Republic of Uzbekistan

Cadaster Agency
under
Ministry of Economy and Finance

WASTE MANAGEMENT PLAN

for

Geospatial Infrastructure for Sustainable Territorial Development (P506803) Project

Draft

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Abbreviations and Acronyms

CA	Cadaster Agency
CORS	Continuously Operating Reference System
EEE	Electrical and Electronic Equipment
EHSG	Environmental, Health, and Safety Guidelines
ESF	Environmental and Social Framework
ESS	Environmental and Social Standards
EWMP	Electronic Waste Management Plan
GIIP	Good International Industry Practice
GISTDP	Geospatial Infrastructure for Sustainable Territorial Development Project
GNSS	Global Navigation Satellite System
GoU	Government of Uzbekistan
GRM	Grievance Redress Mechanism
ICT	Information and Communication Technology
IC	Integrated Circuit
LCD	Liquid Crystal Display
ISO	International Organization for Standardization
IT	Information Technology
MoEF	Ministry of Economy and Finance
NSDI	National Spatial Data Infrastructure
NGO	Non-Governmental Organization
OHS	Occupational Health and Safety
O&M	Operations and Maintenance
PCB	Printed Circuit Board
PIU	Project Implementation Unit
RE	Renewable Energy
SCEEP	State Committee for Ecology and Environmental Protection
SDG	Sustainable Development Goals
SEP	Stakeholder Engagement Plan
Toza Hudud SUE	Toza Hudud State Unitary Enterprise for Waste Management in Uzbekistan
UNFCCC	United Nations Framework Convention on Climate Change
UZ-NSDI	Uzbekistan National Spatial Data Infrastructure
UzKAD	Uzbekistan Cadastre System
WB	World Bank
WEEE	Waste Electrical and Electronic Equipment
WMP	Waste Management Plan

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INTRODUCTION

The Waste Management Plan (WMP) for the Geospatial Infrastructure for Sustainable Territorial Development (GISTD) Project in Uzbekistan outlines the principles, strategies, and responsibilities necessary for managing waste generated throughout the project lifecycle. The project aims to improve geospatial data availability and accessibility by establishing a National Spatial Data Infrastructure (NSDI). While this initiative primarily involves data collection, system upgrades, and technical infrastructure improvements, there are associated environmental and social risks, particularly in terms of electronic waste (e-waste) and minor construction debris. To ensure the project's sustainability, the WMP focuses on waste reduction, segregation, recycling, and safe disposal practices in compliance with Uzbekistan's national waste management policies and the World Bank's Environmental and Social Standard 3 (ESS3) on Resource Efficiency and Pollution Prevention and Management and (ESS4) on Community Health and Safety. This plan serves as a framework for implementing waste management practices that minimize adverse environmental impacts while ensuring compliance with applicable laws and regulations.

Project Description

The Geospatial Infrastructure for Sustainable Territorial Development Project (GISTD) aims to improve the availability and accessibility of geospatial data in Uzbekistan. The Project will support the development of a National Spatial Data Infrastructure (NSDI), which enables cities and regions in the country to transition to digital economies and services through the development of online platforms, which enhance citizen services, inform evidence-based government decisions, and advance digital transformation initiatives. Central to this infrastructure is the capacity to spatially locate Uzbekistan's assets—land, natural resources, and infrastructure—on accessible digital platforms, enabling effective asset management critical for development planning, and enhancing resilience to climate change and disaster risk management. The development of Uzbekistan's NSDI (UZ-NSDI) will enable the national, regional, and municipal governments to improve investment planning, infrastructure development, and public service delivery through efficient geospatial data use. The project directly supports the Uzbekistan 2030 Strategy which underscores the need for resilient economic growth and regional equity, optimization of land use.

Project Components

The GISTD comprises the following 3 components:

Component A: Support to NSDI implementation.

A.1.: Support to NSDI Implementation at the Central Level: Key activities include the development of data standards and data sharing agreements; the design and implementation of the UZ-NSDI architecture, the establishment of three new data centers in the existing buildings (which might require the refurbishment or rehabilitation of the buildings), including procurement of necessary software and hardware; the development of a national UZ-NSDI geoportal as well as one regional geoportal to facilitate data access and use. Under this component, various equipment will be procured to establish and operationalize Uzbekistan's National Spatial Data Infrastructure (UZ-NSDI). This includes:

NSDI Data Centers and Backup Facilities: Hardware, standard software, and other necessary equipment will be procured to equip the NSDI Data Center and the backup data center.

State Fund for Geodesy-Cartography (SFGC) Data Center: Equipment will be supplied to enhance the geospatial data storage and management capacity of the State Fund for Geodesy-Cartography.

Republic Center for Aerogeodesy (RCAG) Data Center: Equipment procurement will support the Republic Center for Aerogeodesy in processing and managing aerial geospatial data.

A.2.: Support to NSDI contributing institutions*:* Key interventions will focus on supporting selected stakeholder institutions that provide data for and use UZ-NSDI, including the region and municipality of Samarkand, through technical assistance and the provision of IT infrastructure (hardware and software) for managing and distributing geospatial data, enabling them to effectively participate in and benefit from the UZ-NSDI.

Component B: Geospatial infrastructure and data enhancement.

B.1.: Enhancement of surveying and mapping infrastructure: This subcomponent will focus on upgrading and updating the surveying and mapping infrastructure. 80 GNSS stations will be supplied and installed in the existing Continuously Operating Reference System (CORS) infrastructure to improve spatial data accuracy and geodetic reference frameworks.

B.2.: Information systems and data: The subcomponent will further support the establishment of a national address register, including the revision of the regulatory framework and information system for data management, and field data collection in Samarkand city.

B.3.: Piloting of new systems and technologies: The subcomponent will focus on piloting new systems and technologies for data collection and management in Samarkand city. A data center will be equipped in selected areas of Samarkand city to support geospatial data processing and storage, along with the procurement of surveying equipment for enhanced data collection.

Component C. Institutional capacity enhancement and Project management.

To ensure effective project implementation and operational efficiency, the following equipment will be procured:

Project Implementation Unit (PIU) Equipment: Necessary IT and office equipment will be supplied to facilitate the operations of the PIU, ensuring smooth project coordination, monitoring, and reporting.

Project Location

The project will be implemented across the entire Republic of Uzbekistan. It focuses on the creation and use of spatial data, management of land resources, and provision of information to the e-government system.

Figure 1. Map of Uzbekistan and Neighboring Countries

Objectives of the WMP

The objectives of this Waste Management Plan are to minimize waste generation through efficient resource use, promote sustainable disposal methods, and safeguard human health and the environment. The plan establishes guidelines for the proper handling of waste materials, reducing pollution and ensuring effective compliance with national and international environmental standards. Key objectives include:

- Establishing best practices for reducing, reusing, and recycling materials to minimize waste generation.
- Ensuring the proper segregation, storage, handling, and disposal of both hazardous and non-hazardous waste.
- Preventing environmental contamination and health risks through appropriate waste management techniques.
- Complying with Uzbekistan's waste management regulations and the World Bank Environmental and Social Framework (ESF).
- Implementing efficient e-waste management practices, considering the technological nature of the project.
- Promoting awareness and training among project personnel and stakeholders regarding proper waste handling and disposal procedures.

Waste Generation and Classification

Types of Waste Anticipated

The GISTD project will generate various types of waste, primarily due to the procurement of IT equipment, minor civil works for data center upgrades, and the installation global navigation satellite system (GNSS)

equipment at 80 Continuously Operating Reference System (CORS) stations. Expected waste will be categorized as follows:

Non-Hazardous Waste:

- Office waste, including paper, cardboard, and packaging materials generated from IT infrastructure procurement and operations.
- Organic waste from administrative and project activities.
- Plastic waste from packaging, disposable containers, and other office-related consumables.

Hazardous Waste:

- **Electronic waste (e-waste)**: This includes obsolete or damaged computers, servers, printers, routers, and other IT equipment.
- **Batteries and lighting equipment**: Used batteries, fluorescent tubes, and other discarded lighting materials that require specialized disposal procedures.
- **Chemical waste**: Residues from cleaning agents, maintenance chemicals, and other potentially hazardous substances used in data centers and surveying activities.

