GEF-8 Program Framework Document (PFD)

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General Project Information

Project Title	
Global Electronics Management (GEM) Program	
Country(ies)	**GEF Program ID**
Global Philippines Türkiye Peru Cambodia Colombia Kazakhstan Viet Nam Djibouti Ethiopia Somalia Botswana Eswatini Lesotho Mozambique Namibia South Africa	11553
GEF Agency(ies)	**GEF Agency ID**
UNIDO	
Other GEF Agenc(ies):	**Submission Date**
AfDB UNDP UNEP	3/20/2024
Type of Trust Fund	
GET	
Anticipated Program Executing Entity(s):	**Anticipated Program Executing Partner Type(s):**
Philippines: To be determined during the PPG Turkiye: Ministry of Environment, Urbanisation and Climate Change Peru: To be determined during the PPG	CSO Government Others

Cambodia: Ministry of Environment Colombia: Ministry of Envionrment and Sustainable Development (Ministerio de Ambiente y Desarrollo Sostenible, MADS) Vietnam: Ministry of Natural Resources and Environment Regional SADC: Africa Institute Kazakhstan: Cooperation for Sustainable Development (CSD) Center Djibouti: Ministry of Environment and Sustainable Development and The Intergovernmental Authority on Development (IGAD) in Eastern Africa Ethiopia: FDRE Environmental Protection Authority (EPA) Somalia: Ministry of Environment and Climate Change of Somalia and the Intergovernmental Authority on Development (IGAD)1	Government Government Government CSO CSO Government Government Government
Sector (Only for Programs on CC):	Project Duration (Months): 72
GEF Focal Area (s) Chemicals and Waste	Program Commitment Deadline:

Taxonomy

Focal Areas, Chemicals and Waste, Disposal, Persistent Organic Pollutants, New Persistent Organic Pollutants, Waste Management, Hazardous Waste Management, eWaste, Sound Management of chemicals and waste, Best Available Technology / Best Environmental Practices, Open Burning, Convene multi-stakeholder alliances, Influencing models, Transform policy and regulatory environments, Demonstrate innovative approache, Strengthen institutional capacity and decision-making, Stakeholders, Communications, Awareness Raising, Strategic Communications, Education, Public Campaigns, Behavior change, Private Sector, Large corporations, SMEs, Financial intermediaries and market facilitators, Local Communities, Civil Society, Community Based Organization, Non-Governmental Organization, Academia, Type of Engagement, Participation, Partnership, Consultation, Information Dissemination, Beneficiaries, Gender results areas, Gender Equality, Participation and leadership, Capacity Development, Knowledge Generation and Exchange, Gender Mainstreaming, Gender-sensitive indicators, Women groups, Sex-disaggregated indicators, Capacity, Knowledge and Research, Knowledge Generation, Seminar, Training, Course, Workshop, Learning, Innovation, Knowledge Exchange, Exhibit, Conference, Field Visit, South-South

GEF Program Financing (a) 60,000,000.00	PPG Amount: (c) 1,733,487.00
Agency Fee(s): (b) 5,400,000.00	PPG Agency Fee(s): (d) 156,013.00
Total GEF Project Financing: (a+b+c+d)	Total Co-financing

67,289,500.00	364,225,000.00

Project Tags

CBIT: No SGP: No

Program:

Other Program

Program Summary

Provide a brief summary description of the program, including: (i) what is the problem and issues to be addressed? (ii) what are the program objectives, and how will the program promote transformational change? iii) how will this be achieved (approach to deliver on objectives), and (iv) what are the GEBs and other key expected results. The purpose of the summary is to provide a short, coherent summary for readers. The explanation and justification of the program should be in section B "program description". (max. 250 words, approximately 1/2 page)

1. The Global Electronics Management (GEM) Program aims to significantly reduce the generation of electronic wastes (e-wastes) and increase circularity and resource recovery in the electronics sector of developing countries, through the creation of an enabling environment, including access to finance, technology and policy and legislative change that fosters responsible electronics management.

2. GEM is envisaged to catalyze the transition from environmentally unsound practices within the electronics value chain towards a cleaner, more sustainable and resource-efficient supply chain and lifecycle. With the global electronics market increasingly reliant on digitalization and modern conveniences, the program systematically addresses the substantial environmental impacts associated with this sector, including resource depletion, chemical pollution, and greenhouse gas (GHG) emissions. Embracing an inclusive value-chain approach, GEM seeks to foster cleaner production methods and promote sustainable consumption patterns along the entire lifecycle of products, from design to re-use. This encompasses reducing hazardous chemicals in production processes, innovating designs for resource and energy-efficient electronic components and products and establishing markets for durable and repairable goods. Furthermore, GEM aims to cultivate a resource-efficient value chain by facilitating the reuse, repair, and material recycling of valuable electronic components, while mitigating hazardous waste streams through environmentally sound resource recovery initiatives. Achieving transformational change in the electronics industry will be incentivized through policies and fostering multi-stakeholder cooperation, demonstrating customized strategies to replace resource-intensive processes and materials with more sustainable alternatives and creating a more circular and transparent value chain.

3. The program expects to achieve significant Global Environmental Benefits (GEBs) through upstream measures, including extending the life of Information and Communication Technology (ICT) equipment through better design, facilitated repair, increasing the reuse of functional components, preventing the manufacturing, import, and placing on the market of equipment containing POPs and mercury. GEM also includes downstream initiatives aimed at segregating POPs waste from the overall e-waste stream, environmentally safe management of such waste, and safe processing of e-waste to ensure the recovery of valuable metals and other materials. The project also intends to boost the after-sale services business in the ICT sector by promoting the transition from informal (or semi-formal) to formal status of several small repair shops, through cooperation with local and global ICT manufacturers and retailers, thereby creating a significant number of qualified job positions in the sector. Overall, the project expects to achieve a GHG avoidance of 109 thousand tonnes (Mt), prevent or environmentally safely dispose of around 125 thousand Mt of hazardous waste containing POPs, mercury, lead, and medium-chained chlorinated paraffins (MCCP), dispose of 52 kg of mercury through environmentally sound management, and avoid 33gTeq of U-POPs over the project duration. The project envisages the anticipated avoidance or environmentally sound management of around 481 Mt of

waste containing medium chain chlorinated paraffins, which are a class of substances with POPs features, currently a candidate for listing under Annex A of the Stockholm Convention.

Indicative Program Overview

Program Objective

To significantly reduce the generation of electronic waste and increase circularity and resource recovery in the electronics sector of developing countries, through the creation of an enabling environment, including access to finance, technology and policy and legislative change that fosters responsible electronics management.

Program Components

C1 Enabling Policies on Circular Electronics

Component Type	Trust Fund
Technical Assistance	GET
GEF Program Financing ($)	Co-financing ($)
8,485,000.00	51,430,000.00

Program Outcome:

Outcome 1.1 National or city level strategies and regulations for circular electronics value chain developed.

Outcome 1.2 Policies and incentive mechanisms in place to support circular electronics value chain.

2. Cleaner production and sustainable consumption and use

Component Type	Trust Fund
Investment	GET
GEF Program Financing ($)	Co-financing ($)
10,480,000.00	86,020,000.00

Program Outcome:

Outcome 2.1 Innovative and resource/energy efficient electronic components (parts) and products designed, manufactured, or placed on the market.

Outcome 2.2 Markets for innovative products and behavior change away from unnecessary consumption and toward increased longevity.

3. Resource-efficient value chain across the electronics sector

Component Type	Trust Fund
Investment	GET
GEF Program Financing ($)	Co-financing ($)
24,067,000.00	170,630,000.00

Program Outcome:

Outcome 3.1. Mechanisms to maximize reuse, repair and material recycling put in place.

Outcome 3.2. Hazardous waste streams in the electronics sector removed from the value chain

C4: Knowledge Management, Communication, Program-level Coordination

Component Type	Trust Fund
Technical Assistance	GET
GEF Program Financing ($)	Co-financing ($)
12,349,250.00	35,819,000.00

Program Outcome:

Outcome 4.1 Knowledge Management platform established to support sharing and learning, capacity building, awareness raising among various stakeholders to achieve sectoral transformation taking into consideration gender responsive actions.

Outcome 4.2 Coordination and linkages amongst the relevant global and national stakeholders and platforms established

M&E

Component Type	Trust Fund
Technical Assistance	GET
GEF Program Financing ($)	Co-financing ($)
1,820,750.00	7,186,000.00

Program Outcome:

Accountability and adaptive management to track and maximize program results ensured, including gender and environmental safeguards.

Component Balances

Project Components	GEF Project Financing ($)	Co-financing ($)
C1 Enabling Policies on Circular Electronics	8,485,000.00	51,430,000.00
2. Cleaner production and sustainable consumption and use	10,480,000.00	86,020,000.00
3. Resource-efficient value chain across the electronics sector	24,067,000.00	170,630,000.00
C4: Knowledge Management, Communication, Program-level Coordination	12,349,250.00	35,819,000.00

M&E	1,820,750.00	7,186,000.00
Subtotal	**57,202,000.00**	**351,085,000.00**
Project Management Cost	2,798,000.00	13,140,000.00
Total Project Cost ($)	**60,000,000.00**	**364,225,000.00**

Please provide Justification

PROGRAM OUTLINE

A. PROGRAM RATIONALE

Briefly describe the current situation: the global environmental problems that the program will address, the key elements and underlying drivers of environmental change to be targeted, and the urgency to transform associated systems in line with the GEF-8 Programming Directions document. Describe the overall objective of the program, and the justification for it. (Approximately 3-5 pages) see guidance here

Global environmental problems associated with the electronics sector

4. The electronics sector, while driving unprecedented technological innovation and societal progress, is also at the forefront of pressing global environmental concerns. From the extraction of raw materials to the disposal of electronic waste, the industry's operations have far-reaching environmental implications. Key issues include the depletion of finite resources, the release of hazardous chemicals into the environment, and the generation of electronic waste at unprecedented rates. These challenges not only exacerbate global environmental degradation but also contribute to social and economic inequities, particularly in developing nations where electronic waste often ends up. Thus, understanding and addressing the environmental problems associated with the electronics sector is imperative for fostering a sustainable future for both humanity and the planet. The following environmental problems will be addressed through the GEM program:

Table 1: Global environmental problems along the electronics value chain

E-waste generation and resource valuation	The production, use and end-of-life treatment of electronics have many unintended environmental and social consequences. Electronic waste – commonly referred to as e-waste – is discarded electronic devices and their parts, including with a battery or plug, that are no longer wanted (i.e., no longer satisfies the user for its intended purpose), not functional, or obsolete. Typical sources of e-waste are households; business users including government departments, public and private sectors, and business process outsourcing (BPO) industries; manufacturers and retailers of personal computers (PCs), integrated circuit (IC) chips, motherboards, cathode ray tubes (CRTs), and a variety of peripheral goods; and e-waste imports (Jain, Muskan, et. al., 2023).
Climate impact	Like any large industry, the electronics sector emits considerable amounts of GHGs contributing to climate change. Estimates of the contribution of digital technologies to climate change suggest a

	range of 1.4%–5.9% of global GHG emissions, of which ~31% is contributed by digital devices such as smartphones, desktops, displays, and netbooks. The embodied carbon footprint of new electronic products, especially ICT devices is due to mineral mining, manufacturing, and value chain transportation. It was estimated that between 2014 and 2020, embodied GHG emissions from selected e-waste generated from ICT devices increased by 53%, with 580 million tCO2e emitted in 2020. Flat-screen TVs had the highest emissions, accounting for about 41% of total emissions, followed by laptops and tablets, flat-screen computer monitors, desktop computers, mobile phones, computer accessories, printers, and gaming consoles. At business-as-usual, emissions will increase to ~852 million tCO2e annually by 2030 (Singh and Ogunseitan, 2022).
Environment and socio-economic impacts	The fate of 82.6% (44.3 Mt) of e-waste generated in 2019 is uncertain, and its whereabouts and the environmental impact varies across different regions. Even in high income countries where waste recycling infrastructures have been developed, around 8% of the e-waste is discarded in waste bins and subsequently landfilled or incinerated. This is mostly comprised of small equipment and small IT. Products that can still be refurbished and reused are usually shipped as second-hand products to low- or middle-income countries. Estimates on transboundary movements range from 7-20% of the e-waste generated (Forti, V. et al., 2020). In middle- and low-income countries, the informal sector plays a significant recovery role albeit under inferior conditions, causing severe health effects to workers and children living near the facilities, as E-waste contains toxicants such as heavy metals and POPs, which may be released during e-waste processing and disposal.

5. E-waste generation and resource valuation. According to the Global E-waste Monitor 2020, an estimated 53.6 million Mt of e-waste was generated worldwide in 2019 averaging 7.3 kilograms of e-waste per capita. Raw materials from e-waste generated is valued at USD 57 billion attributed primarily to iron, copper, silver, gold, and palladium. Most of the e-waste in 2019 is generated in Asia, 24.9 Mt with 5.6 kg/capita, followed by Americas 13.1 Mt (13.3 kg/capita), Europe 12 Mt (16.2 kg/capita), Africa 2.9 Mt (2.5 kg/capita) and Oceania 0.7 Mt with 16.1 kg/capita, respectively. ICT devices such as screens and monitors and small IT and telecommunication equipment categories of electrical and electronic equipment yield a combined e-waste of about 21.3% of the total e-waste generated in 2019 (Forti, V. et al., 2020).

6. Rapidly advancing technologies and incremental introduction of technical innovations, rising consumer demand for electronics, shorter product life cycles (including planned obsolescence and limited repair options), and restrictive policies and regulations regarding options to repair and refurbish have made e-waste one of the fastest-growing waste streams in the world (Forti, V. et al., 2020; Chen & Ogunseitan, 2021). The amount of e-waste generated worldwide increased three times faster than the world's population.

7. In 2019, the formal documented collection and recycling was 9.3 Mt or 17.4% of e-waste generated with valuation of USD 10 billion worth of raw materials recovered in an environmentally sound way. Statistics show that in 2019, the continent with the highest collection and recycling rate was Europe with 42.5%, Asia ranked second at 11.7%, the Americas and Oceania were similar at 9.4% and 8.8%, respectively, and Africa had the lowest rate at 0.9%. Although recycling grew 1.8 Mt since 2014, an annual growth of almost 0.4 Mt, the total e-waste generation increased by 9.2 Mt, with an annual growth of almost 2 Mt (or about 3 to 4%), demonstrating that recycling activities are not keeping pace with the global growth of e-waste. (Forti, V. et al., 2020).

8. The electronics industry also faces economic challenges, including shortages of indispensable materials. Based on 2019 data, the demand of iron, aluminum, and copper to produce new electronics was approximately 39 Mt. Even if all these metals were to be recovered from e-waste (25 Mt), the world would still require about 14 Mt of iron, aluminum, and copper from primary resources (11.6 Mt, 1.4 Mt, and 0.8 Mt, respectively). Furthermore, embedded in 1 million mobile phones are 24 kg of gold, 16,000 kg of copper, 350 kg of silver, and 14 kg of palladium, which are valuable resources that could be recovered, reused in manufacturing, and avoid the need to mine new materials, translating to reducing GHG emissions (WEEE Forum, 2021). Although recycling of valuable mineral from e-waste may be more convenient than mining, this option is still largely unexploited. When e-waste is not properly managed, their content of hazardous substances prevents their recycling, turning them into an environmental and health threat rather than resources.

9. Climate impacts. Increasing the useful lifespan expectancy of electronic devices by 50%–100% can mitigate up to half of the total GHG emissions. Such outcomes will require coordination of eco-design and source reduction, repair, refurbishment, and reuse. These strategies can be a key to efforts towards climate neutrality for the electronics industry, which is currently among the top eight sectors accounting for more than 50% of the global carbon footprint (Singh and Ogunseitan, 2022).

10. On the bright side, a European study found that despite the exponential increase in data traffic and ICT product performances, the energy efficiency of ICT-related products increased thus reducing electricity use on average by 1.7% annually. The efficiency improvement may be attributable to the density of transistor chips doubling every 2-3 years as well as improvements in light-emitting diode (LED) backlight efficiency, solid state data storage, artificial intelligence (AI) and machine-learning (ML) in servers and switches, full optical fiber in data networks, increased speed in satellite communication, green power purchasing and waste heat recovery by data centers, energy saving communication protocols for people and the Internet-of-Things (IoT) (Kemna, Renee, et. al., 2020).

11. Environment and socio-economic impacts. A considerable amount of e-waste is still exported illegally or mis-declared. The uncontrolled e-waste transboundary movement the prevalence of informal recycling is driven primarily by relatively cheap labor and lack of safety environmental standards for pollution control in recipient countries (Shittu et al., 2021). The incentives for informal workers to enter the e-waste recycling sector are related to the high profits in commercializing devices or components or reuse and recycling, combined with the low level of investment needed to participate in this trade. Overall, the markets for second-hand electrical devices and secondary raw materials deriving from these devices are significantly more profitable than the conventional recyclables from solid waste. At the same time, this trade has low entry barriers and is accessible to non-skilled workers (ILO, 2014).

12. Electronic items contain many different toxic substances. While users are unlikely to have contact with these substances while the items are in use, these toxicants can be released into the environment if E-waste are unsafely disposed or recycled.

Persistent Organic Pollutants (POPs), mercury, and other chemicals of concern in ICT.

13. Although e-waste constitutes around 2% to 5% of total solid volume generation, it contributes more than 70% in terms of toxicity. Several chemicals used in the manufacturing of ICT equipment, while posing minimal risk to users due to their low concentration, become significant environmental concerns if the equipment is improperly dismantled or disposed of at the end of its life cycle. These chemicals encompass toxic metals such as mercury (Hg), lead (Pb), chromium (Cr), beryllium (Be), palladium (Pd), and gallium (Ga). Additionally, they include Persistent Organic Pollutants (POPs) such as various brominated flame retardants, (including PBDEs), as well as chemicals which have been proposed as candidate substances under the Stockholm Convention, such as MCCP, used as plasticizers or flame retardants in PVC cables, because of their POP-like characteristics. The constituents of MCCPs are highly toxic to aquatic invertebrates and mammalian wildlife in the environment (SC, 2024b).

14. Moreover, inadequate management of e-waste, or the extraction of valuable metals like gold, silver, and platinum from e-waste through unsafe processes, can generate other hazardous chemicals such as Unintentional Persistent Organic Pollutants (U-POPs) like dioxins and furans, Polycyclic Aromatic Hydrocarbons (PAHs), and fine particulate matter. Releases of U-POPs can be avoided or reduced through several project activities: (a) By avoiding the open burning of e-waste through upstream reduction of e-waste generation; (b) by reusing computer components to prevent them from entering the waste cycle; (c) by recycling metals from e-waste using Best Available Techniques or Best Environmental Practices (BAT/BEP) technologies (in-country or abroad); or (d) by managing polyvinyl chloride (PVC) cable waste through environmentally sound management.

15. The downside of the unprecedented penetration of ICTs is exemplified by the risk of toxic e-waste exposure to approximately 30 million people across 32 cities listed as e-waste recycling centers in 15 countries. Among the exposed population, approximately 5.8 million are younger than 18, and around 6.1 million are women of childbearing age (15 to 49) (Singh and Ogunseitan, 2022). E-waste disproportionately burdens women, affecting their mortality, morbidity, fertility, and the development of their children. Lacking institutional support and representation, women and children are denied adequate safety equipment, health precautions, and health insurance (McAllister et al., 2014).

System description of the electronics value chain

16. Electronics have become indispensable in modern societies and the digital world – integrated in everyday household use, transport, energy supply, health, and security systems. Electronic products can be categorized into large and small household appliances, ICT equipment, consumer equipment and photovoltaic panels, lighting equipment, electrical and electronic tools, toys, leisure and sports equipment, medical devices monitoring and control instruments and automatic dispensers. Demand grows as most companies across the world combine digital infrastructure such as servers with new technologies like artificial intelligence or block-chain to enable completely new products, services, and business models.

17. The global electronics market size is valued at USD 1.5 trillion in 2022 and expected to reach USD 2.1 trillion by 2028. Among the different categories, major appliances contributed the most to the revenue share, generating around USD 440 billion in revenue in 2022. Similarly, increase in ICT production and consumption has not only enhanced social connectivity but has also facilitated access to various services, including banking, home delivery, and geo-referenced services. In 2021, the total number of mobile devices in operation worldwide reached 14.9 billion with 7.1 billion mobile users or 2.10 mobile device per business user; it is predicted that these numbers will further rise to 18.2 billion units at 2.43 devices per user by 2025 (Radicati, 2021; Laricchia, 2023).

