Proposed study on Technical Costs

Management of Post-Consumer Electrical and Electronic Equipment in Indonesia







Research group activity

Your office has been tasked with conducting research in the following areas:

- Collecting data to inform how much access to waste costs are.
- Collection costs
- Transportation costs
- Recycling costs
- EEE ownership
- E-waste generation rates
- EEE put-on-market amounts

Please consult with your group and come up with a plan for each area of research in response to the following questions:

- What data will you aim to collect?
- What methods will you use to collect this data?
- From which sources would you aim to get the data?
- Which stakeholders will you involve / approach in the data collection?

Three Pillars



Foundational Principles

Cost-effectiveness

Regardless of whether the cost burden falls on producers, consumers, or the government, the system must remain economically efficient to ensure long-term viability.

Full cost coverage

Fees must be sufficient to cover the entire costs of environmentally sound e-waste management, including collection, transportation, treatment, and safe disposal.



E-waste flows & priority setting



Policymakers / legislation focus



Business focus

	Category	Weight / Size	Environmental / Health	Material value
1	1. Cooling & Freezing (CFCs)	High	High	Medium
Ŭ	2. Screen	High	High	Medium
Ŷ	3. Lamps (with mercury)	Low	High	Low
<u></u>	4. Large household appliances	High	Low	Medium / High
	5. Small household appliances	Medium	Low	Medium
	6. IT and Consumer Equipment	Medium	High	High

Research Objective

To assess the technical costs involved in managing post-consumer electronics within a selected province in Indonesia for a selected category of electronic equipment.



The study is intended as an internal reference for the government in shaping e-waste regulation and financial mechanisms as well as to complement the ongoing and anticipated projects led by Japan and Germany.

Rationale

- Indonesia is a vast and diverse country, with significant regional variations in population density, e-waste generation, collection infrastructure, and treatment capacity.
- A uniform, nationwide fee system may not accurately reflect the true costs associated with e-waste management in respective provinces.
- The cost of transporting e-waste to treatment centres varies significantly based on distance and logistical challenges, impacting the overall cost structure.
- Therefore, estimating the EHF at the provincial level is a more effective approach, even more so is having the payment made upon the point of purchase.



EHF Calculation Methodology





Approach

To ensure accuracy and feasibility, the study will adopt a multistakeholder and data-driven approach, including:

- Independent Evaluation cost assessments based on industry benchmarks and best practices.
- Stakeholder consultations Engagement with government agencies, producers, retailers, recyclers, and waste management organizations to gather insights on cost structures, operational challenges, and financial requirements.



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Access to Waste

Costs (or revenues) to get the waste from the original holder (the consumer).

In many developed countries, consumers dispose of their waste for free, sometimes they even have to pay.

In developing countries, the holder of the product to be discarded expects an economic compensation in most cases.

Access to waste is considered a cost when the waste holder receives economic compensation, and revenue if the consumer pays to dispose of his/her waste.





Access to Waste

This cost varies significantly depending on consumer behaviour and socio-economic factors.

Estimation Approach

Survey & Stakeholder Interviews

- Conduct surveys and interviews with households, informal collectors, repair shops, and waste aggregators to assess current consumer disposal practices and price expectations.
- Identify whether consumers expect compensation for returning e-waste or are willing to pay for proper disposal.

Market Price Benchmarking

- Compare access-to-waste costs in similar markets (e.g., other Southeast Asian countries).
- Assess price differences across various product categories (e.g., smartphones, laptops, routers).

Reverse Supply Chain Analysis

- Evaluate the existing e-waste recovery channels, including informal sector involvement, trade-in programs, and producer take-back schemes.
- Identify potential leakage points where e-waste might be lost to informal recycling or exported.

Sample questionnaire

Household post-consumer electronics disposal survey 1. How do you usually dispose of your old or broken electronic devices? (Select all that apply) □ Sell to scrap dealers or informal collectors □ Return to retailer/manufacturer (e.g., trade-in, take-back programs) Drop off at formal recycling centres or government programs Dispose with general household waste Give away to family, friends, or donation programs □ Other (please specify) 2. Have you ever been paid for handing over your e-waste (e.g., selling to collectors, retailers, recyclers)? □ Yes, regularly □ Yes, occasionally □ No 3. If yes, how much do you typically receive for different types of e-waste? (Approximate per unit) Mobile phones: _____ o Small appliances (e.g., toasters, blenders): Other (please specify): _____

Data Sources

- Consumer behaviour surveys
- Interviews with informal sector actors
- Producer and retailer trade-in schemes
- Case studies from similar markets

Collection



Includes the cost of hiring, purchasing (or the corresponding depreciation of) items like containers, cages and bins used to collect and store waste.