Potential Risks of These Toxic Substances

- **Lead (Pb):** A neurotoxin harmful to both humans and wildlife, it can contaminate water sources and lead to developmental disorders.
- **Mercury (Hg):** Used in lighting components and LCD displays, mercury exposure can lead to nervous system damage and respiratory diseases.
- **Cadmium (Cd):** Found in batteries and circuit boards, cadmium is a known carcinogen that affects the kidneys and bones.
- **Chromium VI (Cr6+):** Used in metal coatings, this substance is highly toxic and can cause lung cancer and DNA damage.
- **Brominated Flame Retardants (BFRs):** Used in plastic casings, cables, and PCBs, these chemicals persist in the environment and disrupt human hormonal systems.
- **Polyvinyl Chloride (PVC):** Found in cables and insulation, PVC releases dioxins when burned, which are harmful air pollutants.
- **Lithium (Li) & Cobalt (Co):** Used in rechargeable batteries, improper disposal can lead to fires, soil degradation, and toxic metal exposure.

Cooling agents used in Air conditioning in Data centers

The Vertiv™ Liebert® CRD25 precision air conditioner, designed for row-based cooling in data centers, utilizes R410A refrigerant, a hydrofluorocarbon (HFC) blend commonly used in HVAC systems. While R410A is effective in heat transfer, it has a high Global Warming Potential (GWP) of 2,088, meaning its release into the atmosphere can significantly contribute to global warming.

Potential Harmful Chemicals and Waste Components:

- **Refrigerant (R410A):** Accidental leaks or improper handling during maintenance can release R410A into the atmosphere, exacerbating greenhouse gas effects.
- **Lubricating Oils**: The compressor within the CRD25 uses synthetic lubricants to ensure smooth operation. These oils can be harmful to the environment if spilled or disposed of improperly, potentially contaminating soil and water sources.

— **Electronic Components**: The unit contains various electronic parts, including circuit boards and sensors, which may contain hazardous substances like lead or mercury. These components require careful handling during disposal to prevent environmental contamination.
— **Air Filters:** Over time, air filters accumulate dust, microbial agents, and other contaminants. If not disposed of properly, they can pose health risks and environmental hazards.

Safe Disposal and Waste Management Recommendations:

— **Refrigerant Handling**: Engage certified HVAC professionals for any maintenance involving refrigerant handling. Ensure that any recovered R410A is either recycled or disposed of in accordance with local environmental regulations to prevent atmospheric release.
— **Oil Management**: Collect and store used lubricating oils in designated containers. Partner with licensed waste management companies to recycle or dispose of these oils safely, preventing soil and water contamination.
— **Electronic Waste (E-Waste)**: Develop an e-waste management protocol that includes inventorying electronic components, assessing their condition, and collaborating with certified e-waste recyclers to handle, recycle, or dispose of these parts responsibly.
— **Air Filter Disposal**: Implement a routine schedule for air filter replacement. Seal used filters in appropriate bags and dispose of them following local regulations, especially if they contain hazardous materials.

Construction Waste:

— Minor construction debris, including dust, scraps from IT equipment installation, and leftover cables and wiring materials.
— Small amounts of building materials (asbestos and others) from the rehabilitation and installation of new hardware in data centers.

Waste Management Plan

Waste Prevention and Reduction

Preventing waste generation is the most effective way to minimize environmental impact. The GISTD project will implement waste prevention strategies by ensuring efficient procurement, limiting unnecessary resource use, and prioritizing digital documentation to reduce paper waste. IT equipment will be selected based on longevity and energy efficiency, reducing the need for frequent replacements. Additionally, inventory control measures will be enforced to avoid overstocking materials that could become waste.

Waste Segregation and Storage

To facilitate proper disposal, waste will be segregated into designated categories at project sites, administrative offices, and technical facilities. Clearly labeled and color-coded waste bins will be provided for paper, plastics, metals, and e-waste. Hazardous waste will be stored separately in secure containers to prevent cross-contamination. Temporary storage areas for e-waste and hazardous materials will be established at data centers and municipal offices before their transfer to certified waste treatment facilities.

Waste Reuse and Recycling

The project will promote the reuse and recycling of materials to minimize the environmental footprint. Office supplies such as paper and cardboard will be recycled through local vendors. Plastic waste will be collected and sent to recycling facilities. IT equipment that is no longer needed but remains functional will be refurbished and donated to educational institutions or government agencies. For non-reusable e-waste, partnerships with certified recycling contractors will be established to ensure environmentally sound disposal practices.

Waste Treatment and Disposal

The final step in the waste management hierarchy is safe disposal. The project will engage licensed waste contractors for the proper treatment and disposal of hazardous and non-hazardous waste. E-waste will be processed according to international best practices, ensuring that valuable components are recovered and harmful substances are neutralized. Non-recyclable general waste will be transported to municipal landfills in compliance with Uzbekistan's waste disposal regulations.

Waste Collection and Disposal by "Toza Hudud" SUE

The "Toza Hudud" State Unitary Enterprise [1](SUE) is responsible for waste collection, transportation, and disposal services across Uzbekistan. This organization operates under the State Committee of the Republic of Uzbekistan for Ecology and Environmental Protection (SCEEP) and is tasked with handling municipal solid waste (MSW). In the context of the GISTD project, "Toza Hudud" SUE may be engaged for the collection and transportation of waste generated from project activities, including e-waste and construction debris.

Overview of "Toza Hudud" SUE:

- There are a total of 116 sanitation and waste collection enterprises across Uzbekistan.
- "Toza Hudud" SUE operates in 13 regional branches, including Karakalpakstan, with additional district and city-level subsidiaries.
- The enterprise employs approximately 7,000 workers and operates 3,264 specialized vehicles for waste collection and transportation.
- "Toza Hudud" and "Maxsustrans (operates only in Tashkent city)" together manage 3,179 waste collection points and 10,372 waste containers across the country.
- Uzbekistan has 333 waste disposal and landfill sites, including 310 solid waste burial sites and 23 waste processing and utilization facilities.

Scope of Engagement:

- **Collection and Transportation:** "Toza Hudud" SUE will collect and transport project-generated waste to designated disposal or recycling facilities.
- **Disposal:** The organization will ensure that all non-recyclable waste is disposed of in accordance with national environmental standards.
- **Recycling and Reuse:** Recyclable materials will be processed at appropriate facilities to minimize landfill use and promote sustainable waste management practices.

[1] https://www.uznature.uz/en/activity/waste?numer=453

By engaging "Toza Hudud" SUE, the project ensures that waste is managed in accordance with Uzbekistan's regulatory framework while leveraging an established and efficient waste management service provider.

Institutional Responsibilities

The responsibilities and duties associated with this waste management plan are outlined in the table below:

Table 1. The responsibilities and duties associated with waste management plan

Entity	Responsibilities
Cadastre Agency (CA)	Overall implementation, monitoring, and enforcement of the WMP.
Project Implementation Unit (PIU)	Ensuring compliance with waste management protocols, conducting capacity-building sessions, and reporting on waste management progress.
Contractors & Subcontractors	Implementing site-specific waste management measures, maintaining proper waste documentation, and ensuring waste is disposed of through authorized channels.
Toza Hudud SUE	Collecting, transporting, and disposing of project-generated waste in accordance with national waste management policies.

Monitoring and Reporting

Effective monitoring and reporting are essential to ensure compliance with the **Waste Management Plan (WMP)** and to assess the efficiency of waste management practices throughout the project lifecycle. The monitoring framework will facilitate tracking of waste generation, segregation, storage, transportation, and disposal, ensuring alignment with Uzbekistan's **national regulations, World Bank Environmental and Social Standards (ESS), and Good International Industry Practices (GIIP).**

Objectives of Monitoring and Reporting:

- Ensure compliance with **Uzbekistan's national waste management laws** and **international environmental regulations.**
- Assess the efficiency of **waste minimization, segregation, reuse, and recycling measures**.
- Identify gaps or inefficiencies in waste handling, storage, and disposal, and **recommend corrective actions.**
- Track **waste generation, collection, transportation, and disposal trends** to improve future waste management practices.
- Minimize environmental and health risks associated with **improper e-waste and hazardous waste disposal.**
- Ensure **accountability and transparency** in waste management procedures.