18. The electronics industry is comprised of three main groups of actors: (i) lead firms; (ii) tier 1 companies consisting of contract manufacturers, which may be engaged in electronic manufacturing services (EMS)

and/or original design manufacturing (ODM); and (iii) tier 2 and 3 companies made up mainly of component suppliers. Lead firms outsource non-core activities to contract manufacturers and specialize in their core competencies (e.g., product development, consumer research, branding, and marketing), which are also the most profitable segments of the chain. Most lead firms based in European countries, Japan, the United States and China. The value of China's electronics industry in 2020- reached nearly USD 350 billion, which was about 25% of the global assembly value. China is the largest exporter of electronics products in the world, especially portable computers, and mobile phones (ILO, EU, and OECD, 2022).

19. Traditionally dominated by vertically integrated firms, the electronics sector moved towards modular industry structures thanks to standardization of the components required to produce electronic goods. Under a modular production, assembly operations can easily be separated from technology development and basic, high-volume components can easily be outsourced throughout the value chain as firms seek to lower costs (Duke CGGC, 2016).

20. The electronics sector employed 17.43 million workers in 2021 (IbisWorld, 2021). About 80% to 85% of the workers in the sector isare in the assembly line processes. Most of the assembly line workers are women while male workers are generally assigned in fabrication and maintenance related tasks. Men generally occupy higher and better paid positions while women earn on average 16 % less than their male colleagues (Villadiego, 2017).

21. As it makes lives more convenient and work more efficient, increased production and use of electronics especially ICT products is further driven by higher levels of disposable incomes, urbanization, mobility, industrialization, and rights to communication and access to information. Therefore, it is crucial to acknowledge the environmental challenges associated with the entire lifecycle of electronics, from raw material extraction and manufacturing to consumer choices and use, and up to end-of-life management and chemicals management. As critical as electronics are to society, so is the challenge to make the steadily growing industry more sustainable.

Key system drivers and opportunities for a green trajectory

The main system drivers of the electronics sector may be categorized into technological, economy and marketing strategies, regulatory-political, and social.

22. Technological. Electronics is undoubtedly one of the most technology-driven sectors, profoundly transforming societies through pervasive connectivity and the availability of technological solutions. Technology innovation is most conspicuous in the ICT sectors, for example the IoT and 5G network will push forward the development of innovative products. However, developments are still primarily oriented toward satisfying consumers and ensuring a competitive advantage for manufacturers rather than promoting higher environmental sustainability. The rate at which new products with programmed obsolescence features are made available to consumers has a profound social and environmental impact, which should be communicated effectively to the consuming public – an area of opportunity for the GEM Program to support. In other cases, consumers who are aware of the cost-effectiveness of durable products even with higher upfront costs may be limited by the availability of such products in their local market. The impact of digital divide that prevents people's access to efficient and sustainable products could be mitigated by facilitating entry of long-lifespan electronics into the market through policy issuances against planned obsolescence, favoring products with embedded right-to-repair provisions or mandating greater producer responsibility.

23. Economy and Marketing Strategies. The complexity of electronic products and the manufacturing chains have led to a high concentration of power within the electronics sector, primarily in the hands of a few global players. The value chain of these large manufacturers is often dispersed among several countries and any effort to promote a more sustainable electronics economy must be global in scope. The GEM

Program, primarily through the global coordination team, would have to involve these players and these since the design and innovation phase predominantly occurs where the big brands' headquarters reside. They often hold the intellectual property rights, shaping the product's core features and overall market appeal. They can leverage advanced technological infrastructure, skilled labor, and significant R&D investments to conceptualize, design, and engineer electronic products. They can influence demand for better products and service models from mostly developing countries, which often host manufacturing and assembly lines. Through the child projects in developing countries, GEM can influence the hubs where the physical creation of these electronic products takes place. Trade and product quality standards could also be established, especially to limit electronics of poor quality and with planned obsolescence being imported by developing countries.

24. Use of Big Data and consumer behavior. While major manufacturers and exporters could collect consumer data, influence consumption patterns, and employ aggressive marketing strategies resulting in excessive turnovers of electronic products, they also have the power to encourage more sustainable consumer behavior. Depending on the situation and levels of control of each country in the electronics value chain, transformational shifts can be achieved by the GEM Program through effective governmental regulations, increased accountability of the supplier of raw materials or electronic parts and products, incentivizing circular economy initiatives, and a better understanding of the consumers' motivational drivers to adopt a more sustainable electronic consumption behavior.

25. E-waste Regulations and Trade. According to the Global E-waste Monitor as of October 2019, only 71% of the world's population, or less than half of all countries, had a national e-waste policy, legislation, or regulation in place (Forti, et al., 2020). In many cases, this legislation remains at the strategy stage and lacks secondary norms for implementation and a clear strategy for enforcement. Globally, there is a pressing need to increase the number of countries with Extended Producer Responsibility (EPR) regulations, not just for the major players but also for mass producers of short-lived electronic products, parts, and accessories. There is an opportunity for the GEM Program to improve the management at the end-of-life stage of electronic products, such as e-waste collection systems, dismantling, and upgraded recycling capacities, which are currently not properly regulated or enforced in many countries.

26. Social. The social drivers of the electronics industry are diverse. Consumer electronics serve as solutions to connectivity needs, work tools, entertainment gadgets, life-saving equipment, and devices to enhance the quality of life. Therefore, access to electronic devices should be considered an unalienable right. However, technological addiction and compulsive shopping, prevalent among teenagers but affecting all generations, represent another aspect of the social impact of the electronics sector. This, in turn, contributes significantly to environmental issues, as many discarded devices remain perfectly functional. On the end-of-life side, entire communities of informal waste pickers and informal repairers rely on the collection of discarded products, while formal repairers face higher costs, scarce availability of spare parts, and regulatory complexity. Many informal e-waste workers likewise earn a living in unsafe workplaces that recover secondary materials from discarded electronics but have little choice as this trade has low entry barriers and is accessible to non-skilled workers. Specifically, e-waste management burdens women - disproportionately affecting their mortality/morbidity and fertility and the development of their children.

Gender dimension of the electronics sector

27. Gender is a critical component of the global electronics sector as 60 - 65% of its workforce are women. In Vietnam, 80% of workers in the electronics industry are women who are working in the assembly lines (IPEN, 2024). In India, 70% of the 1.2M workforce are women. Based on the data gathered from electronics manufacturers (INTEL, 2023), women in leadership position comprise 18-30% of the total workforce while for non-technical position it is 55 to 58%. The table below shows the global data on the positions of women at Intel.

Table 2: Positions held by women at Intel, Global Data

Positions	2020, in %	2021, in %	2022, in %
Board of Directors	30	30	33.0
Executives	20.7	20.7	18.9
Senior Leadership	18.8	18.6	18.9
Senior	21.3	21.7	22.6
Experienced	30.4	31.3	32
Entry level	37.9	36.5	36.5
All Global Employees	27.8	27.7	28.1
Technical	25.2	24.3	24.7
Non-Technical	57.7	54.4	55.2

28. Apple employs around 3 million people in the 52 countries that it operates. Women comprise 47%, 58%, and 34% in open leadership, retail leadership, and R&D leadership roles respectively. Integrated Microelectronics Incorporated (IMI) operates 20 manufacturing facilities in 10 countries, with a total of 14,076 employees, out of which 60% are women, whilst only one out of the 13 members of the board is a woman. Apple, Intel, and IMI report a gender pay ratio of 1:1.

29. However, in the electronics sector, the gender issue presents itself with multifaceted dimensions. The complexity of the gender dimension in the electronics sector mirrors the intricate nature of its value chain. The data above mostly represent the situation of sex disparity in the strategic areas of management, marketing, manufacturing, and R&D. While these figures illustrate progress in some areas, they also underscore persistent challenges in achieving gender parity, particularly in leadership and technical roles.

30. These disparities are not solely attributable to the industry but likely reflect existing gender imbalances within the broader society. Despite strides towards gender diversity and inclusion, women continue to face barriers to advancement and representation in these critical sectors, contributing to a persistent gender gap.

31. In critical areas such as material sourcing, notably in mining of critical minerals, and e-waste management, women experience a distinct set of challenges. These challenges include wage disparity, heightened exposure to hazardous chemicals, and pervasive discrimination. Women engaged in these segments often endure harsh working conditions and are disproportionately affected by the environmental and health hazards associated with the electronic industry's value chain. Material sourcing and e-waste management, particularly in developing countries, are dominated by the informal sector, further exacerbating the vulnerabilities faced by women in these roles.

32. These are the issues that the GEM Program intends to address: provide fair opportunities for the participation of women in the work force particularly in decision-making, improved working conditions and reduced exposure to hazardous chemicals, and overall advancement in any segment of the electronics value.

Barriers to advance towards a more circular and resource-efficient electronics value-chain

33. This intricate web of dynamics within the electronics sector underscores the multifaceted nature of its value chain, requiring comprehensive approaches to address the various facets of the challenges imbedded in the sector. Overall, the barriers to be overcome by GEM Program to advance circular electronics and achieve resource-efficient management of electronics wastes include:

- Fragmented policies specifically focused on electronic waste management at national and local levels as well as resistance to the introduction of new electronics lifespan standards, producer responsibility or right to repair.;
- Unavailability or lack of access to alternative materials or suitable cleaner technologies needed for the manufacture of electronic parts or assembly of electronic products.;
- Aggressive marketing campaigns and current consumer culture that patronize newly released models of ICT devices such as mobile phones, rendering mostly perfectly functional units unwanted and discarded.;
- Lack or limited infrastructure, business models and best available technologies and best environmental practices (BAT/BEP) capacities to track, collect, separate, recover, and recycle valuable electronic components in a formal, safe, and environmentally sound manner.; and
- Lack of platforms for regional and global platforms for regional cooperation and best practices sharing not just on e-waste management but on circular and resource-efficient electronics management along the value-chain.
- The prevalence of gender stereotypes and biases perpetuating unequal opportunities and representation across various roles and levels within the industry hindering sex parity across the value chain.
- The presence of hazardous chemicals including POPs, toxic metals, and others may hinder the recycling of materials derived from e-waste, and unavailability of final disposal capacity of the separated hazardous waste.

Objective of the program

34. The proposed global program aims to significantly reduce the production of electronic waste and increase circularity and resource recovery in the electronics sector of developing countries, through the creation of an enabling environment, including access to finance, technology and policy and legislative change that fosters responsible electronics management. By leveraging transformative change at global scale and applying systems thinking, the value chain will be transitioned toward sustainable consumption and production, including the reduction of hazardous chemicals. Based on the Circular Electronics System (Figure 1), the components and outcomes of this program aim to contribute to various stages or levels of the electronics value chain. In this term, a product is considered circular only if the following three attributes apply (CEP, 2022):

1. The product is made from verified circular resources;
2. The product is designed for use-phase optimization and material recovery;
3. The product's use phase is optimized, and materials are recovered at end of life.

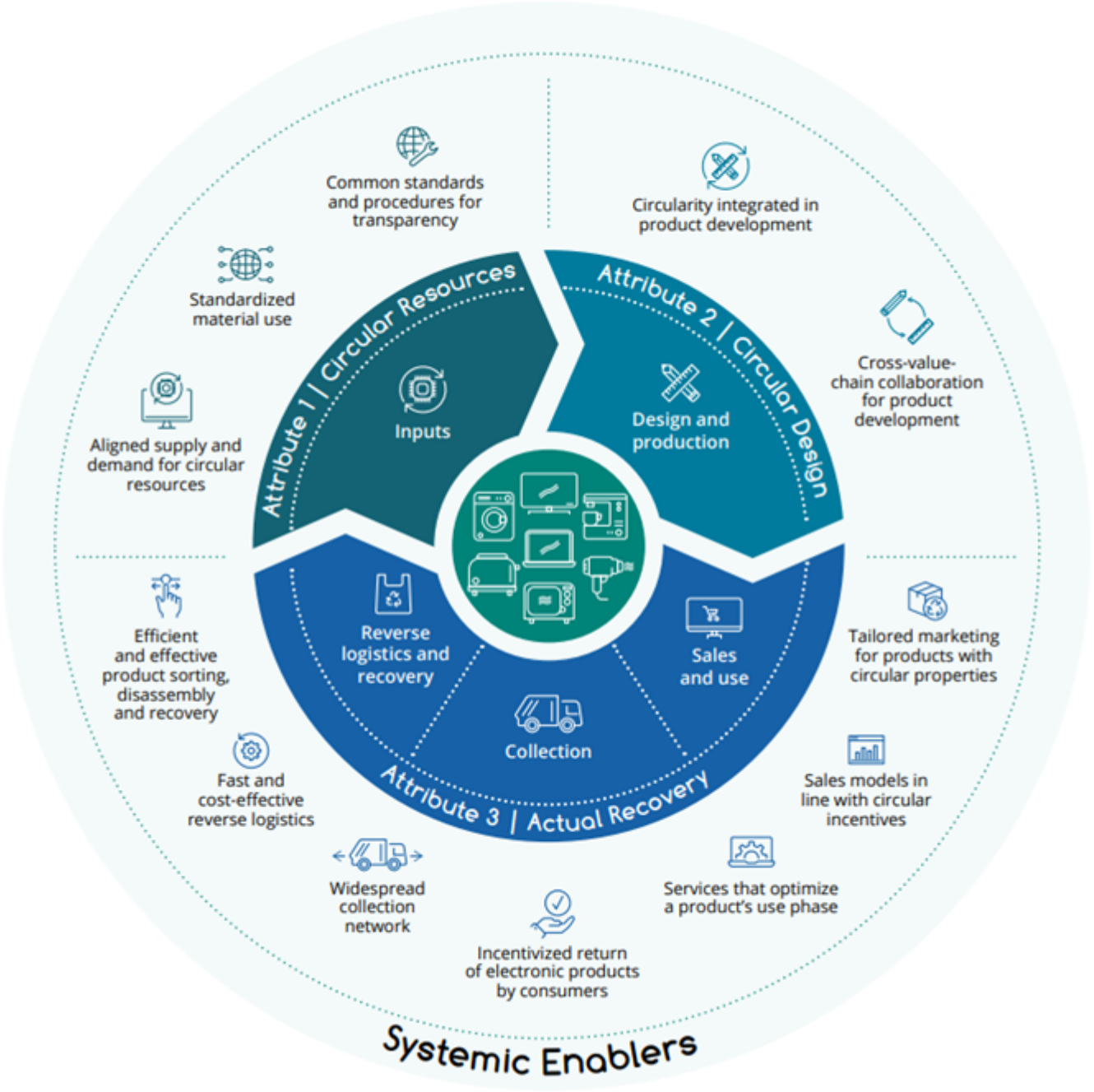

Figure 1: Circular electronics system (CEP, 2022)

Figure 1 shows how the different circular systems-based measures can support circular electronics products (CEP, 2022). In essence, the electronics value chain encompasses the following major stages: (1) resource extraction and sourcing, (2) design and manufacture, (3) sales and use, (4) collection of discarded materials or e-waste, (5) sound recovery and reuse.

B. PROGRAM DESCRIPTION

This section asks for a theory of change as part of a joined-up description of the program as a whole. The program description is expected to cover the key elements of "good project design" in an integrated way. It is also expected to meet the GEF's policy requirements on gender, stakeholders, private sector, and knowledge management and learning (see section D). This section should be a narrative that reads like a joined-up story and not independent elements that answer the guiding questions contained in the PFD guidance document. (Approximately 10-15 pages) see guidance here

The Global Electronics Management (GEM) Program

35. Many, if not all, of the challenges associated with the electronics sector such as resource depletion and environmental pollution, are global in scope. Consequently, they stand to benefit significantly from global action. For instance, replacing or finding alternative sources for minerals like cobalt or lithium can have a profound impact on the economies of countries with mining operations. However, it can also trigger a worldwide restructuring of the market.

36. The manufacturing of electronics operates within a global network, even though recent geopolitical crises have prompted major industry players to attempt to localize their manufacturing processes.

37. The program offers greater potential to harness the diverse strengths of participating countries. These strengths can range from resource availability and technological expertise to manufacturing capabilities and stockpiles of end-of-life EEE. The program also aims to promote policy alignment. Different countries often have their own regulations and policies concerning electronics wastes and recycling, leading to situations where a policy, such as a ban on E-waste imports in one country, can inadvertently impact other nations. The program can play a crucial role in harmonizing these policies and reducing regulatory complexity.

38. Similarly, the program aims to promote collaboration to foster innovation. Cross-border and south-south cooperation often catalyzes the development of new technologies, business models, and solutions that might not have been attainable through isolated national efforts.

39. The program will serve as a knowledge platform for best available technologies and best environmental practices (BAT/BEP) in the electronics sector for innovators, start-up and would be private entities in the tier 2 stakeholders to access and catalyze businesses and initiatives to complement the current initiatives of electronic manufacturers and organizations. Also, for the national governments of the participating countries in the formulation or updating of their national action plans and roadmaps for circular electronics, incorporating diversity, inclusivity and gender equality in their plans and policies.

40. The project will tackle e-waste challenges with multifaceted approach such as i) strengthening recycling technologies through innovation; ii) enforcement and enhancement regulatory frameworks supported by legislations and national action plans and iii) fostering consumer awareness and participation in e-waste management through the different engagement and behavior-based activities envisioned in the project. Collaboration between government bodies, private sector and consumer is an essential component of the project since this plays a pivotal role in the e-waste management landscape. Environmentally sound management of e-waste is an imperative but also an opportunity to innovate and create sustainable solutions.

Scope of the Program

41. . The program primarily focuses on common interventions in the Information and Communication sectors, targeting devices such as mobile phones, tablets, laptops, desktop computers, and TV monitors. Some child-projects have proposed interventions related to other electronic equipment or sectors, like PV panels and batteries.

42. The participating countries will strengthen their national and local action plans supported by legislations on Circular Economy Principles that will cover circular design, right to repair, standards and guidelines on EEE/WEEE and incentivization. New business models to encourage SMEs and private enterprises on urban mining, deposit, take back and leasing mechanisms, pilot PPPs on ICT circular design and creation of markets for innovative and circular electronic products are also proposed.

43. The various country- or region-specific policies are expected to enable circular electronics and sustainable e-waste management initiatives. Most of the child projects propose interventions for manufacturers to incorporate circular eco-designs as well as cleaner or low-toxicity raw materials; to change consumer behavior towards durable or repairable electronic products supported by green labeling standards; and to facilitate the establishment of systems and facilities that accommodate ICT repair or refurbishment. Some child projects also include enforcing rules on trade of electronic products and improving capacity to analyze toxic chemicals in e-waste.

44. Systematic collection, logistics and treatment centers as well as addressing POPs and hazardous substances in e-waste are common actions identified in all child projects. While some explore improving the environmental performance of domestic urban mining practices where recovered materials are destined for export, all child projects explore the development of local capacities to further do onsite processing after recovery.

45. Additional actions identified were setting standards for imported WEEE, improving cross-border movement of reusable/recycled components, gender-sensitive trainings to value chain actors, support to the informal e-waste sector, and benchmarking of practices in other countries.

46. All child projects will incorporate awareness raising activities of stakeholders towards behavior change on consumer's choice on circular electronic products which includes trainings, workshops, study tours, capacity building on e-waste recycling and EEE hazardous waste component assessment (particularly in Peru), social marketing campaigns and branding for sustainable ICT consumer products. These campaigns will be accessed through the child country digital platform and linked with the Global Child platform. Linkages with international organizations, academe and research institutions for information dissemination and lesson learned sharing were identified by some of the participating countries.

