etc.	**435,177**
8521-8522	**5**	**0404 0406**	Household electronic equipment	Video recording and video playback equipment, etc.	**1,635**
8523	**6**	**0301**	Components, other goods	Tape disks, storage devices, etc.	**103,741**
8525	**5**	**0403 0404 0406**	Communication equipment, Household electronic equipment	Transmitting equipment for radio or television broadcasting, television cameras, digital cameras and recording video cameras, etc..	**16,488**
8527	**5**	**0403**	Household electronic equipment	Broadcasting radio receivers, radio broadcasting receiving equipment, etc.	**16,712**
8528	**2, 5**	**0308 0309 0404**	Computer and peripheral equipment Household electronic equipment	Receiving equipment for television communication, monitors with cathode ray tubes, monitors and projectors not including television receiving equipment, etc.	**42,242**
8529	**5**	**0403**	Other goods	Antennas and antenna reflectors of all types, etc.	**32,694**
8531	**5**	**0403 0404 0405**	Communication equipment	Electrical equipment audible or visual signalling, etc.	**4,643**
8534	**6**	**0301**	Components	Printed schemes, etc.	**2,202**
8540	**3**	**0503 0505**	Components	Electronic lamps and tubes with thermocathode, etc.	**1,302**
8541	**6**	**0301**	Components	Transistors other than phototransistors, etc.	**80,040**
8542	**6**	**0301**	Components	Electronic integrated circuits, etc.	**10,808**
9504	**6**	**0702**	Household electronic equipment	Video game consoles and video game equipment, etc.	**63**
TOTAL					**1,117, 026**

unitar
United Nations
Institute for Training and Research

CSD center

Funded and supervised by:

Federal Ministry
for the Environment, Nature Conservation,
Nuclear Safety and Consumer Protection

Umwelt Bundesamt