Monitoring Activities and Key Indicators:

Table 2. Monitoring Activities and Key Indicators

Monitoring Aspect	Key Performance Indicators (KPIs)	Frequency	Responsible Party
Waste Segregation	Percentage of waste correctly segregated at the source	Monthly	PIU, Contractors
E-Waste Collection	Number of collection points established; Amount of e-waste collected (kg)	Quarterly	PIU, **Toza Hudud**
Storage Compliance	Proper labeling and storage of hazardous and non-hazardous waste	Monthly	PIU, Site Supervisors
Recycling and Reuse	Percentage of total waste recycled or reused	Biannually	PIU, **Toza Hudud**, Recycling Contractors
Disposal Compliance	Number of disposals conducted at licensed facilities	Annually	**Toza Hudud**, PIU
Training and Awareness	Number of awareness sessions conducted for staff and stakeholders	Annually	PIU, Environmental Specialists
Incident Reporting	Number of non-compliance cases or accidents related to waste management	As needed	PIU, Contractors
Grievance Redress Mechanism (GRM)	Number of grievances received and resolved	Quarterly	PIU, GRM Committee

Roles and Responsibilities in Monitoring:

Project Implementation Unit (PIU):

- Oversees the implementation of the **WMP** and ensures compliance with national regulations.
- Compiles **quarterly and annual waste management reports** and submits them to relevant stakeholders.
- Coordinates waste collection, transportation, and disposal activities with **Toza Hudud SUE.**

Toza Hudud SUE (Waste Contractor):

- Responsible for the **collection, transportation, and disposal of e-waste and construction debris** in designated facilities.
- Ensures that all **waste handling processes comply with environmental regulations** and safety standards.
- Provides **waste tracking and disposal certificates** for all collected materials.

Contractors and Subcontractors:

- Implement **on-site waste management measures**, including **segregation, proper storage, and waste minimization**.
- Ensure all waste is transferred to **Toza Hudud** or other **licensed recycling/disposal facilities.**

Environmental and Social ESF Specialists:

- Conduct **regular site inspections and audits** to ensure best practices are followed.
- Provide technical guidance on **waste handling, environmental impact mitigation, and compliance**.

Stakeholders and Community Representatives:

- Participate in **waste-related public consultations and training**.
- Report grievances related to **waste mismanagement** through the **Grievance Redress Mechanism (GRM)**.

Reporting Mechanism:

Monthly Internal Reports:

- Contractors and site supervisors will submit **monthly reports on waste segregation, collection, and storage** conditions.
- **Toza Hudud SUE** will provide reports on waste collection, transportation, and disposal activities.

Quarterly Performance Reports:

- The PIU will compile **quarterly reports** that include **key performance indicators, compliance status, challenges, and recommendations.**
- Reports will be shared with relevant stakeholders, including the World Bank.

Annual Compliance Reports:

- A **comprehensive annual report** will be submitted to regulatory agencies, summarizing waste management activities, disposal records, and sustainability efforts.
- The report will evaluate progress towards **minimizing environmental impact** and **achieving recycling targets**.

Incident and Non-Compliance Reports:

- Any **improper waste disposal, environmental violations, or spillages** will be **immediately reported** to the PIU.
- Corrective measures will be implemented in coordination with **Toza Hudud** and relevant authorities.

Evaluation and Continuous Improvement:

- Monitoring results will be reviewed periodically to identify opportunities for **improving waste management efficiency**.
- Adjustments will be made to **waste segregation, storage, and disposal procedures** to enhance sustainability.
- Training sessions and awareness campaigns will be conducted to ensure continued **compliance with environmental and social best practices**.
- Stakeholder engagement and consultation will be strengthened to ensure community participation in **proper waste disposal efforts**.

Compliance and Legal Framework

This WMP aligns with national and international waste management policies, ensuring adherence to Uzbekistan's waste regulations and World Bank ESS3 standards. Additionally, it is fully aligned with the World Bank's Environmental, Health, and Safety (EHS) Guidelines, which provide best practices for waste minimization, pollution prevention, and proper disposal.

The key legal and regulatory framework governing waste management in Uzbekistan includes:

Table 3. National Waste Management Laws and Regulations

Law/Regulation	Key Provisions
Law on Waste of the Republic of Uzbekistan (Latest Amendment: July 23, 2024)	Establishes the framework for waste collection, storage, transportation, processing, and disposal.
Presidential Decree No. DP-4291 (April 17, 2019)	Approves the "Strategy for Solid Waste Management in the Republic of Uzbekistan for 2019-2028," outlining objectives for waste minimization and environmental safety.
Presidential Decree No. PF-5863 (October 30, 2019)	Establishes the "Concept of Environmental Protection of the Republic of Uzbekistan until 2030," which includes waste management reforms.
Presidential Resolution PQ-4845 (September 29, 2020)	Introduces state-private partnerships for municipal waste management services.
Cabinet of Ministers Resolution No. 783 (November 25, 2024)	Implements environmental monitoring measures for industrial waste.
Draft Law on Strengthening Payment Discipline in Waste Management (2025)	Aims to improve fee collection for waste management services.

Table 4. Uzbekistan's participation in International Conventions and Agreements

Convention/Treaty	Key Provisions	Ratification Date	Date Uzbekistan Joined
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal	Regulates the international movement of hazardous waste.	22 December 1995 (accession)	7 May 1996
Stockholm Convention on Persistent Organic Pollutants	Aims to eliminate hazardous chemicals in waste management.	22 May 2001	8 May 2019
United Nations Framework Convention on Climate Change (UNFCCC)	Addresses climate-related impacts of waste disposal.	20 June 1993 (acceptance)	21 March 1994
Kyoto Protocol	Establishes guidelines for reducing waste-related greenhouse gas emissions.	20 August 1999	16 February 2005

Waste Management Matrix

Table 5. Waste Management Matrix

Waste Type	Source/Activity	Potential Impact	Mitigation Measures	Monitoring Indicators	Responsible Party
Non-Hazardous Office Waste (Paper, Plastic, Cardboard, Packaging Materials, Food Waste)	Daily administrative activities in data centers, registry-cadastre offices, and stakeholder institutions	- Increased municipal waste burden. - Littering, clogged drainage systems. - Land and visual pollution.	- Implement waste reduction strategies (digital documents, double-sided printing). - Provide separate bins for recyclables and general waste. - Engage Toza Hudud SUE for collection and transportation. - Promote composting for organic waste.	- Volume of waste segregated and recycled. - Proper waste collection frequency. - Presence of recycling bins in office spaces.	- PIU - Office Administrators - Toza Hudud SUE
Construction and Renovation Waste (Scrap materials, broken tiles, cement debris, wiring, metal scraps, pipes, lead paints)	Minor renovations at data centers and upgrading of IT infrastructure	- Soil contamination from improper disposal. - Air pollution due to dust and debris. - Visual and land pollution. - Exposure risk for workers, laborers, and nearby residents	- Ensure segregation of construction waste (metal, wood, concrete). - Transport waste to licensed construction disposal sites. - Reuse materials where feasible (e.g., metal, bricks). - Implement dust control measures during demolition work.	- Number of waste disposal certificates from licensed facilities. - Volume of waste materials reused/recycled. - Adherence to safety and environmental regulations.	- Contractors - Toza Hudud SUE - PIU Environmental Safeguards Officer