47. In terms of impact on Global Environmental Benefits, the common interventions envisaged by the child projects are all aimed at preventing waste generation and promoting resource recovery, and may be grouped in Upstream and downstream initiatives, as follows:

1) Upstream and midstream interventions aimed at:

a. Prolonging the use of equipment achieved through consumer behavior change, with or without repair interventions. Repair interventions may be promoted by policy interventions on the right to repair and establishment of partnerships among manufacturers and ICT maintenance and repair businesses. Policy interventions will be supported by specific, measurable, achievable and time bound planning (SMART) to bring in or strengthen businesses engaged in repair of equipment.
b. Promoting the reuse of functional components of equipment in the same type of equipment or in other categories, possibly facilitated by policy interventions and SMART planning as above, on circular design or proactive initiatives on circular and modular design, standard methodologies for testing reused components, and piloting projects related to the safe dismantling, testing, and marketing of used ICT components.
c. Promoting chemical replacement or avoidance in the manufacturing of ICT components, with the general objective to reduce the use of hazardous chemicals in products, for instance, by avoiding the use of MCCP or other chlorinated plasticizers in the manufacturing of cables, or by ceasing the manufacturing and placing on the market of mercury-containing backlights for computer monitors (Cold Cathode Fluorescent lamps or CCFL).

2) Downstream interventions aimed at:

a. Promoting Urban and e-waste mining, i.e., recovery of metals and critical minerals from e-waste and end-of-life equipment. Urban and e-waste mining can be conducted either locally, if BAT/BEP technologies for

metal recovery are available, or through local dismantling and shipment abroad for metal recycling in BAT/BEP compliant plants.

b. Carrying out the segregation of POPs and mercury-contaminated waste from non-contaminated waste streams, such as PBDE contaminated plastic from CRT computer monitors, and safe removal of CCFLs from Liquid Crystal Display (LCD) monitors.

48. All the above interventions have the potential to reduce the release of GHGs into the environment, prevent the generation of U-POPs, avoid the generation of e-waste, and ensure that POPs and other substances of concern are not used in manufacturing or are properly destroyed through environmentally safe processes. The Global project therefore intents to achieve significant Global Environmental Benefits in term of:

- Direct GHG avoidance (Core GEB indicator 6.2)
- Environmentally Safe Management or prevention of POPs as chemicals (Core GEB indicator 9.1.) and their waste (Core GEB indicator 9.6.)
- Environmentally Safe Management or prevention of mercury as chemicals (Core GEB indicator 9.1.) and mercury waste (Core GEB indicator 9.6.)
- Avoidance of plastic waste (Core GEB indicator 9.8.)
- Reduction of the release in the environment of U-POPs (Core GEB indicator 10.1.)

49. The above interventions will have a profound impact on society in terms of job creation and facilitating the shift from informal to formal employment. This includes not only low-skill jobs in the waste management sectors but also high-skill jobs in the circular design of ICT equipment, safe dismantling, maintenance, and remanufacturing processes.

50. As described above, the gender dimension in the electronics sector reflects the complexity of its value chain and gender issues are inherent in the global electronics sector. A vital component of the GEM program is therefore a gender mainstreaming action plan that will include gender-sensitive social and economic activities with targets and indicators linked to the electronics value chain.

51. Targeted actions for companies, educational institutions, governments, and society include:

- Implementation of gender-inclusive policies and practices to address issues on women being under-represented, sexism and discrimination, informal employment and to foster supportive and flexible work culture.
- Promotion of gender equality in educational institutions and training centers by encouraging girls to pursue Science, Technology, Engineering and Mathematics (STEM) education and by challenging gender stereotypes.
- Promote government policy towards gender equality by setting quotas for women representation; offering incentives for companies with programs meant to address diversity, equality, and inclusivity (DEI).
- Education and awareness raising to promote women's career advancement, mentorship, and networking opportunities.
- Strengthen occupational health and safety measures to protect the health and well-being of women working in recycling and material sourcing businesses.

Additional Gender Analyses at national level will be able to identify further gaps and ensure that the planned activities of this proposed program are targeted, relevant, effective and sustainable

Theory of change

52. The overall program Theory of Change (Figure 2) presents the common approach across the electronics value chain with examples of outputs and interventions showing how they map to the Outcomes and overall project objective.

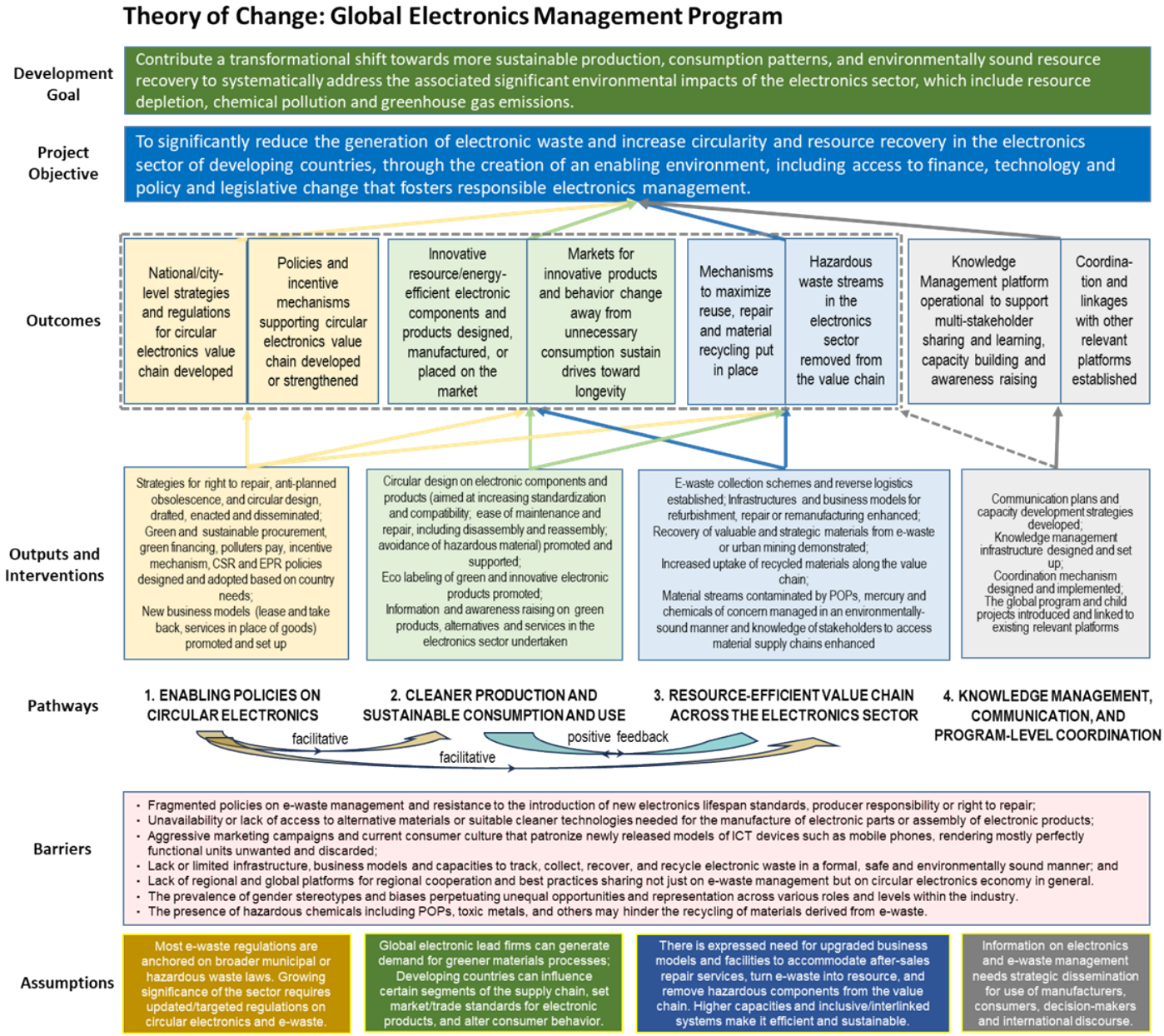

Figure 2: GEM Program Theory of Change

53. The Theory of Change commences with an acknowledgement that the growing pressures to address e-waste and its associated negative impacts stem from unabated consumerism of electronic products and the mostly linear nature of managing electronics throughout its value chain. While several initiatives have already demonstrated the proper disposal of e-waste with some demonstration facilities established to improve the working conditions of the mostly informal work of collection, dismantling and recovery of valuable electronic components, it has now become imperative to integrate and interlink solutions along the value chain to support efforts in developing countries. Recognizing the complexity of the electronics life cycle, it is expected that the GEM Program would need to cross political borders, for example by promoting international cooperation and exchanges related to electronic product quality standards, import and export of components and products, or trade of recycled materials.

54. The transformational value of this is geared towards encouraging suppliers and manufacturers to design products that have longer lifespans or can be repaired and ensure that the process reduces or excludes chemicals that would be potential toxicants at end-of-life stages. This approach requires closer cooperation between the

project teams and the electronics manufacturers to align business with sustainable development objectives. However, it remains a reality that circular interventions on the supply side are highly dependent on the buy-in of global electronic brands mostly headquartered in developed countries. The global GEM team will coordinate with these brands and facilitate work with platforms such as the Circular Electronics Partnership to create high-level demands for circular electronics and create global multiplier effects to increase the tonnes of resources saved, and chemicals or e-waste avoided. Contract manufacturers and component suppliers will re-engineer their operations to align with cleaner requirements. In turn, reusable components or products can be made available to the domestic, regional, and global supply chains.

55. GEM will focus support on the segments of the value chain carried out in developing countries. The program will capitalize on the issuance of policies and strategies that advance electronics circularity to balance out the largely market-driven regimes currently prevailing in the sector. Regulatory frameworks allow governments to influence trade, chemical use, manufacturing and e-waste management practices. It can also create an enabling environment for electronics consumers to make informed choices on product purchases and use. Without these policy enablers, circular electronics framework will neither take off nor sustained, will remain as a corporate-driven prerogative, and continue to be limited to end-of-pipe e-waste management as core approach.

56. Cleaner processes in manufacturing facilities should be complemented by after-sales service centers for consumers such as authorized repair centers for products under warranty or hubs for general maintenance services such as for repairs or parts replacement. Many repair service providers in developing countries are neither well-regulated nor standardized. Consumer issues on data mining, quality of repair services or quality of replaced parts remain major hurdles for wider acceptance. If these were not supported by the project, there will be lost opportunities for avoiding additional e-waste generation. This will also perpetuate the culture of discarding functioning devices and buying new ones.

57. The GEM Program will also address hazardous chemicals and new chemicals of concern, develop innovative business models with value chain linkages, and reinforce the elements of inclusion of vulnerable groups, to carry out environmentally sound e-waste management. E-waste recovery and recycling is not new since there had been some good practices demonstrated on e-waste collection, dismantling and recovery in some parts of the world. However, most of these initiatives are heavily reliant on the recovery of highly valued materials, resulting in “cherry picking” and leaving the majority of the undesirable materials for later disposal.

58. GEM endeavors to improve the valuation of more recoverable e-waste components by introducing new technologies to collect and process them. Core strategy is to capitalize on any value-adding operation in urban mining with a goal to increase the number of private sector enterprises venturing into urban mining. The program will innovate on increasing the efficiency of e-waste collection because this remains a challenge. GEM’s integrated approach will likewise encourage business-to-business linkages either by (a) enhancing the capacity of developing countries to recover e-waste for export to countries with higher capacities for further processing and/or (b) improving local recycling capacities by installing sound facilities or improving existing technologies in developing countries. The program also addresses the root cause of cherry picking – to reduce this practice, GEM can explore matching the needs of manufacturers, e.g. asking for the minimum acceptable impurities, and customizing this minimum requirement with the operational standards of recyclers. These are expected to drive investments by manufacturers, SMEs, and startups, including supporting the informal e-waste sector to establish formal cooperatives or social enterprises. The increasing amount and diversity of electronic products becomes added pressures for stakeholders in developing countries to adopt sound e-waste recycling technologies and establish facilities at scale. Additionally, this component shall address material streams contaminated by POPs, mercury, and chemicals of concern to be either prevented upstream at managed in an environmentally-sound manner.

59. Finally, proofs of concept from demonstration of cleaner production, greener consumption and resource-efficient electronics value chain can feed into international policy discourse that can further effect second- or

third-tier positive impacts on circular economy metrics. On a globally strategic level, GEM's global coordination team will ensure that GEB and other program-level indicators are woven into and achieve synergies among country child projects. The program will target transformation in several systems—prioritizing the health, urban, and natural systems—by contributing to their transition towards sustainable resource use, accelerating circularity and decarbonization, eliminating hazardous/polluting chemical use, implementing national frameworks, broadening the utilization of eco-friendly and environmentally beneficial solutions, and delivering global commitments and targets.

60. Participating countries are estimated to generate a total of more than 3 million Mt of e-waste in 2023 with weighted average of 7 kg of e-waste generation per capita, specifically ranging from as low as 0.6 kg per capita reported in Mozambique to as high as 11.1 in Türkiye. In 2024, combined mobile phones in use in these countries are estimated at 750 million units. National level policy interventions are expected to benefit at least 650 million people, which is the combined 2023 population of all participating countries. While 5 out 16 already have e-waste legislation, there remain opportunities for all partners to adopt specific policies that advance circular electronics frameworks.

61. On a globally strategic level, GEM's global coordination team will ensure that GEB and other program-level indicators are woven into and achieve synergies among country child projects. The program will target transformation in several systems—prioritizing the health, urban, and natural systems—by contributing to their transition towards sustainable resource use, accelerating circularity and decarbonization, eliminating hazardous/polluting chemical use, implementing national frameworks, broadening the utilization of eco-friendly and environmentally beneficial solutions, and delivering global commitments and targets.

Program Components

62. Guided by the Theory of Change of the program, the project components will engage the 4 transformational levers depending on the local contexts of the target countries in each child project, which include: (i) creating a coherent regulatory environment (ii) infrastructure; (iii) innovation and learning; and (iv) multi-stakeholder dialogues and partnerships. The three substantive components will be facilitated by two additional components promoting knowledge management and monitoring & evaluation (M&E) coordinated by the global child project. Participating countries will benefit from increased access to information, education, knowledge management and best practices among all actors, while stronger South-South cooperation will build capacity, convene industry and regulator networks, and ensure global coordination and access to knowledge on best practices in finance, innovation, regenerative design, circularity, and behavior change.

Each child project will engage all transformation levers yet focus on multiple components in line with national priorities; acknowledging the presence of certain industries and services along the electronics value chain in each country; and based on the identified issues, impacts, and opportunities for interventions.

63. Component 1: Enabling Policies on Circular Electronics

The goal of component 1 is to develop plans and strategies to foster circular and resource-efficient electronics along the value chain at the national and local levels. Depending on local context, these may be standalone frameworks or mainstreamed into other relevant plans or programs.

Recognizing the need for elaborating or harmonizing policies, this component will likewise examine regulatory gaps that hinder the holistic approach to addressing the challenges of short-lived electronic products, unsustainable practices in the manufacture of electronics and its parts/components, and the lost opportunities to reduce electronics and e-waste footprint. It is anticipated that a well-defined and quantifiable Circular Economy

strategy, developed in coordination with existing initiatives on consumer products, will ensure that the regulatory framework on electronics is seamlessly integrated into a coherent perspective on sustainability for the participating countries.

In alignment with the unique value chain landscapes and requirements in each country, this component is dedicated to advancing the development, enactment, and dissemination of policies aimed at promoting sustainable practices throughout the electronics industry. These policies include the adoption of environmentally friendly raw materials, the implementation of circular design principles for electronic products, measures to mitigate planned obsolescence of ICT equipment, promoting the right to repair electronic devices in use, fostering green specification and procurement practices, facilitating green financing initiatives, advocating for polluter pays principles, and promoting EPR.

Across the countries participating in this global initiative, the degree of implementation of circular economy strategies and EPR for ICT equipment varies. While these strategies are increasingly commonplace in other industrial sectors such as the Food & Beverage packaging sector, the adoption of EPR or CE strategies for ICT equipment remains less prevalent and often relies on downstream approaches. Consequently, there is a missed opportunity to leverage the substantial environmental benefits that could be achieved through proactive measures at the design stage, aimed at conserving resources and creating more durable and repairable electronic equipment. Enabling environments for innovative business models to reduce electronic waste such as lease, take back, trade in, or provision of services in place of goods shall be established.

The implementation of Right to Repair policies will empower consumers and businesses, facilitating easier maintenance and repair of electronic products, fostering job creation, and mitigating the depletion of mineral resources. Furthermore, policies that prohibit the manufacture or importation of chemicals of concern will minimize further risks, for example, of mercury used in CCFLs used as backlight in LCD monitors of computers and television (TV) sets while MCCP used as plasticizers in or flame retardants in PVC cables are now currently being proposed for listing under the Stockholm Convention. Any or a combination of these policies shall be carried out with respect to the institutional frameworks of participating countries, ensure consistency, effectiveness, and the involvement of OEM at the global level.

Within this component the role of the Global Child Project will be key in:

- Providing global-level expertise on the regulatory and policy tools for a more sustainable value chain if ICT equipment.
- Developing templates for the development of plans and strategies to foster circular electronics along the value chain, for consideration by the child projects in the development of their strategies.
- Supporting child projects in Engaging Major Manufacturers and Exporters: International cooperation will be sought to facilitate discussions between governments and major EEE manufacturers and exporters. These discussions will aim to encourage companies to adopt environmentally friendly practices, such as designing products with repairability in mind and embracing sustainable manufacturing and marketing strategies.
- Establish an exchange a platform to sustain a regular exchange among national level regulators and stakeholders, global level stakeholders, ICT value chain experts, to provide to the child-projects with knowledge about best practices and lesson learned, and to foster the national and international consistency of the regulatory tools proposed, and their compliance with the relevant international MEAs and with global trade exchange protocols and agreements.
- Assessing the impact on the global value chain of the proposed intervention.

The global enabling policy development work will serve as a base for child projects when designing their own gender-responsive policy interventions. Child projects will prioritize the development, enactment, and dissemination of gender-responsive policies tailored to the unique needs of each country's electronic value chain landscape. National gender analysis will inform specific work plans, taking into account the different needs of

men and women in the entire lifecycle of electronics, and ensuring equitable outcomes for all. Gender-disaggregated indicators and a comprehensive gender strategy will facilitate ongoing monitoring and adaptations to promote gender mainstreaming.

This component will particularly include actions aimed at supporting two outcomes:

64**. Outcome 1.1 National or city level strategies and regulations for circular electronics value chain developed.**
Under this outcome, the development of any or a combination of national or city-level strategies, policies, and legislations as enablers of electronics circularity will be carried out. As each country or region's situations differ, for example on the types and magnitude of electronics enterprises or services in operation or on the policy framework currently in place, each child project will define its own policy focus areas.

In addition to recommendations on policies to be adopted or enacted, the GEM Program will support the elaboration of implementing rules and regulations to provide clear guidance on how to implement them, including standardized process flows, institutional arrangements, upholding of accountability, and observance of safeguards. These clarificatory rules or guidelines will be aligned with each country or region's institutional and legal structures.

- Strategies and policies for CE in the ICT sector, including circular design. This will entail drafting and enacting Circular Economy policies, strategies or plans for electric and electronic equipment (EEE) or specific to ICT devices, and official guidance for their implementation. That could for instance include promoting circular design principles, such as reducing planned obsolescence and creating products built to last. The strategy could also include enhanced digitalization of EEE in the perspective of an "EEE lifecycle chain of custody", leveraging technology to optimize resource usage and product lifecycle management. A significant shift from traditional product sales to the provision of services will be proposed by the new rules, depending on the characteristic of the country's economy, encouraging a more sustainable consumption pattern. Additionally, the strategies should foster collaboration among stakeholders within the ICT supply chain to streamline processes and improve resource efficiency throughout the industry.

- Extended Producer Responsibility (EPR) regulatory framework established for the ICT sector. Although is acknowledged that a full EPR implementation may be a long-term objective in some of the participating countries, still this is a key tool to mobilize investment to address the lack of infrastructures for the improved collection and management of e-waste.

- Limited to child projects that have included EPR among their objectives, this output focuses on establishing an EPR regulatory framework for the ICT or the EEE sector. EPR is a crucial tool aimed at ensuring that sufficient financial and technical capacity is in place to manage the waste generated from end-of-life EEEs. By enforcing EPR, the aim is to promote sustainable waste management practices, reduce environmental impact, and encourage greater accountability within the EEE manufacturing industry.• "Right to repair" policies or legislation drafted and enacted, awareness on existing repairable equipment and devices raised. Efforts will be made to draft and enact comprehensive 'Right to Repair' policies or legislation that empower consumers and businesses to repair and maintain their EEE goods easily. These policies will ensure that manufacturers provide necessary documentation, spare parts, and access to diagnostic tools to facilitate repairs. By promoting repairability, these policies will reduce electronic waste, extend product lifespans, and encourage sustainable consumption. Such policies or legislation will be integrated and supported by official technical guidance on their implementation.
- Anti-planned obsolescence regulations and directives developed. Aside from the right to repair, other directives may be formulated to ensure that electronic goods in stores are built to last. These can potentially include giving consumers the right to know if a product is repairable, requiring smartphones batteries to be replaceable, disallow battery software lockout also known as "parts pairing" to enable repair, mandate consumer

warranty or serviceability period (minimum service dates for access to repair and parts), ensure that repurposed electronics (e.g. old phones to video doorbell) do not violate copyrights, and others.