Construction and Renovation Waste (Abestos or asbestos containing materials (ACM)	Minor renovations at data centers and upgrading of IT infrastructure	-Airborne asbestos fibers causing severe health risks (asbestosis, lung cancer, mesothelioma, respiratory disorders). -Exposure risk for workers, laborers, and nearby residents. -Soil and water contamination due to improper disposal. -Air pollution from disturbed asbestos-containing materials. -Regulatory and legal compliance risks, including fines and project delays. -Increased waste management complexity and costs due to specialized handling and disposal requirements. -Long-term health effects	- If asbestos or asbestos containing materials (ACM) are found at a construction site, they should be clearly marked as hazardous waste. - The asbestos should be appropriately contained and sealed to minimize exposure. - Prior to removal, if removal is necessary, ACM should be treated with a wetting agent to minimize asbestos dust. - If ACM is to be stored temporarily, it should be securely placed inside closed containers and clearly labeled. - Removed ACM must not be reused.		- Contractors - Toza Hudud SUE - PIU Environmental Safeguards Officer

Hazardous Waste (Chemical residues, old cleaning agents, fluorescent lamps, expired batteries, oils, and lubricants from generators)	- Cleaning and maintenance of office and data centers. - Generator maintenance and fuel storage.	- Groundwater and soil contamination if not properly disposed of. - Toxic emissions from improper burning. - Health risks to workers handling hazardous materials.	- Store hazardous waste separately in labeled, sealed containers. - Engage licensed hazardous waste contractors for collection and disposal. - Train personnel on hazardous waste handling. - Ensure safe storage and spill prevention measures.	- Volume of hazardous waste disposed of correctly. - Presence of dedicated hazardous waste storage areas. - Number of staff trained in hazardous waste handling.	- Facility Managers - Environmental Safeguards Officer - Toza Hudud SUE
Cooling Agent Waste (Air conditioning refrigerants, lubricating oils, electronic components from precision ACs)	- Cooling systems in data centers (e.g., Vertiv™ Liebert® CRD25 precision air conditioners)	Refrigerant (R410A) leaks: High Global Warming Potential (GWP). - Lubricating Oils: Soil and water contamination. - Electronic Components: Hazardous substances (lead, mercury). - Air Filters: Health risks if not properly handled..	Engage certified HVAC professionals for refrigerant handling. - Ensure recovered R410A is either recycled or disposed of according to environmental regulations. - Store used lubricating oils in designated containers and dispose of via licensed hazardous waste contractors. - Implement an e-waste management protocol for electronic components. - Seal used air filters in appropriate bags before disposal.	- Compliance with refrigerant disposal regulations. - Safe disposal records for lubricating oils and electronic components. - Properly labeled and stored air filters. - Training records for HVAC professionals on refrigerant handling.	-FFacility Managersacility Managers - Toza Hudud SUE - HVAC Contractors

Municipal Solid Waste (General refuse, cafeteria waste, broken furniture, glass, textiles)	- Daily office operations. - Waste from meetings, conferences, and events.	- Uncollected waste may lead to vermin infestation and odor. - Public health risks if improperly disposed of.	- Regular collection and disposal by Toza Hudud SUE. - Establish waste separation at source (organic, recyclables, general waste). - Encourage waste minimization practices in offices.	- Proper segregation of waste at disposal points. - Waste collection and disposal records. - Compliance with municipal waste disposal regulations.	- Office Managers - Toza Hudud SUE - PIU
Plastic Waste (Bottles, packaging, single-use plastic items)	- Daily operations in data centers, offices, and project meetings.	- Non-biodegradable waste accumulating in landfills. - Blockage of drainage systems. - Potential harm to local ecosystems.	- Implement plastic waste reduction measures (ban single-use plastics). - Install dedicated plastic waste bins in office premises. - Partner with recycling companies for plastic waste.	- Percentage of plastic waste diverted from landfills. - Presence of recycling bins for plastic waste. - Reduction in single-use plastic consumption.	- Office Managers - Toza Hudud SUE - PIU
Medical Waste (Masks, gloves, used tissues, disinfectant wipes, expired first aid materials)	- Office sanitary and medical waste.	- Potential health risks to workers if disposed of improperly. - Cross-contamination in general waste.	- Provide clearly marked bins for medical waste. - Use licensed medical waste disposal services. - Train staff on safe disposal of medical waste.	- Presence of designated disposal bins for medical waste. - Compliance with health and safety regulations.	- Health & Safety Officer - Facility Managers - Toza Hudud SUE
Scrap Metal and Wood Waste	- Infrastructure maintenance and renovations.	- Sharp and hazardous materials can pose risks to workers. - Improper disposal in landfills contributes to pollution.	- Store metal and wood waste separately for recycling. - Engage licensed recycling companies for disposal. - Reuse metal and wood for future construction needs where possible.	- Volume of metal and wood waste recycled. - Presence of secure storage for scrap materials.	- Contractors - Toza Hudud SUE - PIU Environmental Safeguards Officer

ELECTRONIC WASTE (E-WASTE) MANAGEMENT PLAN

The Cadastre Agency (CA), as the Implementing Agency of the Geospatial Infrastructure for Sustainable Territorial Development (GISTD) Project in Uzbekistan, is committed to managing environmental and social risks associated with project implementation in a structured and systematic manner throughout the project life cycle. Waste generation is one of the key environmental risks that must be considered from the early stages of project planning through to implementation. A proactive approach to waste management is essential to ensure compliance with national regulations, international best practices, and environmental sustainability principles.

Waste management planning for the GISTD Project should be initiated at the pre-planning stage to establish appropriate handling, disposal, and mitigation measures within the legal and environmental frameworks of Uzbekistan. Possible waste streams that may be generated during project implementation may include solid wastes, hazardous wastes, electronic wastes, etc. However, the focus of this plan is on electronic waste or E-Waste. An E-Waste Management Plan (EWMP) is used to describe the waste management related issues within the Electrical and Electronic Equipment (EEE) industry sector and specify the best way to address these issues, giving specific actions, targets, and timeframes. Throughout project implementation, various waste streams may be generated, including office waste such as paper and packaging materials, as well as electronic waste (E-waste) from IT equipment and infrastructure. However, this plan focuses specifically on E-waste, which includes discarded EEE such as computers, servers, networking devices, and accessories.

9.1 E-Waste Definition and General Considerations

Waste electric and electronic equipment (WEEE) is referred to as e-waste or electronic waste and it is defined as any end-of-life or end-of-use piece of ‘‘equipment which is dependent on electrical currents or electromagnetic fields in order to work properly”. The E-Waste Management Plan (EWMP) is designed to address key waste management concerns within the digital infrastructure sector and establish best practices for managing electronic waste efficiently. It outlines specific actions, targets, and implementation measures aimed at reducing the environmental footprint of E-waste. The EWMP will be implemented throughout the project lifecycle to:

- Ensure environmental protection, including biodiversity conservation and habitat preservation.
- Protect public health by minimizing exposure to hazardous substances found in electronic waste.
- Comply with legal and regulatory frameworks, including Uzbekistan’s waste management policies and the World Bank Environmental and Social Standards (ESS), particularly ESS3 (Resource Efficiency and Pollution Prevention and Management) and ESS1 (Environmental and Social Risk Management).
- Align with Good International Industry Practice (GIIP) and the World Bank’s Environmental, Health, and Safety Guidelines (EHSG) for effective waste handling, recycling, and disposal.

By implementing this E-Waste Management Plan, the project will contribute to a sustainable digital transformation while ensuring that waste-related risks are mitigated effectively, in line with Uzbekistan’s environmental policies and the World Bank’s ESF.

E-Waste Definition and General Considerations

Electronic waste, commonly referred to as E-waste or Waste Electrical and Electronic Equipment (WEEE), includes discarded electrical and electronic devices that have reached the end of their operational life or are no longer in use. E-waste is broadly defined as any equipment that relies on electrical currents or electromagnetic fields for its functionality. This category covers a wide range of electronic and electrical equipment (EEE), including but not limited to:

- Information technology (IT) and telecommunications equipment, such as computers, servers, printers, scanners, routers, and copiers.
- Consumer electronics, including mobile phones, tablets, televisions, and entertainment systems.
- Office and industrial electrical equipment, such as backup generators, electric cables, and network infrastructure.
- Components and accessories, including batteries, printed circuit boards (PCBs), plastic casings, cathode-ray tubes (CRTs), capacitors, and electric cables from end-of-life vehicles (ELVs).