• Policies or legislation prohibiting the manufacture or importation of ICT equipment containing POPs, mercury, or other chemicals of concern. These policies will minimize the generation of hazardous e-waste in the participating country, coming, from mercury used in CCFLs used as backlight in LCD monitors of computers and television (TV) sets and MCCP used as plasticizers in or flame retardants in PVC cables.

65. **Outcome 1.2 Policies and incentive mechanisms in place to support circular electronics value chain.**

The establishment of the following polices, or incentive mechanisms have been considered as suitable to support this wider outcome:

• Green Procurement designed and adopted by Public Institutions, Academies, Firms, and Voluntary Partners. Green procurement initiatives will be developed by private or public partners of the child projects, aiming at fostering a Circular Economy and creating a market for environmentally friendly equipment. These initiatives will drive the demand for products that align with Circular Economy principles, such as being repairable, upgradable, easily dismantled, compliant with ROHS regulations, energy-efficient, and more. In countries where least-cost rules still prevail over Green Procurement principles, alternative focus could be on Green Specification standards.• Incentivizing ICT Repair Businesses: The ICT repair business can be supported through facilitation in establishing formal business, tax reliefs, loans under existing financing mechanisms for SMEs or green industry. Criteria for getting such benefits should include attendance at training provided by the project in collaboration with ICT brands on ICT circular economy and safe dismantling and repair. • Introducing Incentives for Purchasing Repairable/Upgradable Devices: To incentivize consumers to choose repairable and upgradable devices, governments or municipalities may introduce financial and tax incentives. These incentives may include reduced taxes on repair services, subsidies for eco-friendly products, or discounts on future purchases for those who opt for repairable products or cover guarantee costs.•

Facilitate the marketing of sustainable ICT devices. Financial facilitation for the import or marketing of ICT devices fulfilling specific CE criteria can be worked out, in collaboration with the GEM-PT (for the establishment of common criteria) and supported by public or private banking institutions and governments.

66. **Component 2: Cleaner production and sustainable consumption and use**

The goal of Component 2 is to design intermediate and final products for circularity, and incorporate cleaner production technologies during material sourcing and production stages, are transformative aspects in global electronics management since it tackles the first stages of the value chain.

67. **Outcome 2.1. Innovative and resource/energy efficient electronic components (parts) and products designed, manufactured or placed on the market.**

The global project will establish coordination with global ICT brands, and circular economy platform, and global ICT trade exchange platforms worldwide to identify opportunities and appraise the impact and sustainability of the interventions proposed by the child projects on the global value chain and to get global-level insights on the circularity of the proposed intervention.

The global program will also identify, through open discussion with the ICT industry and circular economy platforms, global-level hindrances which may affect the adoption at global level of the solutions proposed at national level, and, in collaboration with the global brands, identify solutions, already being pursued by the industry at global level or in countries not participating in the project, which may be replicated at the level of the child projects.

The global project will also identify and share with the child projects information which may be used in the design of country-level intervention, like quality requirements or security standards for materials and components intended to be recycled or reused in the value chain, case studies on the implementation of circular economy regulations, standard templates for the evaluation of the interventions.

The global program will also coordinate with multinational / global institutions having a direct or indirect regulatory role in the ICT sector, including the secretariats of the Stockholm, Basel, and Minamata conventions and the IPCC.

At the level of child projects, Interventions supporting the first outcome of this component may encompass:

- Promoting the sourcing of sustainable, reused and/or low-toxicity raw materials and chemicals;
- Promoting the design of products to ensure durability, and improved system compatibility;
- The incorporation of right-to-repair principles such as design for access to and ease in maintenance and repair, including disassembly and reassembly;
- Fostering process changes that require lower energy, water and material consumption;
- Adoption of innovative clean technologies within a "green design" perspective;
- Promoting the design of products that can readily be recycled soundly at their end of their useful life;
- Enhancing the taking-up of recovered materials and components into the manufacture of new electronic products.

The design process may incorporate a functional substitution approach for chemicals in products and processes as suggested by Tickner et al. (2015) such as looking at chemical function (search for a functionally equivalent chemical substitute), end-use function (search for other means to achieve the function of the chemical in the product) and function as service (search for alternatives that could serve the same purpose). Main objective is to reduce the use of hazardous chemicals wherever possible, therefore ensuring that sustainable materials are sourced and used while green and sustainable chemistry can eliminate chemicals of concern in products. For example, an alternative design that avoids the use of MCCP as plasticizer and flame retardant may be explored.

68**. Outcome 2.2. Markets for innovative products and behavior change away from unnecessary consumption and toward increased longevity.**

The second outcome under this component involves market creation for circular products for consumers. Driving consumers to patronize more durable and reparable electronic products could employ a wide range of strategies, including provision of guidance to consumers on the long-term costs and benefits of durable ICT products, favoring sellers that offer buy-back or trade-in of old units in case of new purchases, right to repair and warranty offers, simplifying the fine prints or conditions regarding electronic products, and/or being a responsible green consumer in general.

At the global level, the program will establish partnerships with ICT Companies and global circular economy platforms to promote and support the development and marketing of innovative products that prioritize longevity and sustainability, to encourage the investment in research and development for eco-friendly and durable technologies, to avoid unnecessary replacement of functional equipment caused by software upgrades, etc.

The global project could also develop or review certification programs or labels for ICT products that meet specific sustainability criteria, such as energy efficiency, recyclability, and durability. This can help consumers make informed purchasing decisions.

At child-projects level, a non-exhaustive list of activities which may be carried out to pursue the objective of this component includes:

- Introduce incentive programs such as tax breaks or subsidies for companies that produce or consumers who purchase innovative, longevity-focused ICT products. This can encourage adoption and investment in sustainable technologies.
- Advocate for policies and regulations that promote sustainable practices in the ICT industry, such as EPR laws, right-to-repair rules, minimum set of information on maintenance and spare part replacements.
- Engage with local communities to foster a culture of sharing, repairing, and repurposing ICT devices. Organize community repair events, swap meets, or online platforms for exchanging used electronics.

• Partner with schools, colleges, and universities to integrate sustainability and longevity principles into curricula related to ICT, engineering, and design. Foster innovation and entrepreneurship among students to develop solutions for sustainable ICT products.

These options may be applied to any segment of the electronics value web within each partner country. It is recognized that specific interventions will differ between countries depending on their current policy landscape, their level of control in one or more actors along the electronics or electronic parts value chain/web, and their national/local priority needs in the sector.

As guidance, the generally accepted drivers for the upstream aspects of circular electronics are regulatory measures (under Component 1) governing the placing of the market of electronic products or the establishment of rules related to the prohibition of manufacturing and import of MCCP containing cables. As this Component can facilitate the recovery and recycling of parts (Component 3), so can the availability of reusable materials be incorporated into circular designs. Additionally, the buy-in of lead firms/OEMs are critical since they have a strong influence to require certain circular standards from their contract manufacturers or component suppliers. Generated proofs of concept can be documented and shared (Component 4) and can serve as basis for global project coordination and advocacy.

Integrating gender mainstreaming into Component 2 ensures inclusivity, equity, and effectiveness in cleaner production and sustainable consumption practices. The global program and all the child projects acknowledge gendered dimensions within regenerative design and circular business models, and extends their focus to incorporate gender-responsive approaches in business models, product design and consumption patterns, ensuring equitable access to sustainable products and technologies. Considerations are made regarding how different genders might interact with and benefit from products and services, ensuring that designs are inclusive and accessible to all. For example, wearable electronics needs to be designed with inclusivity in mind, considering the diverse needs and preferences of different genders. This may involve developing products with features that cater to a range of body types and style preferences.

GEM program activities advocate for gender considerations throughout the business models and design processes, from material sourcing to manufacturing, including promoting ethically sourced sustainable materials and designing inclusive products. This will support the ensuring fair wages and safe working conditions for all workers, particularly women who may be disproportionately affected by exploitative labor practices. Efforts aim to address gender disparities in accessing clean technologies and sustainable products, supporting women's participation and businesses.

Attention will be paid to changing and emerging job opportunities for both women and men mitigating potential gender disparities as the transition from linear materials systems to circular systems may lead to shifts in the labor market. For example, roles in waste picking may see a reduction, while opportunities in reuse/refill collection systems may experience growth.

69. **Component 3: Resource efficient value chain across the electronics sector.**
The goal of Component 3 is to create and implement mechanisms to maximize reuse, repair, and material recycling within the electronic sector in an environmentally sound manner to ensure that circularity designed into products is not wasted, e.g., ensuring the recycling or reuse of materials and components is indeed carried out safely.

Several different interventions have been proposed by the participating countries under this component. Upstream initiatives include the development of standards, the establishment of schemes for the re-use of functional electronic components, whilst downstream initiatives include intervention aimed at improving E-waste collection and logistics. the upgrading of E-waste treatment centers, the environmentally safe disposal of POPs and other hazardous chemicals, and the recovery of valuable materials from E-waste.This component

"closes the loop" in the value chain by connecting the post-consumption/use phase of products with the green design/production phase. On a case-to-case basis, reverse logistics or incentivized collection schemes for unusable or still functional but unwanted electronic products depend on the sources – establishments (e.g., institutions, BPOs, industries) or households.

The component will also endeavor to address challenges in countries with significant or growing consumption by enhancing their role as importing countries, through the establishment of standards for imported products and design criteria, and initiatives aimed at improving the cross-border movement of EOL reusable components and recyclable materials, to explore the creation of a healthy global value chain/market for recycled parts/materials through this global program.

Business models shall be introduced to establish, upgrade, or expand facilities for refurbishment, repair, or remanufacturing of End-of-Life products. Proper and sound recovery of valuable materials shall demonstrate BAT/BEP in urban mining (including technologies for well-controlled secondary metal production) and expected to drive investments by manufacturers, SMEs, and startups, including ideally supporting the informal e-waste sector to establish formal cooperatives or social enterprises. Sustaining such initiatives would require the awareness of relevant stakeholders on such materials available for uptake and for the program to enhance access to the value chains of these materials. Additionally, this component shall address material streams contaminated by POPs, mercury, and chemicals of concern to be either prevented upstream at managed in an environmentally-sound manner.

70. **Outcome 3.1. Mechanisms to maximize reuse, repair and material recycling put in place.**

Beside the expected environmental benefits, the activities envisaged in support of this outcome may profoundly benefit the society and economy of the child project countries through the creation of employment opportunities, particularly in the green economy sector, and supporting the growth of small businesses and entrepreneurship by facilitating the transition of informal repair shops to formal repair services. Making repaired and refurbished ICT components available in the second-use market at affordable prices can also improve access to technology, especially for underserved communities and individuals with limited financial resources. This can contribute to bridging the digital divide and promoting digital inclusion by providing access to essential technology tools and resources. Furthermore, the collaboration between ICT manufacturers, distributors, after-sale service providers, and repair shops fosters innovation in product design, repair techniques, and recycling processes and encourages the development of eco-friendly technologies and business models focused on sustainability. That would be enhanced through the establishment of databases for ICT components which will facilitate knowledge sharing and collaboration, contributing to the advancement of circular economy practices in the electronics industry.

On the recycling side, e-waste could be a valuable source of rare earths, precious metals, and other minerals that may be effectively reused in the electronics industry. Recycled metals are two to ten times more energy efficient than metals smelted from virgin ore. Furthermore, mining discarded electronics produces 80% less carbon dioxide emissions per unit of gold compared to mining it from the ground (PACE - WEF 2019). The quantity of gold and silver in printed circuit boards is high. It is estimated that each type of Printed Circuit Board contains a quantity of gold, according to the complexity and the number of functions displayed by the devices, ranging from 142 g/t to over 700 g/t. By comparison, the average amount of gold found in ores is only 5-10 g/t of metal. A similar situation occurs for silver and for other metals used in PCBs (Kasper and Veit 2018). In Table 3 below, based on data derived from research undertaken by Purdue University and other information (directly referenced in the table), the relative concentration of metals in discarded equipment and e-waste, with the associated CO2 footprint related to primary and secondary production, is reported. The table only includes metals that may be recovered through technologies usually available in developing countries, while many other critical minerals may be most effectively and safely processed in large BAT/BEP facilities located in a limited number of countries.

Table 3 Equivalent carbon footprint from primary and secondary production of metals from e-waste

	Content in average EEE (kg/t) (not including casings) (source: 1 and 5)	CO_2 Footprint for primary production (t/t)	CO_2 Footprint for metal scrap recovery (secondary production) (t/t)
Al [2]	24	16.1	0.6
Cu[3,4]	166	4.1	1.2
Fe [5]	30	1.06	0.08
Ni [7]	4.5	13	0.22
Zn [5]	6	3.66	0.43
Pb[1,5]	2.36	0.59	0.2

1. Dylan T. Buechler, Nadezhda N. Zyaykina, Cole A. Spencer, Emily Lawson, Natasha M. Ploss, Inez Hua, Comprehensive elemental analysis of consumer electronic devices: Rare earth, precious, and critical elements, Waste Management, Volume 103, 2020, Pages 67-75, ISSN 0956-053X, ht
2. International Aluminium – Greenhouse Gas Emissions. Available at https://international-aluminium.org/statistics/greenhouse-gas-emissions-aluminium-sector/
3. Ekman Nilsson A, Macias Aragonés M, Arroyo Torralvo F, Dunon V, Angel H, Komnitsas K, Willquist K. A Review of the Carbon Footprint of Cu and Zn Production from Primary and Secondary Sources. MINERALS. 2017; 7(9):168. https://doi.org/10.3390/min7090168
4. Nickel Institute: Life Cycle Data: Nickel Metal. https://nickelinstitute.org/en/library/general-publications/life-cycle-data-nickel-metal/
5. IPCC Emission factor database. https://www.ipcc-nggip.iges.or.jp/EFDB/stat_tables.php
6. Bureau of International Recycling (BIR)- Report on the Environmental Benefits of Recycling – 2016 edition
7. https://www.bir.org/publications/facts-figures/download/172/174/36?method=view

The global program will promote and facilitate the agreement between the local after sale services, repair-refurbishment sectors, and global manufacturers. The purpose is not only to increase the shift from informal toward informal business, but to increase the number of equipment which can be legally and safely repaired and reuse. Through collaboration with the global brands and with global circular economy platforms, the project will deliver training for trainers in the various aspects related to dismantling, testing, and re-assembling of used ICT functional components.

Such activities will presumably increase the number of components that can be reused or repaired, with an increase in the global environmental benefits compared with what could be achieved through the implementation of uncoordinated activities.

The global program could also assist the child projects in the identification of recycling services, by establishing connections with global providers of recycling services, and by helping and supervision in the drafting of the bidding documents and associated term of references.

Coordination among the global brands and the repairing-refurbishing sectors at the country level will ensure the adoption of common standards.

At the child-project level, one or more of the following initiatives can be implemented based on the country situation:

a) Agreement among ICT manufacturers or distributors and authorized provider of after-sale services;
b) Training of after-sale service centers and repair shops to on the dismantling of end of use equipment and testing for functionality of used components in compliance with manufacturers' quality standard rules;
c) Supporting the shifting of informal repair shops to formal repair services through agreement and training provided by the project, in collaboration with manufacturers;
d) Establishment of reverse logistic and collection schemes
e) Establishment of databases of ICT components to verify cross- compatibility and facilitate the placement in the second-use market of such components;

f) Establishment of policies related to e-waste aimed at preventing discarded functional equipment (for instance, equipment discarded because of software upgrade) from entering into the waste stream;
g) Collection of EOL ICT equipment and ICT e-waste for environmentally safe dismantling, and recovery of metals and critical materials locally, by means of available BAT/BEP processes;
h) Collection of EOL ICT equipment and ICT e-waste, local dismantling and pre-treatment undertaken locally, shipment to BAT/BEP recovery facility abroad; and
i) Collection of discarded / EOL functional ICT component from EOL ICT equipment and ICT e-waste to remove functional components, perform their functionality test and place that components back in the manufacturing stream or in the certified second-hand market.

In terms of benefits, in addition to the expected reduction of GHG releases, this category of initiatives will obviously reduce the need for virgin ore mining, conserving natural resources such as rare earths, precious metals, and other minerals, and contributing to the resilience of the ICT value chain globally.

71. **Outcome 3.2. Hazardous waste streams in the electronics sector removed from the value chain**

The presence of POPs, mercury, and other substances of concern in e-waste may heavily affect their recyclability. The MCCP weight in internal computer cables may range from 11 to 40 grams of MCCP per equipment (ECHA 2022 and KEMI 2018). USB cables or internet connection cables may potentially contain MCCP in the range of 1 to 6.5 grams per meter of cable. According to a UNIDO project in the Philippines, PBDEs in the plastic casing of CRT monitors may range from 8 to 12 grams per kilogram of plastic used for the casing of such products. CCFL-LCDs may contain from 10 to over 100 milligrams of mercury, based on the number and length of CCFLs. The removal and segregation of hazardous components from e-waste will simultaneously reduce environmental risks and increase recyclable materials. This process ensures environmentally sound management (ESM) of e-waste.

Activities which may be carried out under this component may be, for instance:
- Collection of discarded CCFL-LCD and CRT monitors to ensure the safe segregation of POPs and mercury.
- Collection of discarded ICT internal and external cables to ensure the proper disposal of plastic contaminated by MCCP.

The child-projects, with technical support by the GEM GCP, will ensure that the risks which more often affect the undertaking of recycling activities will be properly addressed:
- Inadequate handling of e-waste leading to environmental pollution or exposure of workers to health hazard, will be prevented through a careful design and implementation of standard operating procedures to be adopted in all the e-waste handling and dismantling activities.
- Proof of performance testing of the recovery technologies adopted, to verify the release of U-POPs, PAHs, and metals, will be carried out with the purpose of identifying the need for improvement of the procedures or technologies up to the BAT standards.

The contribution of the GEM GCP project to the child projects will be to provide information related to the BAT/BEP in the metal recycling sector, and to facilitate the interaction among global players in the field of critical mineral recycling with the child-project implementing countries.

Gender mainstreaming of Component 3 ensures that the strategies and interventions implemented consider the diverse needs and roles of women and men throughout the value chain. This involves promoting equal access to opportunities in recycling, refurbishment, and remanufacturing activities, as well as supporting the involvement of women in decision-making processes across the value chain and related to waste management and recycling initiatives.

Additionally, in each child project efforts are made to address gender disparities in access to resources and opportunities within the electronic sector, including the informal sector. This may include targeted initiatives to increase women's participation in formal recycling and remanufacturing businesses, as well as providing support for women-owned enterprises in the informal e-waste sector to establish formal cooperatives or social enterprises.

Furthermore, GEM program aims to address material streams contaminated by persistent organic pollutants (POPs), mercury, and other chemicals of concern in an environmentally sound manner. Gender mainstreaming ensures that these efforts are inclusive and take into account the specific vulnerabilities and risks faced by women in handling hazardous materials, especially related to women's reproductive health and the informal sector operations.

72. **Component 4: Knowledge management, communication, and program-level coordination**

The ICT value chain, encompassing items such as smartphones, tablets, and laptops, is not just long and complex but also continually adapting to the global landscape. At the global level, the design, manufacturing, and marketing of ICT components and products are influenced by numerous factors. These include technological advancements, access to critical minerals, trade policies, tariffs, intellectual property rights, technology standards, cybersecurity, conflicts, geopolitical events, and compliance with international environmental conventions related to climate change, ozone depletion substances, POPs, and mercury.

Given the global scope of this project, there is a pressing need to ensure proper coordination and effective knowledge exchange among the GEM and global entities and stakeholders, including the Secretariat of the Stockholm, Basel, and Minamata Conventions, as well as the IPCC. Collaboration with the headquarters of global brands is essential, particularly concerning topics that could simultaneously impact all child projects. These may encompass strategies related to chemical substances, green manufacturing processes, recycling technologies, global marketing policies, and more.