For the GISTD Project, the most relevant forms of E-waste will include computers, servers, printers, copiers, networking devices, and related accessories. Due to the presence of hazardous materials such as lead, mercury, cadmium, and brominated flame retardants, improper disposal of E-waste can pose significant risks to human health and the environment. However, E-waste also contains valuable and scarce materials, such as gold, silver, copper, and rare earth metals, which can be recovered through sustainable recycling practices. The following are the equipment planned to be procured by the project:

- NSDI Data Center Hardware and Software
- Backup Data Center Equipment
- State Fund for Geodesy-Cartography (SFGC) Data Center Equipment
- Republic Center for Aerogeodesy (RCAG) Data Center Equipment
- IT Infrastructure for Contributing Institutions and Selected Municipality
- GNSS Equipment for Existing 80 CORS Stations
- Cadastral Field Measurement Equipment
- Surveying Equipment for Data Collection
- Data Center Equipment for the Pilot City
- IT and Office Equipment for the Project Implementation Unit (PIU)

10.1 Toxicity and Environmental Impact of E-Waste in the GISTD Project

Electrical and electronic equipment (EEE) contain various hazardous materials that pose significant risks to human health, water bodies, soil, and wildlife if not handled and disposed of properly. While some substances found in electronic devices are naturally occurring and relatively harmless, their transformation into compounds used in manufacturing processes often results in highly toxic and persistent materials. For instance, chromium in its natural form is relatively safe, but when processed into chromium VI (hexavalent chromium), it becomes highly toxic and hazardous.

Several common toxic substances found in electronic waste (E-waste) include:

- Lead (Pb): Found in circuit boards, batteries, and cathode-ray tube (CRT) monitors. It is highly toxic to the nervous system, kidneys, and reproductive health.

- Mercury (Hg): Used in fluorescent lamps, LCD screens, and some printed circuit boards. Exposure can cause neurological damage and developmental disorders.
- Cadmium (Cd): Present in rechargeable batteries, circuit boards, and plastic casings. It is a known carcinogen and can cause kidney damage.
- Brominated Flame Retardants (BFRs): Used in plastics, cables, and circuit boards to prevent fire hazards. These compounds are highly persistent, accumulating in the environment and human tissues, potentially disrupting the endocrine system.
- Polyvinyl Chloride (PVC): Found in electrical cables and insulation. When burned, it releases dioxins and furans, which are among the most toxic substances known to science

10.2 Environmental and Health Risks of E-Waste

E-waste toxicity affects multiple environmental compartments:

- Human Health: Exposure to toxic metals and chemicals from improper disposal can result in cancer, nerve damage, respiratory disorders, and reproductive issues.
- Soil Contamination: Heavy metals such as lead, cadmium, and mercury leach into the soil from improperly disposed E-waste, reducing soil fertility and contaminating agricultural land.
- Water Pollution: Leachates from landfilled or improperly discarded E-waste can infiltrate groundwater and surface water, contaminating drinking water sources and aquatic ecosystems.
- Air Pollution: Burning E-waste, especially plastics containing PVC or BFRs, releases toxic dioxins and heavy metals into the atmosphere, contributing to respiratory diseases and global warming.

10.3 Toxic Substances in E-Waste

The following table outlines some of the most common toxic substances found in E-waste and their environmental and health effects:

Table 6. Common Toxic Substances in E-Waste and Their Effects

Substance	Occurrence in E-waste	Electronic Items
Halogenated compounds		
PCB (polychlorinated biphenyls)	Condensers, Transformers	Refrigerators for offices
TBBA(tetrabromo-bisphenol-A) PBB (polybrominated biphenyls) PBDE (polybrominated diphenyl ethers)	Fire retardants for plastics (thermoplastic components, cable insulation) TBBA is presently the most widely used flame retardant in printed circuit boards	Fire extinguishers, electrical cables, electrical wires
Chlorofluorocarbon (CFC)	Cooling unit, Insulation foam	
PVC (polyvinyl chloride)	Cable insulation	Electrical wires, internet and satellite dish wires

Heavy metals and other metals:		
Arsenic	Small quantities in the form of gallium arsenide within light emitting diodes	Fluorescent bulbs, bulb diodes
Barium	Getters in cathode ray tubes (CRTs)	
Beryllium	Power supply boxes which contain silicon-controlled rectifiers and x-ray lenses	Computer box, junction box, electrical equipment
Cadmium	Rechargeable computer batteries, fluorescent layer (CRT screens), printer	Computer batteries, printer inks and toners,

10.4 Toxic Substances Expected in Equipment Procured under the GISTD Project

The following table presents an overview of the key equipment categories to be procured under the project and the toxic substances they may contain:

Table 7. Common Toxic Substances in E-Waste and Their Effects

Equipment Type	Expected Toxic Substances	Environmental and Health Risks
GNSS Receivers & Antennas	Lead (Pb), Cadmium (Cd), Brominated Flame Retardants (BFRs)	Lead poisoning, environmental contamination, bioaccumulation risks
Servers & Storage Systems	Lead (Pb), Mercury (Hg), Arsenic (As), Cadmium (Cd), Chromium VI (Cr6+)	Neurotoxicity, kidney damage, carcinogenic effects, water/soil pollution
Network Equipment (Routers, Switches, Modems)	Brominated Flame Retardants (BFRs), Lead (Pb), Chromium VI (Cr6+)	Persistent organic pollutants (POPs), respiratory issues, skin irritation
Workstations & Computers	Lead (Pb), Mercury (Hg), Cadmium (Cd), BFRs	Endocrine disruption, cancer risk, groundwater contamination
UPS & Power Supply Equipment	Lead (Pb) (Batteries), Sulfuric Acid (H_2SO_4)	Soil and water contamination, acid burns, hazardous air emissions
Cables & Wiring	Polyvinyl Chloride (PVC), Lead (Pb), Phthalates	Air pollution (when burned), leaching of hazardous chemicals
Printers & Scanners	Toner dust (Carbon Black), Cadmium (Cd), Lead (Pb), BFRs	Respiratory hazards, carcinogenic effects, contamination risks

Lithium-Ion Batteries (for Portable Devices & GNSS Systems)	Lithium (Li), Cobalt (Co), Nickel (Ni), Lead (Pb)	Fire/explosion risk, heavy metal contamination, soil degradation
Display Monitors & Screens (LCD/LED)	Mercury (Hg), Lead (Pb), Indium (In), Arsenic (As)	Toxic vapor release, neurological effects, bioaccumulation in ecosystems
The Vertiv™ Liebert® CRD25 precision air conditioner for Data centers	Refrigerant (R410A), synthetic lubricant	Accidental leaks or improper handling of the refrigerant during maintenance can release R410A into the atmosphere, exacerbating greenhouse gas effects; These oils can be harmful to the environment if spilled or disposed of improperly, potentially contaminating soil and water sources

10.5 Benefits of Sustainable E-Waste Management in the GISTD Project

Implementing sustainable e-waste management practices within the Geospatial Infrastructure for Sustainable Territorial Development (GISTD) Project will contribute significantly to reducing environmental impact, conserving resources, and supporting economic development. Proper handling, collection, and recycling of e-waste will ensure compliance with Uzbekistan's national regulations and the World Bank's Environmental and Social Standards (ESS3) while also promoting long-term sustainability.

10.5.1 Reduction of Greenhouse Gas Emissions and Energy Savings

E-waste contains valuable metals and materials that, when recycled, reduce the need for primary resource extraction. The production of metals such as gold, silver, copper, and palladium from raw ores requires intensive energy, mining, and refining processes, which generate significant amounts of carbon dioxide (CO_2) emissions. However, recovering these materials from discarded electronic devices (such as old computers, servers, and phones) uses only a fraction of the energy compared to mining and refining raw materials.

By promoting efficient recycling processes, the GISTD Project can contribute to climate change mitigation efforts by reducing greenhouse gas emissions from mining and manufacturing operations. The circular economy approach in e-waste recycling ensures that valuable resources are kept in use for longer periods, reducing the overall carbon footprint of electronic equipment.