73. **Outcome 4.1 Knowledge Management platform established to support sharing and learning, capacity building, awareness raising among various stakeholder to achieve sectoral transformation considering gender responsiveness of activities.**

At child-project level, it is important that the knowledge sharing, and communication approach is consistent among child-projects, and it is well tailored to the specific situation of the country / region where the projects are implemented.

This will entail the identification and preparation of information to be shared, in consideration of:
- the audience (Why this audience is important?),
- their need for information (What do they need to know?),
- the media to be used for reaching the audience (How can we best reach them?),
- timing (when is the best time to release information?)
- as well as the metric and format to be used for the quantitative data and indicators.

Awareness-raising programs that can influence behavior change include educating consumers and businesses about the benefits of durable, repairable, and upgradable electronic goods. Through various media channels and educational programs, the public will be informed about the positive environmental and economic impacts of sustainable ICT products over disposable ones. The public can be informed about the lifespan and environmental impact of electronic devices and on useful tips on how to extend the lifespan of gadgets through maintenance, repair, and responsible disposal practices.

74. **Outcome 4.2 Coordination and linkages amongst the relevant global and national stakeholders and platforms established**

Communication between child projects within the GEF Global Electronics Management (GEM) Program is also vital for amplifying the impact of individual child projects and ensure the overall success of the GEM IP. Figure 3 below shows the knowledge management and communication approach which will be adopted by the implementing and executing agencies to gather and share project-related information.

GEM: Knowledge Management and Communication Sharing Framework between Global and Child Projects

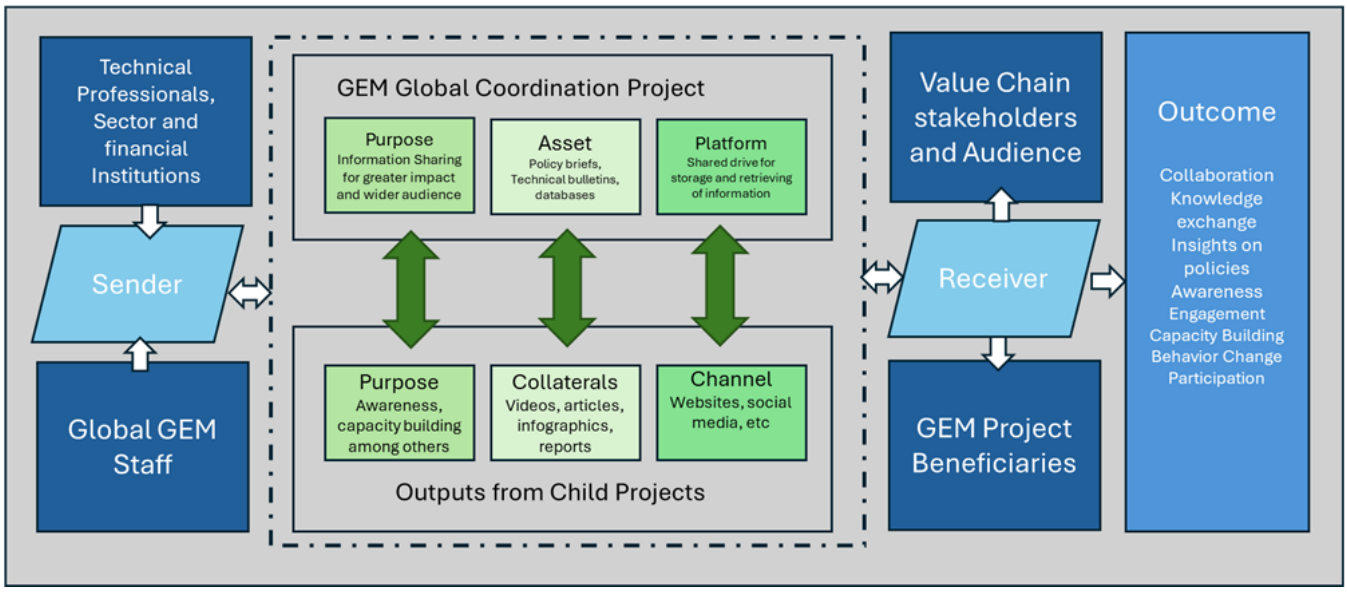

Figure 3. The Knowledge Management and Coordination framework

Component 4 also aims to enhance gender responsive communication, knowledge management and sharing of best practices within the GEM Programme to ensure inclusivity and effectiveness in all activities.

Efforts to engage with all stakeholders, incl. major electronic producers, are gender-mainstreamed, ensuring equal participation and representation of women in discussions and negotiations. This promotes gender equality in the electronic industry and contributes to the development of more gender-responsive policies and practices.

Intermediate outputs of Component 4, such as knowledge products and tools developed by country teams and project partners, are designed as gender-responsive. This includes ensuring that technology fact sheets, video documentation, policy papers, and monitoring tools are gender-responsive and address the specific needs and priorities of women and men. Gender-responsive language and gender-balanced images will be used in relevant campaigns (women presented as agents of change). The global project will support gender integration in the national projects by providing resources and technical assistance for good practices during project design and implementation.

A program-level gender action plan will be developed during the PPG to ensure that gender responsive activities are identified and appropriately executed during the program implementation. This action plan will be communicated to each child project to ensure harmonization of actions to achieve the program targets.

The Child Projects

75. An analysis of the concept notes of the child projects showed that all projects will contribute to the program components and will follow a common approach to ensure the attainment of the program objectives. A tabular check presented in Table 3 summarizes the envisaged interventions of all child projects.

Table 3: Types of interventions per child project concept notes

	Horn of Africa (Ethiopia, Somalia, Djibouti)	Cambodia	Colombia	Vietnam	Southern African countries (Botswana, Eswatini, Lesotho, Namibia, Mozambique, South Africa)	Kazakhstan	Philippines	Türkiye	Perù
	Component 1: Enabling Policy on Circular Electronics:								
Circular economy rules / guidelines	✓	✓		✓	✓	✓	✓	✓	✓
EPR system enforced or piloted	✓	✓		✓	✓	✓	✓	✓	✓
Tax facilitation	✓							✓	✓
Environmental funds	✓	✓	✓		✓	✓			
Strategies on right to repair and programmed obsolescence		✓	✓		✓	✓	✓		✓
Green procurement	✓	✓	✓	✓	✓	✓	✓		✓
New business models			✓	✓	✓	✓	✓	✓	✓
E-waste management rules / guidance		✓		✓			✓	✓	
Additional		✓	✓	✓			✓		✓
	Component 2: Cleaner production and sustainable consumption and use:								
Consumer awareness on electronic product choices		✓	✓		✓	✓	✓	✓	✓
Green labeling and standards		✓	✓		✓	✓	✓		✓

Circular raw materials and components				✓	✓	✓	✓	✓	✓
Circular design		✓	✓	✓	✓	✓	✓		
Avoidance of POPs and mercury		✓		✓	✓	✓	✓	✓	✓
Import rules		✓		✓		✓			
E-waste centers	✓					✓	✓	✓	✓
EPR	✓			✓			✓		
	Component 3: Resource efficient value chain across the electronics sector:								
E-waste collection and logistics		✓	✓	✓	✓	✓	✓	✓	✓
E-waste treatment centers	✓	✓		✓			✓		✓
Development of standards			✓				✓		✓
POP and hazardous substance	✓		✓	✓	✓	✓	✓	✓	✓
Local urban mining		✓	✓	✓	✓	✓	✓	✓	✓
Local / abroad urban mining		✓		✓			✓		
Additional				✓	✓	✓			✓
	Component 4: Knowledge Management								
Training			✓				✓	✓	✓
Project website and Multi-stakeholder platform	✓		✓	✓	✓	✓	✓	✓	✓
Link to other initiatives	✓		✓	✓			✓		✓

The Global Child project for Coordination and Knowledge Management

76. On global coordination, a GEM Project Team (GEM-PT) will be established to oversee the implementation of the program and maintain close collaboration with the child project teams.

Coordination at the global level

- Project management offices of the child projects will facilitate the adoption of consistent criteria in the design, implementation, and evaluation of project interventions, as well as ensuring the consistency of proposed rules or standards developed under the project.

- Engagement with global brands through their headquarters and national departments to ensure that instances emerging at the national level are properly brought up to the global level for acceptance and replication in other countries. Additionally, it will ensure that the technical and financial commitments agreed upon at the global level through interaction with the coordination team are properly propagated at the national level.
- Collaboration with implementing agencies (UNIDO, UNDP, UNEP, AfDB) to facilitate the achievement of agencies' specific agendas and objectives through project implementation.
- Interaction with the secretariats of the United Nations Framework Convention on Climate Change (UNFCCC), The Stockholm Convention on Persistent Organic Pollutants, the Basel Convention on the transboundary transport of hazardous waste, and the Minamata Convention on Mercury.

Technical assistance and knowledge exchange:

- The GEM-PT will undertake training and development of guidance documents, guidelines, and standards covering various aspects:
- General guidelines for monitoring and calculating the GEBs targeted by the project.
- Methodologies for Life Cycle Assessment (LCA) with GHG and chemical targets to assess intervention results against the baseline.
- Guidance on the development, implementation, and evaluation of initiatives related to prolonging the lifetimes of ICT equipment and their impact.
- Guidance on the repair and refurbishing business of ICT, considering environmental balance, social impact, regulatory frameworks, and standardization.
- Advice on the reuse of components, both horizontally within ICT devices of the same categories, and vertically across different ICT devices or even as components of non-ICT devices.
- Guidance on Best Available Techniques (BAT) and Best Environmental Practices (BEP) technologies related to recycling metals and rare earths from e-waste.
- Recommendations on POPs and substances of concern in the manufacturing of ICT and their components.
- Advice on the safe dismantling and disposal of cathode ray tube (CRT) monitors.
- Development of LCA guidelines for the detailed calculation of GHG emissions from manufacturing.

In addition to technical assistance, the GEM-PT will promote knowledge exchange opportunities through:

- Establishment of a GEM knowledge exchange platform interconnected with the platforms established under each child project.
- Annual GEM workshops to be hosted in one of the child projects.
- Establishment of focal groups on specific topics, including chemicals in ICT manufacturing, ICT lifecycle and climate change, policies (including global and national trends on the right to repair, circular economy, EPR, social impact of the repair and refurbishment business, global perspectives related to the recycling of metals and rare earths, and waste prevention.

Through continuous monitoring, the project will timely identify any challenge faced by the child projects and elaborate possible strategies.

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- Establishment of focal groups on specific topics, including chemicals in ICT manufacturing, ICT lifecycle and climate change, policies (including global and national trends on the right to repair, circular economy, EPR, social impact of the repair and refurbishment business, global perspectives related to the recycling of metals and rare earths, and waste prevention.

Overall monitoring and evaluation will also be undertaken by the global child project. The program-level monitoring and evaluation approached is detailed in the Monitoring and Evaluation Section.

Stakeholder Engagement

77. To be able to identify the different stakeholders for this project, an understanding of the electronics supply chain is important. Building on the supply chain is value chain analysis that consider the manner in which value is added along the chain, both to the product/service and the actors involved. The focus in the value chain analysis in the context of identifying the roles of these stakeholders will be limited to ICT electronic products. The up, mid, and downstream processes for these products were reviewed to fully capture the relevant stakeholders in the value chain.

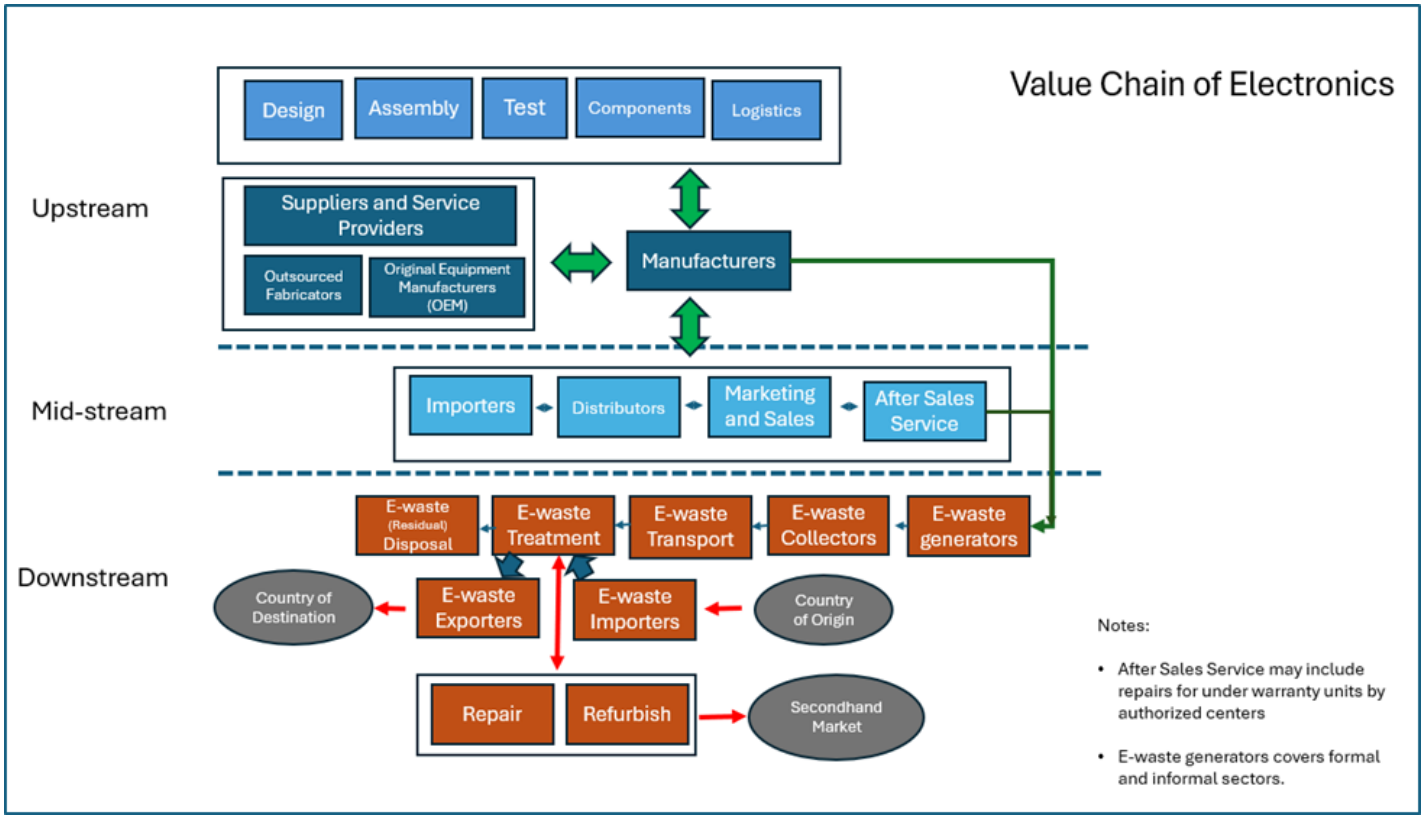

Figure 3 The generic value chain for GEM program

A stakeholder mapping was conducted during the PFD development and preliminary stakeholder engagement plan presented in the Annex is drafted to identify the relevant stakeholders and their potential roles or engagement.

Monitoring and Evaluation

Describe the approach to program-level Monitoring and Evaluation, including ways to ensure coherence across Child Projects and to allow for adapting to changing conditions, consistent with GEF policies. In addition, please list results indicators that will track the Program Objective, beyond Core Indicators. (Max 1-2 pages).

78. As lead agency, UNIDO will perform the overall coordination of the program and provide program level M&E against a program-level Results Framework. UNIDO will work closely with the implementing agencies to ensure harmonized and cohesive monitoring, reporting and evaluation of the program and its child projects.

79. The M&E mechanism to be put in place will ensure alignment with GEF and all implementing agencies policies and requirements, including adherence to environmental and social monitoring safeguards and gender action plans. The main purpose of the Program M&E mechanism will be to measure and document implementation progress towards outcomes and objectives according to verifiable indicators and related means of verification. The results and outputs of the child projects will enrich the program's monitoring and reporting requirements.

80. Regular evaluation of performance based on the committed global environmental benefits to be delivered by the program and the agreed set of indicators will assist in monitoring effectiveness and results. Through this, underperforming activities will be identified, and remedial actions may be undertaken. An effective M&E mechanism will assist in monitoring project risks and flagging project risks early on, refining further work to ensure a coherent, coordinated, and timely achievement of program objectives. It will also support the communication and coordination mechanism of the program, the compilation of lessons learned from the child project and the dissemination to the relevant stakeholders and platforms. 81. Understanding

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81. Understanding

that each participating IAs have its own set of M&E requirements, this component will also promote coherence of indicators and develop a program level system to integrate results and outputs achieved by the child projects. As a minimum, the program will ensure coordination in the delivery of the annual Project Information Reports (PIR), cofinancing reports, midterm review and terminal evaluation. An integrated Program Evaluation will be undertaken by UNIDO as the lead agency.

82. A program-level monitoring and evaluation plan will be developed during the preparatory phase of the program. While each child project will develop its own results framework and M&E plan alignment to the program-level M&E plan and guidance will be ensured. The programmatic M&E system will be designed to fulfill the following:

- Report on the achievement of the GEBs and the program-level indicators through consolidated results from the child projects.
- Track the progress of the child projects versus envisaged timelines.
- Promote knowledge generation and facilitate knowledge exchange between or amongst the project stakeholders.

Table 4: Possible program-level indicators to be considered under GEM Program

INDICATOR	UNIT	REMARKS
Program-wide Indicators		

INDICATOR	UNIT	REMARKS
[Increased] Amount of e-waste avoided, reduced or recovered	Mt or Number of units per year (total and/or by equipment type); Total Mt within the project period	This represents a combination of factors that affect the footprint of the electronics sector. The amount of e-waste may be avoided/reduced at source (manufacturing stage) and during purchase and use (consumer choices, access to repair, etc.). Recovery of reusable components may be achieved when e-waste is properly collected and recycled.
Possible sub-indicators:		
[Increase in] Overall (or additional/extended) average lifespan of electronic devices	Total months or years, or Additional months or years (overall or by type)	This metric may be realized through the implementation of any intervention that (a) produce or consume durable products, (b) sets minimum product qualities or lifespans, (c) adopting anti-planned obsolescence policies, (d) increase in warranty periods, (e) access to quality repair services and spare parts, or (f) reuse or exchange initiatives, etc.
[Increased] Availability of reusable or recycled material on market	Mt per year (total and/or by type); Total Mt within the project period	This supports transparent and fair trade on the availability and accessibility of reusable or recyclable materials.
[Reduced] Use of new raw materials, or [Increased] Reuse of recovered components	Mt per year (total and/or by type); Total Mt within the project period	In the manufacture of new electronic parts and products, there will be less need for extracting new resources from nature if (a) manufacturers re-design product models that use less materials, and/or (b) incorporating reuse of recovered/recycled materials.
[Increased] Out-of-market (OOM)/Put-on-market (POM) ratio for household electronics	Mt/year per Mt/year (Dimensionless)	It compares the amount of electronics taken out of the market (OOM) each year to the amount of electronics that is put on the market (PO) each year. It indicates state of collection and recycling of electronic products.
[Increased] Amount of e-waste collected, repaired, or refurbished	Mt or Number or units per year (total and/or by equipment type); Total Mt within the project period	Similar to OOM/POM ratio, this metric represents the collection and recovery efficiency within a specific system boundary; It however allows further disaggregation of data on e-waste collection and recovery per type or per facility.

INDICATOR	UNIT	REMARKS
[Increase in the number of] Authorized or designated (under warranty) or good quality service centers (post warranty), specifically benefitting women	Number of enterprises. Number of formally employed individuals; and/or Percent female managers/workers	Note: In cases when there are already existing service centers, increase in the volume of ICT equipment/items serviced
National and local plans, policies, guidelines, or strategies on circular electronics or e-waste management recommended to policymakers for adoption	Number	
Globally or regionally relevant strategies or white papers on circular electronics developed and disseminated	Number (per type or thematic topic)	
Other Co-benefit Indicators		
[Decrease in] Health-related (morbidity/mortality) reports or incidences in partner enterprises and immediate communities	Number of health or epidemiological cases related to electronics manufacture or e-waste collection, processing, and disposal	This is an optional indicator and might need more resources to track, attribute and report.
Meaningful involvement of marginalized or vulnerable groups in decision-making processes	Structured subjective measurements of feedback (e.g. safe space for participation, recognition, and capture of concerns, etc.)	Assessment of change based on various subjective indicators based on client satisfaction surveys before (baseline) and after project
Improvement in skills of partners, direct beneficiaries, and stakeholders	Structured objective evaluation of additional technical, financial, organizational, or professional skills	Assessment of change based on various skillset criteria before and after the project, e.g. technical skills, financial skills, organization skills

83. Annual program assessment will be undertaken through the global PSC meetings which will take place once a year, at a minimum. This may be held in tandem with multi-stakeholder coordination and knowledge management activities that will be held annually or biannually to develop partnerships and facilitate knowledge exchange.