10.5.2 Conservation of Land and Prevention of Soil Contamination

Uncontrolled disposal of e-waste into landfills leads to land pollution and soil contamination due to the leaching of hazardous substances such as lead, mercury, and cadmium. Establishing structured e-waste

collection, sorting, and recycling mechanisms will minimize the demand for landfill space, allowing land to be repurposed for more productive uses such as housing, agriculture, and renewable energy projects.

By preventing hazardous waste from accumulating in landfills, the GISTD Project will contribute to environmental protection and sustainable land use planning in Uzbekistan.

10.5.3 Economic Benefits and Job Creation

While this E-Waste Management Plan (EWMP) does not mandate the establishment of an e-waste recycling infrastructure, it highlights the potential for economic development through sustainable waste management. The collection, sorting, manual dismantling, and pre-processing of e-waste could create employment opportunities and support local businesses in Uzbekistan.

By engaging licensed waste management companies such as Toza Hudud SUE and promoting responsible recycling partnerships, the GISTD Project can support the development of a green economy while strengthening Uzbekistan's waste management sector. Capacity-building efforts in e-waste handling and processing will further enhance technical expertise and environmental awareness within the country.

10.5.4 Circular Economy and Resource Efficiency

Through the adoption of sustainable e-waste management practices, valuable secondary raw materials can be recovered and reintegrated into the production cycle. This approach helps:

- Reduce dependence on newly mined resources, ensuring long-term availability of essential materials.
- Lower the cost of electronic production by supplying recycled materials to the market.
- Extend the lifecycle of electronic products by promoting reuse and refurbishment.

10.5.5 Preventing Hazardous Emissions

Improper disposal of e-waste through burning or uncontrolled dumping results in the release of toxic substances into the air, water, and soil. Sustainable e-waste management ensures that hazardous components are safely extracted, stored, and processed in accordance with international safety guidelines. This prevents pollution and protects human health from exposure to toxic heavy metals and persistent organic pollutants (POPs).

E-Waste Management Plan (EWMP)

11.1 E-Waste Management During the Implementation Phase

The E-Waste Management Plan (EWMP) for the Geospatial Infrastructure for Sustainable Territorial Development (GISTD) Project will be implemented throughout the project lifecycle, ensuring proper handling, collection, recycling, and disposal of electronic waste (e-waste). The plan aligns with the World Bank's Environmental and Social Standards (ESS1 and ESS3) under the Environmental and Social Framework (ESF) and Uzbekistan's national legislation on waste management.

This plan is essential to ensure that project-financed electrical equipment (such as GNSS equipment, computers, printers, servers, cables, and backup generators) is managed efficiently when replaced, becomes irreparable, or reaches the end of its operational life. The implementation of this plan will ensure compliance

with Uzbekistan's relevant waste management laws, World Bank Environmental, Health, and Safety Guidelines (EHSG), and Good International Industry Practices (GIIP).

11.1.1 Material Recycling Process

The recycling process for electronic devices involves multiple steps to ensure maximum material recovery and minimal environmental impact This process will be contracted to specialized contractor, which is "Toza Hudud". The three main stages of material recycling include:

1. Dismantling or disassembling process
2. Pre-processing (mechanical processing)
3. Recovery and refining process

While this plan primarily illustrates the recycling process for computers and IT equipment, similar methodologies apply to other types of electronic waste, including servers, backup generators, and communication devices.

11.1.1.1 Dismantling Process

Dismantling is the first stage of e-waste recycling and involves the systematic removal of electronic components and materials using simple tools such as screwdrivers, air drivers, hammers, tongs, and conveyors. The dismantling process enables the separation of materials into different categories (plastics, iron, steel, copper, printed circuit boards (PCBs), and others) for further processing.

The dismantling process is particularly effective in Uzbekistan, where manual disassembly remains economically feasible due to the availability of labor. By breaking down electronic devices into smaller components, dismantling optimizes transportation, pre-processing, and refining efficiency.

Components Processed in the Dismantling Stage

1. **Computer Cases:**
    - Separated into **main body materials** (iron, aluminum, or plastic).
    - Extraction of **power supplies, copper wiring, cooling fans, CD drives, hard drives, memory modules, PCI cards, and motherboards (PCBs)**.
2. **Cathode Ray Tube (CRT) Monitors:**
    - CRT units contain **leaded glass, ferrous shadow masks, and electron guns**.
    - Due to **toxic lead content**, CRT monitors **must be dismantled carefully** and disposed of in **designated hazardous waste facilities**.
3. **Liquid Crystal Display (LCD) Monitors:**
    - Components include **PCBs, cold cathode fluorescent (CCFL) tubes, LCD panel glasses, metals, plastics, and speakers**.
    - **CCFL tubes contain mercury**, requiring special disposal at **heavy metal recovery facilities**.
4. **Printed Circuit Boards (PCBs):**
    - PCBs contain **valuable and hazardous metals**, including **copper (Cu), gold (Au), silver (Ag), lead (Pb), and palladium (Pd)**.
    - Different PCB types (from **hard drives, memory modules, LCD monitors, and motherboards**) require **specialized recovery methods**.
5. **Identification of Scrap Metals:**
    - Extracted metals such as **copper, aluminum, magnesium, and zinc** are classified based on **market value.**

- The **magnet test** helps distinguish between **ferrous and non-ferrous metals** to optimize metal recovery

11.1.1.2 Pre-Processing

Pre-processing (also known as **mechanical processing)** involves **shredding, crushing, and sorting** materials extracted during the dismantling process. This step is essential for **reducing material volume, increasing efficiency, and enhancing metal recovery rates.**

Common **pre-processing techniques** include:

Shredding & Separation:

- Uses **crushers and grinders** to break down e-waste into smaller fragments.
- **Magnetic separation** extracts **ferrous metals**, while **eddy current techniques** separate non-ferrous metals.

Thermal Treatment & Incineration:

- Used for **plastics, contaminated components, and hazardous materials**.
- Requires strict **emission control measures** to **prevent pollution**.

Pulverizing & Compression:

- Reduces **waste volume** for easier **transportation and refining**.

Although **pre-processing accelerates e-waste recycling**, improper blending of **plastic and metallic components** can reduce **precious metal recovery rates**. To enhance **waste value extraction**, the **selection of the appropriate pre-processing method** must be based on:

- **Material characteristics**
- **Market scrap value**
- **Transportation and logistics feasibility**
- **Availability of specialized recovery and refining facilities**

11.1.1.3 Recovery and Refining Process

The final stage in e-waste management is the recovery and refining process, which extracts valuable metals and reusable materials from dismantled components.

- High-value PCBs (with high concentrations of gold, silver, and palladium) are sent to hydrometallurgical recovery facilities, where chemical extraction techniques recover precious metals.
- Lower-value PCBs (with low metal content) are transferred to pyrometallurgical recovery facilities, where metals are extracted through smelting.

Each e-waste component is directed to a specialized recovery facility based on its material composition to maximize recycling efficiency while minimizing environmental and health hazards.

Aim and Objectives of the E-Waste Management Plan (EWMP)

The primary aim of the E-Waste Management Plan (EWMP) for the Geospatial Infrastructure for Sustainable Territorial Development (GISTD) Project in Uzbekistan is to establish and maintain a sustainable and integrated e-waste management system that is effective, efficient, and environmentally responsible. The plan ensures that e-waste generated by the project is managed in compliance with Uzbekistan's national laws, World Bank Environmental and Social Standards (ESS), Environmental, Health, and Safety Guidelines (EHSG), and Good International Industry Practices (GIIP).

The specific objectives of the EWMP are to:

1. Assess the type, nature, and estimated volume of waste that will be generated during the project lifecycle.
2. Identify potential environmental and health risks associated with e-waste generation at project sites.
3. Ensure compliance with Uzbekistan's legal framework, the World Bank's Environmental, Health, and Safety Guidelines (EHSG), and international best practices in waste management.
4. Enhance awareness and capacity building among project stakeholders, including government institutions, businesses, and local communities, on e-waste risks and sustainable management.
5. Develop policies, guidelines, and procedures for e-waste handling, disposal, and recycling that align with Uzbekistan's environmental policies and international commitments.