84. A Midterm Review (MTR) will be conducted towards the 3rd year of implementation for each child project while an independent terminal evaluation (TE) will take place at the end of each child project's implementation within at least 6 months prior to the operational completion of the project.

85. A Programmatic Terminal evaluation in accordance with GEF evaluation guidelines will be conducted in coordination with the UNIDO Evaluation Office after the completion of the terminal evaluations of the child projects. The TE of the program will provide an independent assessment of the program's impact and sustainability.

86. The program will report on the GEF Core Indicators (GEBs) relevant to the project objectives and framework. In addition, it will report on the program level set of indicators that reflects the ambition of the program and child projects vis a vis its impacts. This may include the set of indicators as elaborated in Table 4. Final list of program-level indicators will be ascertained during the PPG.

Coordination and cooperation with Ongoing Initiatives and Programs.

Is the GEF Agency being asked to play an execution role on this program? Yes

If so, please describe that role here. Also, please add a short explanation to describe cooperation with ongoing initiatives and projects, including potential for co-location and/or sharing of expertise/staffing (max. 500 words, approximately 1 page)

87. UNIDO will be the lead agency in the program and will execute the global child project. The organization will ensure close coordination with participating agencies - African Development Bank, UNDP and UNEP - in the program and child projects implementation. UNIDO is cognizant of the tasks and resources required to manage and execute the program. Thus, based on comparative advantages and mandates, other executing partners maybe identified during the project preparatory phase. Initial discussions have been held with the Circular Electronic Partnerships and UNEP on execution possibility. ITU may also be tapped to execute relevant activities.

88. Local coordination with government ministries, regulatory agencies, professional organizations, private sectors and country offices of the relevant IA will be conducted in each child country. Linkages with the other participating countries under UNIDO, UNEP, AfDB and UNDP will be through the global coordination project. Several countries identified the following coordination:

- For SADC, consultations with several entities on EEE and WEEE such as the Lightcycle SA, SAWEEDA or South African Waste Electrical and Electronic Enterprise Development Association, South African e-waste Alliance and E-waste Recycling Authority (ERA) were mentioned and will be elaborated during the PPG stage.
- For HoA, coordination with Platform for Accelerating the Circular Economy (PACE), the E-waste Coalition, the GEF-financed global program on electronics management and regional platforms such as the Africa Circular Economy Facility will be conducted.
- Peru, a coordination with SENATI, a private institution dedicated to professional training in industrial activities, repair and maintenance for electronic products and e-wastes

89. The program will seek synergy and coordination with other agencies, entities and platforms involved in the implementation of similar GEF and non-GEF initiatives. The program will explore opportunities for collaborative approaches and leverage existing initiatives to further amplify the solutions and lessons learned. The program will create linkages or build upon the work of relevant projects across the GEF portfolio including the following:

- Accelerating Transition to a Circular Economy in India's Electrical and Electronic Sector through Sustainable Integrated Approaches (GEF 11405)
- Reduced risks on human health & the environment through reduction of POPs & U-POPs in Eswatini (GEF 11272)
- Circular and POPs-free Plastics in Africa (GEF 11049)
- Circular Economy approaches for the electronics sector in Nigeria (GEF 10141)
- Sound Management of Unintentional Persistent Organic Pollutants (POPs) and Polychlorinated Biphenyl Ether (PBDEs) to Reduce their Emission from the Industrial Waste Sector (GEF 9263)
- Implementation of PCB Management Programs for Electric Cooperatives and Safe E-waste Management (GEF 9078)

- Strengthening of National Initiatives and Enhancement of Regional Cooperation for the Environmentally Sound Management of POPs in Waste of Electronic or Electrical Equipment (WEEE) in Latin-American Countries (GEF 5554)
- Reducing UPOPs and Mercury Releases from Healthcare Waste Management, E-waste Treatment, Scrap Processing and Biomass Burning (GEF 6928)
- Investment Promotion on Environmentally sound Management of Electrical and Electronic Waste: Up-Scale and Promotion of Activities and Initiatives on Environmentally Sound Management of Electrical and Electronic Waste (GEF 5040)

90. The agencies implementing the child projects (African Development Bank, UNDP, UNEP, and UNIDO) will capitalize on their comparative advantages and expertise to ensure that technical oversight is provided to support the program and the child projects.

UNIDO, as lead agency, dynamizes inclusive and sustainable industrialization supporting countries to improve sustainable value chain operations and accelerate adoption of circular economy. UNIDO has worked extensively on the e-wastes sector partnering with governments and with the private sector to encourage industry to 'design for recycling'; promoting sustainable solutions that eliminates the concept of waste and transforms it into an opportunity, into resources for sustainable production. UNIDO recognizes that stakeholder engagement and building solid partnerships are necessary to achieve development results.

The African Development Bank (AfDB) recognizes the transformative potential of the electronics sector in driving economic diversification, innovation, and job creation across the African continent. In its efforts to support this vital industry, AfDB implements a range of initiatives tailored to the specific needs and challenges facing electronics firms, entrepreneurs, and policymakers. One key focus of AfDB's work in the electronics sector is promoting access to finance for businesses operating in this field. The bank provides financing instruments such as loans, grants, and guarantees to support the expansion of electronics manufacturing facilities, the adoption of new technologies, and the development of value chains within the sector. Additionally, AfDB facilitates partnerships with financial institutions and investors to mobilize private capital for electronics projects, fostering entrepreneurship and investment in this critical industry.

UNDP supports countries in creating the enabling environment and piloting experiences towards shifting government, private sector, and household behaviors and assessing possible public and market incentives needed to steer us away from the unsustainable patterns of consumption and production. UNDP has been implementing innovative solutions to address e-waste and promote a more sustainable and circular electronics industry and using diverse source of funds, focusing on strengthening policy, regulatory and financial incentives (such as EPR mechanisms); phasing out harmful chemicals (e.g. POP flame retardants) from e-product manufacturing; supporting circular principles in design processes by building the capacity of manufacturers and producers to improve product design; improving collection, waste management and recycling systems and processes (reducing e-waste generation, improving e-waste management practices, facilitating the recovery and reuse of valuable materials and raising awareness and empowering producers and consumers).

Electronics is one of the high impact sectors identified by UNEP for its programming. Eliminating chemicals of concern from high-impact sector value chains is one of the priorities to promote circularity and resource efficiency. Over the years, UNEP has implemented a series of projects focusing on e-waste or WEEE (waste electric and electronic equipment) related activities. UNEP partners with various stakeholders including other UN entities such as UNITAR, ITU; governments and multilateral agencies for collaboration. one such example is National E-waste Monitor 2023 for Kazakhstan. UNEP's special program supports countries with implementation of BRS, Minamata Conventions and the Global Framework on Chemicals has projects and activities related to e-waste management.

91. Similarly, the program will solicit the assistance of the International Telecommunication Union (ITU) to benefit from its multilateral platform on sharing knowledge and building capacity on electronics-related global issues. The program will also benefit from engagement and partnerships with global brands and global platforms supporting inclusive transition to circular electronics. The partnerships may be aimed at supporting policy dialogues, peer-to-peer learning, knowledge sharing and innovation.

92. UNIDO has inked an institutional Memorandum of Understanding with some global brands including Google, Intel, Lenovo and Hewlett-Packard, which could serve as foundation to their possible participation in the program and benefitting from their initiatives and vice versa.

The program will also endeavor to partner with several global platforms and initiatives including:

- Circular Electronics Partnership, comprising of 6 founding members, which aims to catalyze system transformation for the electronics industry by 2030.
- Solving the E-waste Problem (StEP) is an independent, multi-stakeholder platform for designing strategies that address all dimensions of electronics and applies an integrated, science-rooted approach to create salient solutions to global e-waste challenges along the entire electronics life cycle.
- Global Alliance on Circular Economy and Resource Efficiency (GACERE), with 5 strategic partners – Ellen MacArthur Foundation, Partnership for Accelerating Circular Economy (PACE), World Circular Economy Forum (WEF), ICLEI, and World Business Council for Sustainable Development (WBCSD) – is a voluntary and non-legally binding alliance of countries supporting circular economy. The alliance is supported by the European Union and UNEP and UNIDO are operational needs.

Partnerships by other IAs with other relevant stakeholders will be identified during the PPG and further engagement with them will be assessed.

93. The program will also interact with the Secretariats of the United Nations Framework Convention on Climate Change (UNFCCC), the Stockholm Convention on Persistent Organic Pollutants, the Basel Convention on the transboundary transport of hazardous waste.

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Table On Core Indicators

Indicator 6 Greenhouse Gas Emissions Mitigated

Total Target Benefit	(At PIF)	(At CEO Endorsement)	(Achieved at MTR)	(Achieved at TE)
Expected metric tons of CO_2e (direct)	140639	0	0	0
Expected metric tons of CO_2e (indirect)	0	0	0	0

Indicator 6.1 Carbon Sequestered or Emissions Avoided in the AFOLU (Agriculture, Forestry and Other Land Use) sector

Total Target Benefit	(At PIF)	(At CEO Endorsement)	(Achieved at MTR)	(Achieved at TE)
Expected metric tons of CO_2e (direct)				
Expected metric tons of CO_2e (indirect)				
Anticipated start year of accounting				
Duration of accounting				

Indicator 6.2 Emissions Avoided Outside AFOLU (Agriculture, Forestry and Other Land Use) Sector

Total Target Benefit	(At PIF)	(At CEO Endorsement)	(Achieved at MTR)	(Achieved at TE)
Expected metric tons of CO_2e (direct)	140,639			
Expected metric tons of CO_2e (indirect)				
Anticipated start year of accounting	2026			
Duration of accounting	5			

Indicator 6.3 Energy Saved (Use this sub-indicator in addition to the sub-indicator 6.2 if applicable)

Total Target Benefit	Energy (MJ) (At PIF)	Energy (MJ) (At CEO Endorsement)	Energy (MJ) (Achieved at MTR)	Energy (MJ) (Achieved at TE)
Target Energy Saved (MJ)				

Indicator 6.4 Increase in Installed Renewable Energy Capacity per Technology (Use this sub-indicator in addition to the sub-indicator 6.2 if applicable)

Technology	Capacity (MW) (Expected at PIF)	Capacity (MW) (Expected at CEO Endorsement)	Capacity (MW) (Achieved at MTR)	Capacity (MW) (Achieved at TE)

Indicator 9 Chemicals of global concern and their waste reduced

Metric Tons (Expected at PIF)	Metric Tons (Expected at CEO Endorsement)	Metric Tons (Achieved at MTR)	Metric Tons (Achieved at TE)
1,069.01	0.00	0.00	0.00

Indicator 9.1 Solid and liquid Persistent Organic Pollutants (POPs) removed or disposed (POPs type)

POPs type	Metric Tons (Expected at PIF)	Metric Tons (Expected at CEO Endorsement)	Metric Tons (Achieved at MTR)	Metric Tons (Achieved at TE)
Tetrabromodiphenyl ether and pentabromodiphenyl ether	50.00			
Chlorinated paraffins	1,019.00			

Indicator 9.2 Quantity of mercury reduced (metric tons)

Metric Tons (Expected at PIF)	Metric Tons (Expected at CEO Endorsement)	Metric Tons (Achieved at MTR)	Metric Tons (Achieved at TE)
0.01			

Indicator 9.3 Hydrochloroflurocarbons (HCFC) Reduced/Phased out (metric tons)

Metric Tons (Expected at PIF)	Metric Tons (Expected at CEO Endorsement)	Metric Tons (Achieved at MTR)	Metric Tons (Achieved at TE)

Indicator 9.4 Number of countries with legislation and policy implemented to control chemicals and waste (Use this sub-indicator in addition to one of the sub-indicators 9.1, 9.2 and 9.3 if applicable)

Number (Expected at PIF)	Number (Expected at CEO Endorsement)	Number (Achieved at MTR)	Number (Achieved at TE)

Indicator 9.5 Number of low-chemical/non-chemical systems implemented, particularly in food production, manufacturing and cities (Use this sub-indicator in addition to one of the sub-indicators 9.1, 9.2 and 9.3 if applicable)

Number (Expected at PIF)	Number (Expected at CEO Endorsement)	Number (Achieved at MTR)	Number (Achieved at TE)

Indicator 9.6 POPs/Mercury containing materials and products directly avoided

Metric Tons (Expected at PIF)	Metric Tons (Expected at CEO Endorsement)	Metric Tons (Achieved at MTR)	Metric Tons (Achieved at TE)
140,087.00			

Indicator 9.7 Highly Hazardous Pesticides eliminated

Metric Tons (Expected at PIF)	Metric Tons (Expected at CEO Endorsement)	Metric Tons (Achieved at MTR)	Metric Tons (Achieved at TE)

Indicator 9.8 Avoided residual plastic waste

Metric Tons (Expected at PIF)	Metric Tons (Expected at CEO Endorsement)	Metric Tons (Achieved at MTR)	Metric Tons (Achieved at TE)
37,125.00			

Indicator 10 Persistent organic pollutants to air reduced

Grams of toxic equivalent gTEQ (Expected at PIF)	Grams of toxic equivalent gTEQ (Expected at CEO Endorsement)	Grams of toxic equivalent gTEQ (Achieved at MTR)	Grams of toxic equivalent gTEQ (Achieved at TE)
40.90			

Indicator 10.1 Number of countries with legislation and policy implemented to control emissions of POPs to air (Use this sub-indicator in addition to Core Indicator 10 if applicable)

Number (Expected at PIF)	Number (Expected at CEO Endorsement)	Number (Achieved at MTR)	Number (Achieved at TE)

Indicator 10.2 Number of emission control technologies/practices implemented (Use this sub-indicator in addition to Core Indicator 10 if applicable)

Number (Expected at PIF)	Number (Expected at CEO Endorsement)	Number (Achieved at MTR)	Number (Achieved at TE)

Indicator 11 People benefiting from GEF-financed investments

	Number (Expected at PIF)	Number (Expected at CEO Endorsement)	Number (Achieved at MTR)	Number (Achieved at TE)
Female	171,100			
Male	168,050			
Total	**339,150**	**0**	0	**0**

Explain the methodological approach and underlying logic to justify target levels for Core and Sub-Indicators (max. 250 words, approximately 1/2 page)

To facilitate and harmonize the preliminary calculation at concept note stage, a rapid assessment tool was developed by UNIDO as lead agency.

The following calculation methods and assumption were adopted:

1) GHG reduction:

a. For the prolonged lifespan of the equipment promoted by project activity, GHG reduction was calculated by splitting the contribution from the manufacturing over the new lifespan, whilst the GHG release associated with the consumption would remain unchanged; in case the extended lifespan is achieved through equipment repair, the GHG associated with the manufacturing of spare parts and have been considered. Data for the calculation of GHG associated with the manufacturing or use stage of ICT devices were literature, including (Udit Gupta et al., 2022) and several environmental profiles of ICT products made available by Apple, Sony and Samsung.

b. For the calculation of GHG from activities related to recovery of metal from e-waste: the differential emission from secondary manufacturing (recovery of metal) compared with the primary manufacturing (mining and refining) of metal has been considered using emission factors on literature data from IPPC, international associations of metal industry and others, and adjusted for the recovery ratio achievable by the metal recovery technologies available locally. The GHG associated with local treatment and shipment abroad of e-waste for metal recovery has also been considered. The amount of metal recoverable from e-waste was mostly derived from Dylan T. et al. (2019).

c. GHG associated with the re-use of ICT functional components was considered by multiplying the GHG footprint of each component by the number of each component reused. Computer main board, PCI controllers, memory cards and fan controllers have been considered as the most common spare parts. GHG emission factors were derived from a LCA study carried out in Japan and Korea (Han J et al, 2021) whilst the weight of ICT components was derived from commercial web-based sources.

2) U-POPs avoidance / reduction

a. U-POPs reduction has been considered for all the activities leading to the avoidance of waste (prolonged lifespan, direct reuse of functional components) as well for all the activities related to improved waste management (Environmentally safe management of CRT monitors and POPs containing cables). UNEP toolkit emission factor have been adopted using the factors developed for open burning of e-waste or cables, as relevant.

b. U-POPs avoidance (or additional generation) from e-waste mining has been calculated considering the different categories of technologies (from BAT/BEP to basic technology) through the UNEP toolkit, using the overall amount of e-waste processed (not only the amount of metal recycled). This may have led to an overestimation of the actual number of U-POPs which may be achieved through BAT/BEP technology and would need to be refined at PPG stage,

3) POPs and other substances of concern avoidance / elimination

a. Waste containing POPs, mercury and other substances of concern has been calculated considering either the relative reduction of yearly waste generation over a prolonged life span or taking into account the overall amount of e-waste managed through prolonged lifespan, direct reuse of component, management of CRT and CCFL/LCD monitors and cables.

b. Avoidance and or reduction of POPs as chemicals has been calculated by multiplying the amount of waste processed or avoided by the concentration factor specific for the type of waste/product and chemicals. Data are available for POP - PBDEs in plastic casing of CRT monitors (from a study carried out by UNIDO in the Philippines), for MCCP in cables (European Chemicals Agency and KEMA institute), whilst for Hg the maximum allowed amount of mercury for CCFL lamp was taken by the restriction limit set under the REACH regulation.

The UNIDO GEB Harmonized Calculation Tool is attached as Annex G.

Key Risks

	Rating	Explanation of risk and mitigation measures
CONTEXT		
Climate	Low	GHG avoidance or reduction is achievable by extending the lifespan of ICT equipment whether due to inherent durability or opportunities for repair or parts replacement. GHG savings can also be realized under reuse as a function of the emissions avoided when extracting and processing new raw material inputs. Since climate change mitigation is a co-benefit of product longevity or reuse, achievement of targets is related to the Mt or number of units of electronic products continually used or on the amount e-waste recovered due to project intervention. At the country-level, goals on GHG reduction pertinent to the electronics industry may be attributable to various sectors in the Nationally Determined Contributions (NDCs) hence the GEM project may help country counterparts attribute these actions to each relevant sector if NDCs are planned for use as additional driving forces for action.
Environmental and Social	Moderate	The Program is specifically designed to yield substantial environmental benefits (in the areas of chemicals and waste, climate change and indirectly to biodiversity) as well as positive social impacts related to gender, the informal sector, and the youth. However, the electronics value chain entails potential risks for the environment and the human health with the presence and use of chemicals during the manufacture of electronic products and components as well as the expected release of toxic chemicals generated during the dismantling and recovery of e-waste. For Component 2, risk assessment and actual implementation and monitoring of mitigation actions are required, both during the business-as-usual scenario and during introduction of innovations. The deployment of alternative processes or materials may result in unintended negative environment and social impacts, which need to be safeguarded. Component 3 activities may also have risks associated with

		e-waste collection, establishment of e-waste facilities, actual recovery and recycling, and transport for reuse of functional components, depending on intervention points per country. An environmental management plan must likewise consider the management of residual waste as by-products of recycling and keeping stakeholders and beneficiaries informed of the chemicals of concern and the health and environmental impacts associated with it. Furthermore, actions that promote the inclusion and empowerment of the informal e-waste sector and women should be consciously woven into laying down country-specific strategies and actions.
Political and Governance	Low	The complexity of the electronics sector requires the program to work on, or at least ensure harmonization with, international and national policies, import and export of electronic products or components, transboundary movement of e-waste, trade and product standards on electronic goods, recognizing possible informal or semi-formal business dynamics, and/or the level of enforcement of relevant policies. One issue may be more important in one partner country than the other depending on the scope of local interventions. Nevertheless, it is important to provide space for groups who might be affected or would be opposed to a new or updated policy and design actions that embed conflict-sensitive or "Do no harm" approaches.
INNOVATION		
Institutional and Policy	Low	The electronics industry and the management of post-consumer electronics are high on the agenda of most countries, usually embedded in economic development, trade and/or environmental agenda. Regarding the latter, separate guidelines and regulations for electronic waste management may not yet be present but most countries have municipal or hazardous waste laws that broadly includes WEEE. In this case, it would be rational to bridge policy gaps or harmonize guidelines. Additionally, addressing the electronics value chain is of interest to governments and the private sector as it can contribute substantially to SDG 12 Responsible Consumption and Production, SDG 13 Climate action, and SDG 11 Sustainable cities and communities etc. In the case of introducing anti-planned obsolescence or right to repair proposals, resistance from affected stakeholders can be minimized if these were crafted in line with the current government and corporate sustainability objectives. Meanwhile, regulating the use of mercury or mercury containing compounds is more manageable because of its global phaseout by 2025; however, regulating the manufacture or importation of materials containing MCCP would differ per country pending its inclusion as listed chemicals under the Stockholm Convention.
Technological	Moderate	Risks associated with technological innovation is considered moderate. While the program will endeavor to connect with manufacturers, copyrights and non-disclosure policies may serve as barrier in technology sharing. The program aims to constitute technical working groups and

		global advisory group comprising of relevant major players in the industry to facilitate the exchange of technological innovation to the extent possible.
Financial and Business Model	Low	Innovation risks related to financial and business models are considered low. Financing and business models are generally available and could be adapted to the needs of the project and/or participating child projects.
EXECUTION		
Capacity	Low	UNIDO, UNDP, UNEP and AfDB will be the implementing agencies for the national child projects. They have proven track records of working on in-country projects, having established good network with stakeholders at the country and regional levels.
Fiduciary	Low	Most of the funding will be allocated for technical assistance to countries and stakeholders in identifying the best available knowledge and technical solutions. Funding will also be spent on supporting the development of new policies, addressing global barriers, as well as scaling up innovative solutions. Fiduciary standards are already in place; if needed, procurement rules will be communicated and observed with partners to ensure transparency and quality of the results.
Stakeholder	Low	International organizations actively working on electronics and e-waste, including UNDP, UNEP, and AfDB have been involved in the process of developing the Project Framework Document and the assessment of Global Environmental Indicators. Together with UNIDO, counterpart governments and stakeholders in candidate partner countries have been initially consulted as to country- or region-specific needs. Deep-dive discussions on the roles and contributions of stakeholders at the local level will likewise be part of the elaboration of child projects. Meanwhile, the Global coordination project will reach out to lead electronics firms/OEMs to get their buy-in and will closely coordinate with relevant international bodies such as the Global Electronics Council, the Secretariat to the Stockholm Convention, etc.
Other		
Overall Risk Rating	Moderate	

C. ALIGNMENT WITH GEF-8 PROGRAMMING STRATEGIES AND COUNTRY/REGIONAL PRIORITIES

Describe how the proposed interventions are aligned with GEF- 8 programming strategies and country and regional priorities, including how these country strategies and plans relate to the multilateral environmental agreements.

Confirm that any country policies that might contradict with intended outcomes of the project have been identified. (approximately 2-3 pages)

Alignment with GEF-8 programming strategies

94. The Global Electronic Management project, through the underpinning child projects and the overarching Global Coordination Project, are compliant with the following objectives of the GEF 8 Chemical and Waste and Climate Change focal areas:

GEF – 8 Climate Change Focal Area. The objectives and interventions of the project are in line with the Pillar I of the Climate Change focal area, to "Promote innovation, technology development and transfer, and enabling policies for mitigation options with systemic impacts" with specific reference to objective 1.1. Accelerate the efficient use of energy and materials, as the intervention related to

- Extending the lifetime of ICT devices (with or without repair)
- Reusing electric or electronic components which although discarded are still perfectly functional.
- Recovery of metals with or without BAT/BEP
- Recycling through local pre-treatment and shipment to BAT plants abroad (Mt)

Will have a significant impact on the reduction of GHG through the avoidance of GHG achieved in the manufacturing stage of ICT, or through the energy saving associated with the recovery of metals and other materials from e-waste. The direct reduction of GHG through the above initiatives is estimated in 109,000 Mt of CO2e. The change which will be achieved through project implementation is structural (the system will not go back to the baseline situation after project ends)

GEF – 8 Chemical and Waste Focal Area. The objectives and interventions of the project are in line with objective 1 of the Chemical and Waste focal area, aimed at "Creation, strengthening and supporting the enabling environment to transform the manufacture, use and sound management of chemicals and to eliminate waste and chemical pollution". More specifically, the following activities which can include policy, legislation and capacity and institutional strengthening of the public sector, private sector, CSOs and others as required by the focal area objective are envisaged by the project:

- Investments to eliminate hazardous chemicals, products containing these chemicals and waste,
- Access to, and transparency of chemical information in products and materials
- Reverse logistics and supply chains to enable recovery of materials and products for reuse, thereby preventing them from building up in the environment, through initiatives on ICT.
- Regenerative design of products and materials, which will facilitate removal of hazardous chemicals from supply chains of materials and products and facilitate more closed loop and circular supply chains.
- Green and sustainable approaches, practices, and safer alternatives to hazardous chemicals.
- Green approaches to managing waste that contains hazardous chemicals, or can emit hazardous chemicals if improperly managed, include supporting enterprises to do this responsibly.
- Green procurement to facilitate elimination of products and materials that contain or can contribute to the emission of hazardous chemicals and a build-up of material that contains hazardous chemicals,
- Participation and incentivization of women in businesses that work in management of chemicals and waste.
- Support of financial mechanisms and instruments for innovation in clean and regenerative design of products and materials, particularly those that are developed using indigenous peoples/local communities' knowledge.
- Support to develop and implement financial instruments and mechanisms at national level to allow for access to finance for business to sustain and scale project and program results.
- Policy, legislation, and technical capacity to manage products, materials and chemicals containing hazardous chemicals throughout their lifecycle, including trade.

Contributions of this Program to MEAs and Related Global Environmental Benefits

Stockholm Convention on POPs and Minamata Convention. The Integrate Program on Global Electronic Management (GEM) and the associated child projects will significantly contribute to the objectives of the Stockholm Convention on Persistent Organic Pollutants and the Minamata convention on Mercury by

preventing the use of POPs and mercury in the manufacturing of ICT equipment, avoiding a substantial amount of e-waste generation, carrying out the segregation and disposal of POPs containing waste and Mercury waste in an environmentally sound way.

The presence of persistent organic pollutants (POPs), mercury and other hazardous chemicals in e-waste represents a risk for the environment and human health and an occupational hazard for the recyclers of such waste. POP brominated flame retardants (mostly PBDEs) were a common additive in the plastic casing of Cathode Ray Tube monitors to prevent any fire accident potentially caused by contact with the high voltage and high of some of components of these equipment. MCCPs are currently proposed for listing under the Stockholm Convention (SC, 2024a) due to their toxicity, persistence, and capacity to be transported over long distances. They have also been proposed for a restriction under Annex XV of the REACh regulation (ECA, 2022) and under the EU ROHS regulation (KEMI, 2024). One of the main uses of MCCP is as plasticizers or flame retardant in PVC cables, which are used in a wide variety of electronic devices such as televisions, radios, and computers. Based on the KEMI report (ibidem) 3 kg of MCCPs can be found in one ton of cables. The EU proposal for restriction under Annex XV (ibidem) reports that substances containing CA:C14-17 are predominantly used in PVC compounds used for producing PVC cables and sheathing, with an average concentration in cables in the order of 5% to 18% on a weight basis. Elemental mercury is still a key part of some modern ICT technologies, although its use is mostly limited to Cold Cathode Fluorescent Lamps (CCFL) used as backlight in LCD monitors – both computers and TV sets. CCFLs have been almost completely replaced by Light Emitting Diode lamps (LED). However, CCFL LCDs still represent the most common types of liquid-crystal displays (LCDs) in use: the number of flat panel television sets (TVs) manufactured worldwide up until the year 2013 was 1.2 billion. 87% of those TVs were liquid crystal displays (LCD), 72% of which are illuminated by mercury-containing cold cathode fluorescent lamps (CCFLs) (Elo and Sundin, 2014). Furthermore, there could still be some manufacturing of CCFL-LCDs for non-EU markets, and CCFL-LCDs may still be found in the market, as new or used components. End-of-life CCFL-LCDs should be considered hazardous mercury waste due to their mercury content and their associated environmental and health hazards in dismantling and disposal.

United Nations Framework Convention on Climate Change (UNFCCC). ICT usage is increasingly contributing to global electricity consumption. Data indicates varying trends in mobile, networking, and data center energy usage. As of 2015, even the most optimistic estimates suggested that ICT accounted for up to 5% of the world's energy demand, with data centers alone comprising 1% of this figure, surpassing the energy consumption of numerous nations. Projections indicate that by 2030, ICT could represent 7% of global energy demand. With computing becoming increasingly ubiquitous, researchers need to reconsider their approach to designing and constructing environmentally sustainable computer systems. Despite significant efforts made in the past two decades to enhance energy efficiency, the primary contributor to the total carbon emissions from computing has transitioned from operational activities to the manufacturing of hardware and system infrastructure. In the last decade, the proportion of life-cycle carbon emissions attributed to hardware manufacturing of some of the best-selling phones rose from an average 50% for the iPhone 3GS to around 85% (Udit Gupta et al. 2022). In this framework, whilst continuing the ongoing trend of use of renewable energy for powering data centers, the only obvious approach to significantly reduce the release of GHG from mobile computing is to prolong the lifespan of ICT devices. The project will significantly contribute to the goals of the UNFCC by deploying activities aimed at 1. Fostering consumer behavior toward a more sustainable approach, 2. Modular device design facilitating the replacement of common parts like battery, glass, and casings; 3. Establishing right to repair and agreement between manufacturers' brands and national-level after-sale services; 4. Undertaking assessment with support of the manufacturers on the impact of the software upgrading cycle on the lifecycle of devices at the global level.

D. POLICY REQUIREMENTS

Gender Equality and Women's Empowerment

We confirm that gender dimensions relevant to the program have been addressed as per GEF Policy and are clearly articulated in the Program Description (Section B).

Yes

Stakeholder Engagement

We confirm that key stakeholders were consulted during PFD development as required per GEF policy, their relevant roles to program outcomes and plan to develop a Stakeholder Engagement Plan in the Coordination Child Project before CEO endorsement has been clearly articulated in the Program Description (Section B).

Yes

Were the following stakeholders consulted during PFD preparation phase:

Indigenous Peoples and Local Communities:

Civil Society Organizations : Yes

Private Sector : Yes

Provide a brief summary and list of names and dates of consultations

95. The complexity of the electronics sector merits the engagement of the program to various stakeholders. A detailed stakeholder engagement plan will be developed during the PPG phase, wherein coordination and engagement with relevant stakeholders will also be undertaken. During the development of the PFD, close coordination with the GEF Secretariat and GEF agencies was conducted to support the design of the program framework. The GEF agencies closely coordinated with the country focal points to introduce the program and solicit their participation and endorsement. Possible private sector partners mapped out for the various components of the program/projects were identified and further consulted on a country basis.

96. UNIDO presented the draft PFD Concept during the Chemicals and Wastes Task Force in November 2024 to provide the GEF Secretariat, BRS Secretariat, and GEF agencies an overview of the GEM Program. Email exchanges and interagency calls were also conducted to further agree on the milestones of the PFD development. The interagency call scheduled on 22 February enabled UNIDO to present a revised framework based on the comments received on the circulated concept note version. During this call, a Working Group (WG) comprising of agency focal points was established to finalize the program framework and support its development. The WG conducted several consultative meetings leading to the finalization of the document and presenting it to the GEF Secretariat on 13 March where budget allocation was discussed.

97. As the program necessitates the involvement of global platforms, the following entities were consulted:

(i) Circular Electronics Partnership, a global platform with a vison for a circular electronics by 2030

(ii) StEP Initiatives, a multistakeholder initiative supporting circular economy and zero wastes/emissions

to present the program and see possible engagement of the platform to the program

98. Stakeholder engagement will be the main focus of the preparatory phase to ensure that relevant actors in the electronics sectors are tapped. Further consultations and consultative meetings will be undertaken and their possible roles and engagement defined.

(Please upload to the portal documents tab any stakeholder engagement plan or assessments that have been done during the PFD preparation phase)

Private Sector

Will there be private sector engagement in the program?

Yes

And if so, has its role been described and justified in section B program description?

Yes

Environmental and Social Safeguards

We confirm that we have provided indicative information regarding Environmental and Social risks associated with the proposed program and any measures to address such risks and impacts (this information should be presented in Annex D).

Yes

Overall Project/Program Risk Classification

PIF	CEO Endorsement/Approval	MTR	TE
Medium/Moderate			

E. OTHER REQUIREMENTS

Knowledge management

We confirm that an approach to Knowledge Management and Learning has been clearly described in the Program Description (Section B)

Yes

ANNEX A: FINANCING TABLES

GEF Financing Table

Indicative Trust Fund Resources Requested by Agency(ies), Country(ies), Focal Area and the Programming of Funds

GEF Agency	Trust Fund	Country/ Regional/ Global	Focal Area	Programming of Funds	GEF Program Financing ($)	Agency Fee($)	Total GEF Financing ($)

UNIDO	GET	Philippines	Chemicals and Waste	POPs	4,000,000.00	360,000.00	4,360,000.00
UNIDO	GET	Philippines	Chemicals and Waste	Mercury	1,000,000.00	90,000.00	1,090,000.00
UNIDO	GET	Türkiye	Chemicals and Waste	POPs	4,000,000.00	360,000.00	4,360,000.00
UNIDO	GET	Türkiye	Chemicals and Waste	Mercury	1,000,000.00	90,000.00	1,090,000.00
UNIDO	GET	Peru	Chemicals and Waste	POPs	4,000,000.00	360,000.00	4,360,000.00
UNIDO	GET	Peru	Chemicals and Waste	Mercury	1,000,000.00	90,000.00	1,090,000.00
UNDP	GET	Cambodia	Chemicals and Waste	POPs	3,200,000.00	288,000.00	3,488,000.00
UNDP	GET	Cambodia	Chemicals and Waste	Mercury	800,000.00	72,000.00	872,000.00
UNDP	GET	Colombia	Chemicals and Waste	POPs	4,400,000.00	396,000.00	4,796,000.00
UNDP	GET	Colombia	Chemicals and Waste	Mercury	1,100,000.00	99,000.00	1,199,000.00
UNDP	GET	Viet Nam	Chemicals and Waste	POPs	4,400,000.00	396,000.00	4,796,000.00
UNDP	GET	Viet Nam	Chemicals and Waste	Mercury	1,100,000.00	99,000.00	1,199,000.00
AfDB	GET	Ethiopia	Chemicals and Waste	POPs	2,800,000.00	252,000.00	3,052,000.00
AfDB	GET	Ethiopia	Chemicals and Waste	Mercury	700,000.00	63,000.00	763,000.00
AfDB	GET	Somalia	Chemicals and Waste	POPs	1,680,000.00	151,200.00	1,831,200.00
AfDB	GET	Somalia	Chemicals and Waste	Mercury	420,000.00	37,800.00	457,800.00
AfDB	GET	Djibouti	Chemicals and Waste	POPs	1,120,000.00	100,800.00	1,220,800.00

AfDB	GET	Djibouti	Chemicals and Waste	Mercury	280,000.00	25,200.00	305,200.00
UNEP	GET	Kazakhstan	Chemicals and Waste	POPs	4,000,000.00	360,000.00	4,360,000.00
UNEP	GET	Kazakhstan	Chemicals and Waste	Mercury	1,000,000.00	90,000.00	1,090,000.00
UNEP	GET	Botswana	Chemicals and Waste	POPs	1,336,000.00	120,240.00	1,456,240.00
UNEP	GET	Botswana	Chemicals and Waste	Mercury	334,000.00	30,060.00	364,060.00
UNEP	GET	Eswatini	Chemicals and Waste	POPs	448,000.00	40,320.00	488,320.00
UNEP	GET	Eswatini	Chemicals and Waste	Mercury	112,000.00	10,080.00	122,080.00
UNEP	GET	Lesotho	Chemicals and Waste	POPs	448,000.00	40,320.00	488,320.00
UNEP	GET	Lesotho	Chemicals and Waste	Mercury	112,000.00	10,080.00	122,080.00
UNEP	GET	Mozambique	Chemicals and Waste	POPs	1,336,000.00	120,240.00	1,456,240.00
UNEP	GET	Mozambique	Chemicals and Waste	Mercury	334,000.00	30,060.00	364,060.00
UNEP	GET	Namibia	Chemicals and Waste	POPs	880,000.00	79,200.00	959,200.00
UNEP	GET	Namibia	Chemicals and Waste	Mercury	220,000.00	19,800.00	239,800.00
UNEP	GET	South Africa	Chemicals and Waste	POPs	3,552,000.00	319,680.00	3,871,680.00
UNEP	GET	South Africa	Chemicals and Waste	Mercury	888,000.00	79,920.00	967,920.00
UNIDO	GET	Global	Chemicals and Waste	POPs	6,400,000.00	576,000.00	6,976,000.00
UNIDO	GET	Global	Chemicals and Waste	Mercury	1,600,000.00	144,000.00	1,744,000.00

Total GEF Resources ($)		**5,400,000.00**	**65,400,000.00**

Project Preparation Grant (PPG)

GEF Agency	Trust Fund	Country/ Regional/ Global	Focal Area	Programming of Funds	PPG($)	Agency Fee($)	Total PPG Funding($)
UNIDO	GET	Philippines	Chemicals and Waste	POPs	120,000.00	10,800.00	130,800.00
UNIDO	GET	Philippines	Chemicals and Waste	Mercury	30,000.00	2,700.00	32,700.00
UNIDO	GET	Türkiye	Chemicals and Waste	POPs	120,000.00	10,800.00	130,800.00
UNIDO	GET	Türkiye	Chemicals and Waste	Mercury	30,000.00	2,700.00	32,700.00
UNIDO	GET	Peru	Chemicals and Waste	POPs	120,000.00	10,800.00	130,800.00
UNIDO	GET	Peru	Chemicals and Waste	Mercury	30,000.00	2,700.00	32,700.00
UNDP	GET	Cambodia	Chemicals and Waste	POPs	120,000.00	10,800.00	130,800.00
UNDP	GET	Cambodia	Chemicals and Waste	Mercury	30,000.00	2,700.00	32,700.00
UNDP	GET	Colombia	Chemicals and Waste	POPs	120,000.00	10,800.00	130,800.00
UNDP	GET	Colombia	Chemicals and Waste	Mercury	30,000.00	2,700.00	32,700.00
UNDP	GET	Viet Nam	Chemicals and Waste	POPs	120,000.00	10,800.00	130,800.00
UNDP	GET	Viet Nam	Chemicals and Waste	Mercury	30,000.00	2,700.00	32,700.00
AfDB	GET	Ethiopia	Chemicals and Waste	POPs	63,589.60	5,723.00	69,312.60

AfDB	GET	Ethiopia	Chemicals and Waste	Mercury	15,897.40	1,430.00	17,327.40
AfDB	GET	Somalia	Chemicals and Waste	POPs	48,000.00	4,320.00	52,320.00
AfDB	GET	Somalia	Chemicals and Waste	Mercury	12,000.00	1,080.00	13,080.00
AfDB	GET	Djibouti	Chemicals and Waste	POPs	35,200.00	3,168.00	38,368.00
AfDB	GET	Djibouti	Chemicals and Waste	Mercury	8,800.00	792.00	9,592.00
UNEP	GET	Kazakhstan	Chemicals and Waste	POPs	120,000.00	10,800.00	130,800.00
UNEP	GET	Kazakhstan	Chemicals and Waste	Mercury	30,000.00	2,700.00	32,700.00
UNEP	GET	Botswana	Chemicals and Waste	POPs	40,080.00	3,607.20	43,687.20
UNEP	GET	Botswana	Chemicals and Waste	Mercury	10,020.00	901.80	10,921.80
UNEP	GET	Eswatini	Chemicals and Waste	POPs	13,440.00	1,209.60	14,649.60
UNEP	GET	Eswatini	Chemicals and Waste	Mercury	3,360.00	302.40	3,662.40
UNEP	GET	Lesotho	Chemicals and Waste	POPs	13,440.00	1,209.60	14,649.60
UNEP	GET	Lesotho	Chemicals and Waste	Mercury	3,360.00	302.40	3,662.40
UNEP	GET	Mozambique	Chemicals and Waste	POPs	40,080.00	3,607.20	43,687.20
UNEP	GET	Mozambique	Chemicals and Waste	Mercury	10,020.00	901.80	10,921.80
UNEP	GET	Namibia	Chemicals and Waste	POPs	26,400.00	2,376.00	28,776.00
UNEP	GET	Namibia	Chemicals and Waste	Mercury	6,600.00	594.00	7,194.00