E-Waste Management Legal Framework, ESS, EHSG, and GIIP

13.1 Uzbekistan's E-Waste Legal Framework

The GISTD Project will strictly adhere to Uzbekistan's waste management regulations and policies, particularly those governing e-waste and hazardous waste. The legal framework for waste management in Uzbekistan is established by the State Committee for Ecology and Environmental Protection (SCEEP), which regulates waste disposal, recycling, and treatment.

The key national laws and regulations relevant to e-waste management in Uzbekistan include:

- Law on Waste Management (2002, last amended in 2018) – Governs the management, recycling, transportation, and disposal of all types of waste, including hazardous waste.
- Law on Environmental Protection (1992, amended in 2019) – Establishes environmental standards, compliance requirements, and penalties for improper waste handling.
- Cabinet of Ministers Decree No. 787 (2018) – Regulates the organization and efficiency of municipal solid waste (MSW) management, including electronic and hazardous waste.
- Sanitarian Rules and Norms (SanR&N 0127-02) – Specifies guidelines for the inventory, classification, storage, and disposal of industrial and household hazardous waste.
- Decree on Hazardous Waste Management (2014) – Requires special handling, certification, and disposal of hazardous electronic waste.

The project will work closely with Toza Hudud SUE, the national waste collection and disposal entity, to ensure safe transportation and proper disposal of e-waste.

Table 8. National Waste Management Laws and Regulations

Law/Regulation	Key Provisions
Law on Waste of the Republic of Uzbekistan (Latest Amendment: July 23, 2024)	Establishes the framework for waste collection, storage, transportation, processing, and disposal.
Presidential Decree No. DP-4291 (April 17, 2019)	Approves the "Strategy for Solid Waste Management in the Republic of Uzbekistan for 2019-2028," outlining objectives for waste minimization and environmental safety.
Presidential Decree No. PF-5863 (October 30, 2019)	Establishes the "Concept of Environmental Protection of the Republic of Uzbekistan until 2030," which includes waste management reforms.
Presidential Resolution PQ-4845 (September 29, 2020)	Introduces state-private partnerships for municipal waste management services.
Cabinet of Ministers Resolution No. 783 (November 25, 2024)	Implements environmental monitoring measures for industrial waste.
Draft Law on Strengthening Payment Discipline in Waste Management (2025)	Aims to improve fee collection for waste management services.

Table 9. Uzbekistan's participation in International Conventions and Agreements

Convention/Treaty	Key Provisions	Ratification Date	Date Uzbekistan Joined
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal	Regulates the international movement of hazardous waste.	22 December 1995 (accession)	7 May 1996
Stockholm Convention on Persistent Organic Pollutants	Aims to eliminate hazardous chemicals in waste management.	22 May 2001	8 May 2019
United Nations Framework Convention on Climate Change (UNFCCC)	Addresses climate-related impacts of waste disposal.	20 June 1993 (acceptance)	21 March 1994
Kyoto Protocol	Establishes guidelines for reducing waste-related greenhouse gas emissions.	20 August 1999	16 February 2005

13.1.1 Environmental and Social Standards (ESS)

The GISTD project will comply with the **World Bank's Environmental and Social Standards (ESS)**, particularly:

- **ESS 1: Assessment and Management of Environmental and Social Risks and Impacts** – Ensures that waste management practices minimize risks to human health and the environment.
- **ESS 3: Resource Efficiency and Pollution Prevention and Management** – Requires the project to prevent, minimize, and manage hazardous and non-hazardous waste in line with international best practices.
- **ESS 4**: **Community Health and Safety** – Ensures that projects identify and mitigate risks related to community exposure to hazardous materials, pollution, and project-related activities, including the safe management of waste to prevent adverse health and safety impacts.

Where possible, the project will prioritize **reuse, recycling, and recovery** of e-waste. If these options are not feasible, e-waste will be **treated, destroyed, or disposed of in licensed hazardous waste facilities** in compliance with **Uzbekistan's Environmental Management Regulations**.

13.1.2 World Bank Environmental, Health, and Safety Guidelines (EHSG)

The World Bank's EHSG promotes:

- Waste prevention by reducing unnecessary electronic purchases.
- Reuse and recycling to minimize e-waste generation.
- Proper segregation of hazardous and non-hazardous e-waste.
- Secure storage and record-keeping of hazardous waste.
- Safe collection, transport, and disposal in accordance with national and international environmental regulations.
- Regular monitoring and auditing of e-waste handling processes.

E-Waste Mitigation Measures and Management Plan

To minimize negative environmental and health impacts, the following e-waste mitigation measures will be implemented:

14.1 Procurement of High-Quality Electronic Items

- All electronic devices procured under the GISTD project must be sourced from reputable manufacturers and come with a clear date of manufacture, warranty, and quality assurance.
- Poor-quality, second-hand, or refurbished electronics will not be procured to prevent premature e-waste generation.
- Preference will be given to retailers offering take-back programs for old electronic devices.

14.2 Awareness and Sensitization

- **All staff using project-funded electronic devices** will undergo training on **proper disposal and e-waste recycling procedures**.
- Awareness campaigns will emphasize:
  - **The importance of recycling and safe disposal** of e-waste.
  - **The risks of improper e-waste disposal,** including **data security risks** from old computers and storage devices.

Environmental Health and Safety (EHS) Guidelines for E-Waste Management

15.1 General E-Waste Management

The GISTD project will develop an e-waste management system covering:

- Characterization of waste types (electronic, hazardous, recyclable).
- Collection, transportation, and disposal procedures.
- Risk-based prioritization of hazardous waste treatment.
- On-site waste storage and handling protocols.

15.2 E-Waste Prevention Strategies

To reduce e-waste generation, the project will implement the following measures across data centers, GNSS equipment in CORS stations, and IT infrastructure:

- Substitute hazardous materials with non-toxic alternatives in electronic procurement where possible. For example, selecting energy-efficient servers and networking equipment for data centers that contain fewer toxic substances such as lead (Pb) and mercury (Hg).
- Ensuring proper inventory control to avoid excessive or outdated purchases. This includes tracking GNSS receivers, antennas, and IT hardware to prevent early obsolescence and redundant procurement at CORS facilities.
- Implementing waste segregation measures to prevent hazardous e-waste contamination. In data centers, this includes separating lithium-ion UPS batteries, power supply units, and cooling system components from general waste streams. For GNSS equipment, old or damaged receivers, antennas, and power modules will be safely stored and assessed for reuse before disposal.
- Extending the lifecycle of equipment by prioritizing software upgrades and hardware maintenance for servers, storage devices, and GNSS components instead of premature replacement.
- Procuring durable IT and surveying equipment designed with modular components that can be replaced or upgraded individually instead of discarding entire systems.

15.3 Recycling and Reuse Strategies

- To minimize the environmental impact of e-waste, the project will:
- Identify and promote reuse of working electronics within project offices.
- Establish collection partnerships with licensed recyclers in Uzbekistan.
- Monitor waste generation trends and report on recycling progress.

15.4 Treatment and Disposal

If reuse and recycling are not possible, e-waste will be treated and disposed of safely, following Uzbekistan’s hazardous waste regulations. Options include:

- Chemical or physical treatment to neutralize hazardous materials.
- Licensed disposal facilities for hazardous components.
- Sanitary landfills with appropriate containment measures.

15.5 Hazardous E-Waste Management

- **Hazardous e-waste (**e.g., **batteries, PCBs, leaded glass)** will be **segregated from non-hazardous waste.**
- **Only licensed hazardous waste contractors** will be engaged for **transportation and disposal.**
- **Regular monitoring and compliance checks** will ensure adherence to environmental regulations.

Monitoring Plans and Activities

16.1 Special Considerations for Monitoring Activities

The **Geospatial Infrastructure for Sustainable Territorial Development (GISTD) Project** will establish a **robust monitoring framework** to oversee the management of hazardous and non-hazardous e-waste. The following monitoring activities will be conducted throughout the **project lifecycle** to ensure compliance with national laws, World Bank Environmental and Social Standards (ESS), and Good International Industry Practices (GIIP).