UNEP	GET	South Africa	Chemicals and Waste	POPs	106,560.00	9,590.40	116,150.40
UNEP	GET	South Africa	Chemicals and Waste	Mercury	26,640.00	2,397.60	29,037.60
UNIDO	GET	Global	Chemicals and Waste	POPs	160,000.00	14,400.00	174,400.00
UNIDO	GET	Global	Chemicals and Waste	Mercury	40,000.00	3,600.00	43,600.00
Total PPG Amount ($)					**1,733,487.00**	**156,013.00**	**1,889,500.00**

Sources of Funds for Country Star Allocation

GEF Agency	Trust Fund	Country/ Regional/ Global	Focal Area	Sources of Funds	Total($)
Total GEF Resources					**0.00**

Indicative Focal Area Elements

Programming Directions	Trust Fund	GEF Project Financing($)	Co-financing($)
CW-1	GET	5,000,000.00	35,000,000.00
CW-1	GET	5,000,000.00	45,000,000.00
CW-1	GET	5,000,000.00	35,000,000.00
CW-1	GET	4,000,000.00	26,100,000.00
CW-1	GET	5,500,000.00	28,900,000.00
CW-1	GET	5,500,000.00	18,000,000.00
CW-1	GET	7,000,000.00	80,000,000.00
CW-1	GET	5,000,000.00	35,100,000.00
CW-1	GET	10,000,000.00	29,125,000.00
CW-1	GET	8,000,000.00	32,000,000.00
Total Project Cost		**60,000,000.00**	**364,225,000.00**

Indicative Co-financing

Sources of Co-financing	Name of Co-financier	Type of Co-financing	Investment Mobilized	Amount($)
Recipient Country Government	Department of Environment and Natural Resources	Grant	Investment mobilized	250,000.00
Recipient Country Government	Department of Environment and Natural Resources	In-kind	Recurrent expenditures	750,000.00
Recipient Country Government	Department of Trade and Industry	Grant	Investment mobilized	250,000.00
Recipient Country Government	Department of Trade and Industry	In-kind	Recurrent expenditures	750,000.00
Recipient Country Government	Department of Science and Technology	Grant	Investment mobilized	250,000.00
Recipient Country Government	Department of Science and Technology	In-kind	Recurrent expenditures	750,000.00
Recipient Country Government	Technical Education and Skills Development Authority	Grant	Investment mobilized	500,000.00
Recipient Country Government	Technical Education and Skills Development Authority	In-kind	Recurrent expenditures	2,000,000.00
Recipient Country Government	Philippine Economic Zone Authority	Grant	Investment mobilized	500,000.00
Recipient Country Government	Philippine Economic Zone Authority	In-kind	Recurrent expenditures	1,500,000.00
Recipient Country Government	Subic Bay Metropolitan Authority	Grant	Investment mobilized	500,000.00
Recipient Country Government	Subic Bay Metropolitan Authority	In-kind	Recurrent expenditures	1,500,000.00
Recipient Country Government	Local Government Units	Equity	Investment mobilized	5,000,000.00
Private Sector	To be determined during the PPG	Equity	Investment mobilized	20,000,000.00
Civil Society Organization	To be determined during the PPG	In-kind	Recurrent expenditures	300,000.00

GEF Agency	UNIDO	Grant	Investment mobilized	200,000.00
Recipient Country Government	Ministry of Environment, Urbanization and Climate Change of Türkiye	In-kind	Recurrent expenditures	10,000,000.00
Private Sector	WEEE treatment facilities	Equity	Investment mobilized	35,000,000.00
Recipient Country Government	Ministry of Environment (MINAM)	Grant	Investment mobilized	150,000.00
Recipient Country Government	Ministry of Environment (MINAM)	In-kind	Recurrent expenditures	250,000.00
Recipient Country Government	General Directorate of Environmental Health (DIGESA)	Grant	Investment mobilized	50,000.00
Recipient Country Government	General Directorate of Environmental Health (DIGESA)	In-kind	Recurrent expenditures	100,000.00
Private Sector	WEEE management companies to be confirmed during PPG	In-kind	Recurrent expenditures	500,000.00
Private Sector	WEEE management companies to be confirmed during PPG	Equity	Investment mobilized	15,500,000.00
Private Sector	EEE importing companies to be confirmed during PPG	In-kind	Recurrent expenditures	500,000.00
Private Sector	EEE importing companies to be confirmed during PPG	Equity	Investment mobilized	15,000,000.00
Private Sector	Mobile phone companies to be confirmed during PPG	In-kind	Recurrent expenditures	200,000.00
Private Sector	Technical training institutes and universities to be confirmed during PPG	In-kind	Recurrent expenditures	100,000.00
Civil Society Organization	To be confirmed during the PPG	In-kind	Recurrent expenditures	50,000.00
GEF Agency	UNIDO	In-kind	Recurrent expenditures	50,000.00
GEF Agency	UNIDO	Grant	Investment mobilized	50,000.00
Private Sector	Mobile phone companies to be confirmed during PPG	Equity	Investment mobilized	2,500,000.00

Recipient Country Government	Ministry of Environment	In-kind	Recurrent expenditures	4,000,000.00
Recipient Country Government	Ministry of Industry Science Technology and Innovation (MISTI)	In-kind	Recurrent expenditures	1,000,000.00
Donor Agency	World Bank	Grant	Investment mobilized	13,500,000.00
Private Sector	To be identified during PPG	Equity	Investment mobilized	4,000,000.00
Private Sector	To be identified during the PPG	In-kind	Recurrent expenditures	3,000,000.00
GEF Agency	UNDP	In-kind	Recurrent expenditures	500,000.00
Others	Global E-waste Statistics Partnership (GESP)	In-kind	Recurrent expenditures	100,000.00
Recipient Country Government	Minambiente	In-kind	Recurrent expenditures	1,100,000.00
Recipient Country Government	Computadores para Educar	Public Investment	Investment mobilized	4,000,000.00
Private Sector	To be determined during the PPG	Equity	Investment mobilized	23,800,000.00
Recipient Country Government	Ministry of Natural Resources and Environment	In-kind	Recurrent expenditures	2,000,000.00
Recipient Country Government	Ministry of Industry and Trade	In-kind	Recurrent expenditures	1,000,000.00
Private Sector	Business in the EEE value chains	Equity	Investment mobilized	14,000,000.00
Civil Society Organization	Business Associations	Equity	Investment mobilized	1,000,000.00
GEF Agency	African Development Bank	Loans	Investment mobilized	80,000,000.00
Recipient Country Government	Ministry of Ecology and Natural Resources of Kazakhstan	In-kind	Recurrent expenditures	18,500,000.00
Recipient Country Government	Ministry of Industry and Construction of Kazakhstan	In-kind	Recurrent expenditures	3,500,000.00

GEF Agency	UNEP	In-kind	Recurrent expenditures	500,000.00
Private Sector	Ewaste processing companies	Other	Investment mobilized	8,600,000.00
Others	EBRD	Other	Investment mobilized	1,000,000.00
Others	Kazakh Association for Waste Management “Kazwaste”	Other	Recurrent expenditures	2,750,000.00
Others	Center "Cooperation for Sustainable Development of the Republic of Kazakhstan" (CSD Center)	In-kind	Recurrent expenditures	250,000.00
Recipient Country Government	Botswana	In-kind	Recurrent expenditures	750,000.00
Recipient Country Government	Eswatini	In-kind	Recurrent expenditures	250,000.00
Recipient Country Government	Lesotho	In-kind	Recurrent expenditures	250,000.00
Recipient Country Government	Namibia	In-kind	Recurrent expenditures	500,000.00
Recipient Country Government	Mozambique	In-kind	Recurrent expenditures	750,000.00
Recipient Country Government	South Africa	In-kind	Recurrent expenditures	2,000,000.00
GEF Agency	UNEP	In-kind	Recurrent expenditures	500,000.00
Private Sector	E-waste processing companies Botswana	Other	Recurrent expenditures	4,125,000.00
Private Sector	E-waste processing companies Eswatini	Other	Recurrent expenditures	1,375,000.00
Private Sector	E-waste processing companies Lesotho	Other	Recurrent expenditures	1,375,000.00
Private Sector	E-waste processing companies Namibia	Other	Recurrent expenditures	2,750,000.00
Private Sector	E-waste processing companies Mozambique	Other	Recurrent expenditures	1,500,000.00

Private Sector	E-waste processing companies South Africa	Other	Recurrent expenditures	10,000,000.00
Others	Africa Institute	In-kind	Recurrent expenditures	1,000,000.00
Civil Society Organization	Southern African E-waste Alliance	In-kind	Recurrent expenditures	1,000,000.00
Civil Society Organization	E-Waste Recycling Authority (ERA) South Africa;	In-kind	Recurrent expenditures	500,000.00
Civil Society Organization	South African Waste Electrical and Electronic Enterprise Development Association	In-kind	Recurrent expenditures	500,000.00
Civil Society Organization	Global Electronics Platforms	In-kind	Recurrent expenditures	10,000,000.00
Private Sector	Global Electronics Brands	Equity	Investment mobilized	20,000,000.00
Civil Society Organization	To be determined during the PPG	In-kind	Recurrent expenditures	2,000,000.00
Total Co-financing				**364,225,000.00**

ANNEX B: ENDORSEMENTS

GEF Agency(ies) Certification

GEF Agency Type	Name	Date	Project Contact Person	phone	Email
GEF Agency Coordinator	UNIDO		Ganna Onysko	+431260263647	G.Onysko@unido.org
Project Coordinator	UNIDO		Carmela Centeno	+431260263385	C.CENTENO@unido.org

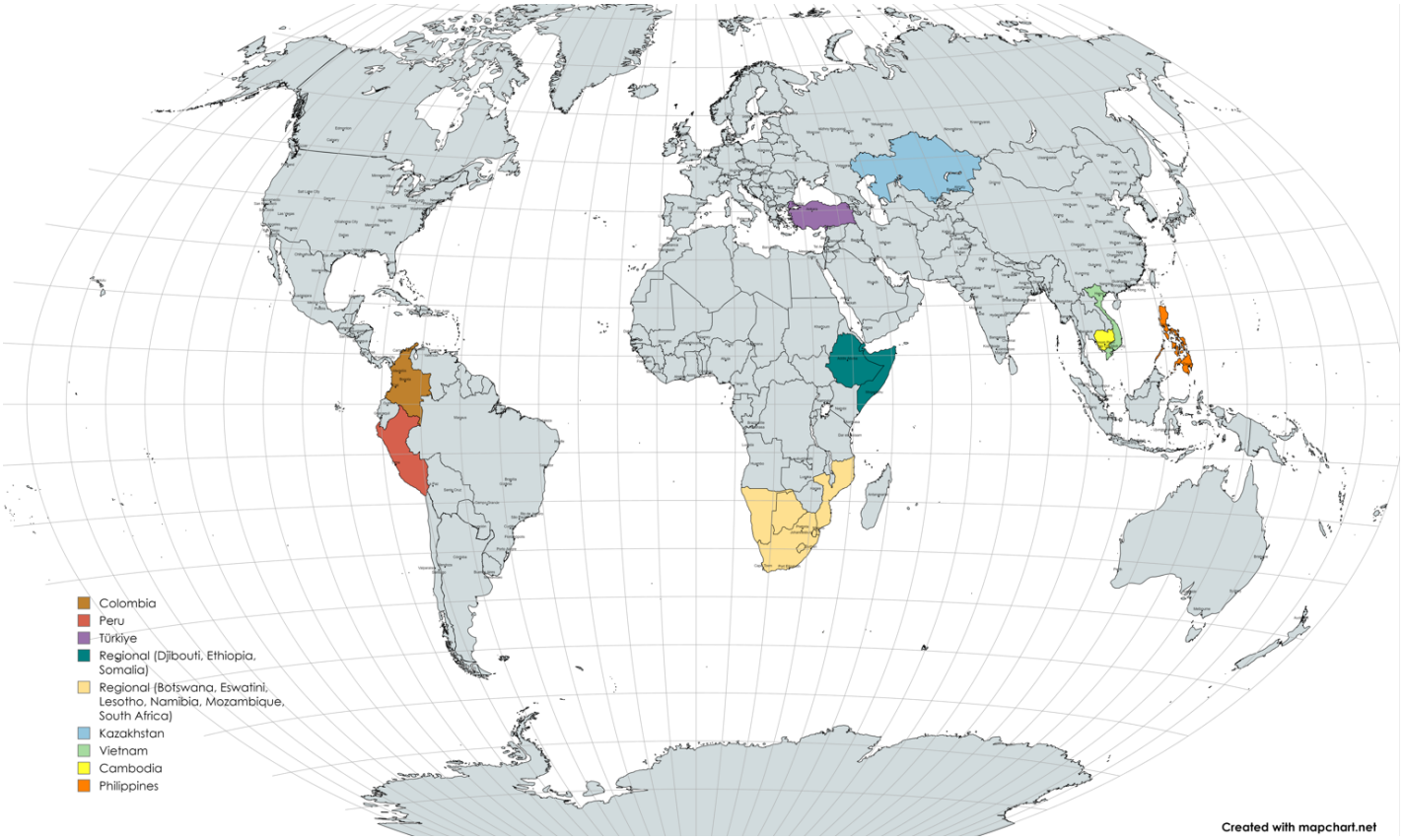
Record of Endorsement of GEF Operational Focal Point (s) on Behalf of the Government(s):

Name	Position	Ministry	Date (MM/DD/YYYY)
Atty. Analiza Rebuelta-Teh	Undersecretary for Finance, Information Systems and Climate Change	Department of Environment and Natural Resources (Philippines)	3/13/2024
Mr. Ahmet Bağci	Deputy Minister	Ministry of Agriculture and Forestry (Turkiye)	3/15/2024

Mr. Liban Mohamed Abdulkadir	Operational Focal Point	Ministry of Environment and Climate Change (Somalia)	3/17/2024
Mr. Mensur Dessie Nuri	Director	Ministry of Planning and Development/EPA (Ethiopia)	3/19/2024
Mr. Dini Abdallah Omar	Secretary General	Ministry of Habitat and Environment (Djibouti)	3/19/2024
Mr. Mauricio Gonzales Del Rosario	Head, General Office for Cooperation and International Affairs	Ministry of Environment (Peru)	3/19/2024
Ms. Maria Teresa Becerra Ramirez	Head of International Affairs Office	Ministry of Environment and Sustainable Development (Colombia)	3/19/2024
Ms. Shahkira Parker	Senior Policy Advisor: International Governance Management	Department of Forestry, Fisheries and the Environment (South Africa)	3/19/2024
Ms. Khangeziwe Glory Mabuza	Principal Secretary	Ministry of Tourism and Environmental Affairs (Eswatini)	3/18/2024
Ms. Saule Sabieva	Director for Climate Policies	Ministry of Ecology and Natural Resources (Kazakhstan)	3/7/2024
Mr. San Vanty	Permanent Secretary of State	Ministry of Environment (Cambodia)	3/19/2024
Mr. Nguyen Duc Thuan	Director	Vietnam Environment Protection Fund Ministry of Natural Resources and Environment	4/3/2024
Mr. Teofilus Nghitila	Executive Director	Ministry of Environment, Forestry and Tourism (Namibia)	4/15/2024
Mr. Eduardo Baixo	Head	Department of Mitigation and Low Carbon Development, Ministry of Land and Environment (Mozambique)	4/1/2024
Ms. Malebogo Somolekae	GEF OFP and Research Coordinator	Department of Environmental Affairs (Botswana)	4/3/2024
Ms. Qongqong Hoohlo	Director	Department of Environment, Ministry of Environment and Forestry (Lesotho)	4/3/2024
Mr. Ahmet Bağci	Deputy Minister	Ministry of Agriculture and Forestry (Turkiye)	4/16/2024
Ms. Maria Teresa Becerra Ramirez	Head of International Affairs Office	Ministry of Environment and Sustainable Development (Colombia)	3/19/2024

ANNEX C: PROGRAM LOCATION

Please provide geo-referenced information and map where the project interventions will take place



ANNEX D: ENVIRONMENTAL AND SOCIAL SAFEGUARDS SCREEN AND RATING

(Program level) Attach agency safeguard screen form including rating of risk types and overall risk rating.

Title
Annex I Preliminary Stakeholders Engagement Plan
ES_Screening_GEM

ANNEX E: RIO MARKERS

Climate Change Mitigation	Climate Change Adaptation	Biodiversity	Decertification

No Contribution 0	No Contribution 0	No Contribution 0	No Contribution 0

ANNEX F: TAXONOMY WORKSHEET

The Taxonomy Worksheet is provided below:

Level 1	Level 2	Level 3	Level 4
Influencing Models	- Strengthen institutional capacity and decision making - Transform policy and regulatory environments - Demonstrate innovative approaches - Convene multi-stakeholder alliance		
Stakeholders	Local communities	Information dissemination Partnership Consultation Participation	
	Civil Society	Non-governmental Organization Community based organization Academia	
	Private Sector	Financial intermediaries and market facilitator SMEs Large corporations	
	Beneficiaries	Communications Education Strategic communication Awareness raising Behavior change	
Capacity, Knowledge and Research	Capacity Development Innovation		
	Knowledge Exchange	South-south Conference Peer to peer	

		Field visit	
	Knowledge generation	Workshop Seminar Training	
Gender Equality	Gender Results Area	Participation and leadership Knowledge generation and Exchange Awareness raising Capacity development	
	Gender mainstreaming	Gender sensitive indicators Beneficiaries Sex-disaggregated indicators Women groups	
Focal Area/Theme	Chemicals and Waste	Best Available Technology/ Best Environmental Practice	
		Waste Management	Ewaste Hazardous waste management
		Disposal	
		Persistent Organic Pollutants	Unintentional Persistent Organic Pollutants New Persistent Organic Pollutants
		Sound management of chemicals and waste	

ANNEX H : CHILD PROJECT INFORMATION

Title

Letters of Endorsement_compiled

Child Projects Concept Notes

Child Projects under the Program

Country	Project Title	GEF Agency	GEF Amount ($) PROJECT FINANCING	Agency Fees($)	Total($)
	FSPs				

Colombia	Strengthening the value chain for WEEE management in Colombia.	UNDP	5,500,000.00	495,000.00	5,995,000.00
Viet Nam	Reduce waste and chemicals of concerns through promoting circularity in electric and electronic management in Viet Nam	UNDP	5,500,000.00	495,000.00	5,995,000.00
Regional	Electronics management for sustainable ICT solutions in the Horn of Africa (HoA)	AfDB	7,000,000.00	630,000.00	7,630,000.00
Regional	Promoting circularity and resource efficiency in the electronics value chain across southern African countries	UNEP	10,000,000.00	900,000.00	10,900,000.00
Global	GEM Program Global Child Project: Coordination and Knowledge Management	UNIDO	8,000,000.00	720,000.00	8,720,000.00
	Subtotal ($)		36,000,000.00	3,240,000.00	39,240,000.00
	MSPs				
Philippines	Sustainable electronics management in the Philippines	UNIDO	5,000,000.00	450,000.00	5,450,000.00
Türkiye	Sustainable electronics management in the Republic of Türkiye	UNIDO	5,000,000.00	450,000.00	5,450,000.00
Peru	Sustainable electronics management in Peru	UNIDO	5,000,000.00	450,000.00	5,450,000.00
Cambodia	Global Electronics Management (GEM) Program Child Project in Cambodia	UNDP	4,000,000.00	360,000.00	4,360,000.00
Kazakhstan	Promoting circularity and resource efficiency in the electronic value chain in Kazakhstan	UNEP	5,000,000.00	450,000.00	5,450,000.00
	Subtotal ($)		24,000,000.00	2,160,000.00	26,160,000.00

	Grant Total ($)		60,000,000.00	5,400,000.00	65,400,000.00