Key monitoring activities will include:

1. **Regular visual inspections** of all e-waste collection, storage, and disposal areas to check for leaks, improper handling, and compliance with labeling and segregation requirements.
2. **Structural integrity checks** for signs of cracks, corrosion, or damage to protective containers, storage floors, and safety barriers.
3. **Verification of security systems**, including locks and safety devices, to ensure restricted access to hazardous waste storage areas.
4. **Functional testing of emergency response systems** (e.g., fire extinguishers, alarms, and spill containment measures).
5. **Documentation of e-waste emissions** and integrity testing results.
6. **Regular tracking of e-waste volumes** and any significant changes in waste generation patterns.
7. **Audits of segregation and collection practices** to verify compliance with waste sorting guidelines.
8. **Monitoring trends in e-waste generation** across project facilities to ensure efficient management strategies.
9. **Characterization of e-waste** at the start of a new waste stream, with periodic reviews to document any changes in waste composition or disposal requirements.
10. **Maintaining waste shipment records**, including tracking e-waste movement from the source to final disposal.
11. **Auditing of third-party recycling and disposal services**, including on-site visits to verify environmentally sound waste management practices.
12. **Monitoring of soil quality** in areas where e-waste is stored or treated on-site, to detect any potential contamination.

Monitoring records for hazardous e-waste collected, stored, or transported will include:

1. Identification of materials and their chemical composition.
2. Physical state of the waste (solid, liquid, gaseous).
3. Quantity of e-waste generated (in kilograms, liters, or number of units).

4. Tracking records for e-waste shipments, including the date of dispatch, transporter details, and final disposal location.
5. Method of disposal (e.g., repacking, treatment, or recycling) with reference to corresponding waste manifests.
6. Storage locations and waste inventory data within project facilities.

Monitoring Roles and Responsibilities

The monitoring framework will assess the **success** of the **E-Waste Management Plan (EWMP)** by evaluating:

- **Whether interventions effectively mitigate environmental and social risks**
- **Whether additional corrective actions are required**
- **Whether monitoring efforts need to be expanded in specific project areas**

17.1 Role of the Cadastre Agency (Implementing Agency)

The Cadastre Agency, as the Implementing Agency of the GISTD Project, will be responsible for the overall monitoring and evaluation of the E-Waste Management Plan (EWMP). Monitoring activities will be conducted throughout the project lifecycle, and the agency will submit annual monitoring reports to the World Bank. Additionally, the Cadastre Agency will oversee training programs and capacity-building initiatives related to e-waste management.

17.2 Role of Project Offices

All **project offices** receiving **electronic devices (computers, printers, servers, cables, etc.)** under the GISTD Project will be responsible for:

- **Implementing the mitigation measures** outlined in the **E-Waste Management Plan**.
- **Conducting periodic internal reviews** to track compliance with waste management protocols.
- **Providing annual reports** to the **Project Implementation Unit (PIU)** on e-waste handling and disposal.

17.3 World Bank Monitoring and Supervision

The World Bank will provide additional oversight and compliance monitoring through periodic supervision missions. The Cadastre Agency will submit Semi-annual monitoring reports to the World Bank, which will be reviewed as part of the Bank's broader project evaluation framework.

Public Consultation Mechanism

To ensure transparent and inclusive waste management, the GISTD project will integrate stakeholder consultation and public engagement as a core component of the E-Waste Management Plan.

- Early and consistent stakeholder engagement will be conducted to ensure awareness and participation in waste management decisions.

- Key stakeholders, including government agencies, local communities, environmental organizations, and project workers, will be consulted on waste management policies and procedures.
- Training and awareness programs will be held for project personnel and contractors on e-waste risks, handling procedures, and regulatory compliance.

18.1 Information Dissemination Channels

To facilitate effective public outreach, multiple communication channels will be utilized:

- Press releases and official announcements
- Public workshops and stakeholder meetings
- Online platforms, social media, and project websites
- Printed materials such as brochures and posters
- Local radio and television broadcasts

The public consultation process will be continuous, ensuring that local stakeholders have opportunities to voice concerns and participate in decision-making throughout the project lifecycle.

Grievance Redress Mechanism (GRM)

- The GISTD Project will establish a Grievance Redress Mechanism (GRM) to handle complaints related to waste management, environmental concerns, and community impacts.
- The GRM will be aligned with the World Bank's Environmental and Social Standard 10 (ESS10) on stakeholder engagement.
- A dedicated grievance resolution team will manage complaints, track responses, and ensure transparency.
- Complaints may be submitted through multiple channels, including:
    - Locked suggestion/complaint boxes at project sites.
    - Dedicated online portals on the Cadastre Agency's website.
    - Phone hotlines and email submission options.
- Anonymous complaints will be accepted, but follow-up responses may not be possible.

E-Waste Management Matrix

Table 10. E-Waste Management Matrix

Issue	Potential Impact	Mitigation Measures	Monitoring Indicators	Responsible Party
Component A: Establishment of Three Data Centers and IT Infrastructure for UZ-NSDI	- Generation of obsolete servers, storage devices, and networking equipment from upgrading data centers. - Risk of improper	- Conduct inventory of all existing equipment before procurement. - Ensure old IT equipment is reused,	- Number of obsolete IT equipment units collected and properly disposed of. - Availability of Toza Hudud	-PIU - Toza Hudud SUE - Data Center Managers

	disposal of e-waste leading to environmental contamination.	refurbished, or recycled where possible. - Engage Toza Hudud SUE for proper collection, transportation, and disposal of electronic waste. - Establish secure e-waste collection points at each data center. - Secure data erasure from decommissioned IT devices before disposal.	disposal certificates. - Implementation of data security measures for decommissioned devices.	
Component B: Procurement and Installation of GNSS Equipment in Existing and New CORS Stations	- Generation of obsolete GNSS equipment, cables, and accessories during upgrades. - Potential informal disposal of old GNSS equipment, increasing e-waste pollution.	- Conduct e-waste inventory before procurement to determine reusability. - Establish dedicated e-waste collection points at existing and new CORS sites. - Partner with Toza Hudud SUE for transportation and disposal. - Require contractors to document waste disposal and recycling activities.	- Number of obsolete GNSS equipment properly disposed of. - Availability of collection points at CORS stations. - Records of e-waste tracking and disposal reports.	- PIU - Toza Hudud SUE - CORS Facility Managers
Component B: Enhancement of the Registry-Cadastre System (UzKAD) and Digital Data Collection Tools	- Increased e-waste from old IT and surveying equipment used in data collection. - Risk of poor e-waste segregation and contamination with hazardous materials.	- Ensure proper segregation of hazardous e-waste (e.g., batteries, circuit boards). - Establish dedicated disposal procedures for old IT and surveying devices. - Train field data collection teams	- Number of surveying devices safely decommissioned. - Number of staff trained on e-waste handling. - Use of licensed recycling or disposal facilities.	- PIU - Surveying & Data Collection Teams - Toza Hudud SUE

		on safe e-waste handling and disposal.		
Component B: Inventory and Field Data Collection for the National Address Register, Utility Cadastre, and 3D City Model	- Generation of used electronic tablets, GPS devices, and laptops after project phases. - Risk of discarding non-functional devices in municipal waste.	- Establish a reuse and donation program for still-functional devices. - Collect and store all e-waste at designated disposal points. - Ensure secure data deletion from used electronic devices.	- Number of devices reused or donated. - Percentage of collected e-waste sent to licensed facilities. - Secure data deletion certificates for sensitive devices.	- PIU - IT and GIS Specialists - Toza Hudud SUE
Component C: Institutional Capacity Building and Project Management	- Need for staff training on e-waste management best practices. - Lack of awareness on proper disposal and recycling options.	- Conduct training and awareness campaigns for PIU, data center staff, and CORS facility managers. - Integrate e-waste management modules into training programs. - Provide guidelines and manuals on safe e-waste handling and disposal.	- Number of training sessions conducted. - Percentage of staff trained on e-waste management. - Distribution of e-waste management guidelines.	- PIU - Training & Awareness Teams - Environmental Safeguards Specialist