In certain cases, it also includes the cost of paying municipal facilities for collection services they provide.

It also includes the salaries of staff.



Collection

Collection costs include infrastructure investment, operational expenses, and workforce costs related to gathering e-waste from consumers or designated drop-off points.

Estimation Approach

Collection Infrastructure Costing

- Determine costs of containers, cages, bins, collection centers, and reverse vending machines required for e-waste storage.
- Use depreciation calculations for reusable infrastructure investments.

Operational & Personnel Costing

- Estimate staff wages for waste collectors, drivers, and sorting personnel based on industry salaries and labour market data.
- $_{\circ}$ $\,$ Factor in administrative costs related to collection management.

Sample questionnaire

Section	Question	Responses	
	5.1.1.Name of Facility		
5.1. General Information	5.1.2. Location (City/Region)		
	5.1.3.Type of Facility (Warehouse/ Dismantling Facility/ Both)		
	5.2.1. Total covered area of your warehouse		
5.2. Warehouse Details	5.2.2. Monthly cost of renting the warehouse		
	5.4.1. Costs associated with electricity usage		
5.4. Operational Costs	5.4.2. How many staffs and what are their positions in your facility? E.g. Logistis Technician/Engineer Sorter		
	5.4.3. Average monthly labor costs for each position		
	5.4.4. What are the costs for other materials used in the facility e.g. Big bags, Palettes? (specify type and associated costs)		
5.5. Additional Information	5.5.1. Additional costs or fees not mentioned above (specify)		

Data Sources

- Cost data from existing waste management programs in Indonesia
- Interviews with municipal waste authorities and recycling firms
- Infrastructure cost estimates from vendors

Transportation

Costs to transport the waste from the collection point or from the consumers' houses/places to the treatment plant.





Transportation

Transportation involves moving e-waste from collection points to treatment and recycling facilities.

Estimation Approach

Distance Analysis

Map out collection points, transfer stations, and treatment facilities to estimate 0 the average transportation distance.

Vehicle & Fuel Costing

- Estimate fuel, vehicle maintenance, and driver salaries based on standard 0 transportation costs in Indonesia.
- Compare costs for different vehicle types (trucks, vans, electric vehicles). 0

Load & Frequency Calculation

Assess average e-waste volume per transport cycle to determine the required 0 number of trips and vehicle capacity utilization.

Sample calculation

Key Inputs

Fuel consumption (i) | Route distance (km) | Fuel cost (\$/i) | Vehicle load capacity (kg ort) | Labor costs: per hour pay for driver and loaders | Other costs: lodging, hazardous/risk pay (if applicable) 1. Diesel Required (I) Diesel Required (I) = Distance (km) × Fuel Consumption (I/km) 2. Fuel Costs Fuel Costs (\$) = Diesel Required (I) × Diesel Cost 3. Allocate Costs by Load Divide the total fuel cost by the total load (t) to find the cost per ton. Fuel cost per ton = Fuel Costs / Vehicle Load (t) 4. Add Labour Costs Include labour costs for drivers and loaders: i. Driver Pay (\$/hr), Loader Pay (\$/hr) ii. Multiply pay by the hours required for the trip. 5. Include Other Costs (Optional) i. Lodging Costs (\$) ii. Hazardous/Risk Pay (\$) Total Transportation Cost = Fuel Costs + Labour Costs + Other Costs Cost per ton=Total transportation cost / e-waste quantity

Data Sources

- GIS mapping of e-waste collection and treatment routes
- Fuel cost data from logistics companies
- Interviews with transport service providers

Recycling



- Each treatment plant incurs operation costs including labour, energy, and costs related to capital investment depreciation and the functioning of the plant itself.
- After dismantling, the resulting fractions are sold on the national or international commodities markets; some fractions have positive value (representing a revenue) while others have a negative value (representing a cost).
- The evaluation of the net treatment cost is based on a straightforward economic balance of all costs and revenues.



Recycling

Treatment costs cover the sorting, dismantling, shredding, and processing of e-waste at recycling facilities. The net treatment cost will be calculated based on the balance between processing expenses and revenue from recovered materials.

Estimation Approach

Direct Processing Costs:

 Calculate expenses related to energy consumption, labour wages, equipment operation, plant maintenance, and depreciation of capital investments.

Material Recovery & Market Price Analysis:

- Identify key material fractions (e.g., gold, silver, copper, plastics, hazardous waste) and evaluate their market value.
- Assess net cost implications by balancing material recovery revenue vs. disposal costs for non-recyclable fractions.

Treatment Efficiency Benchmarking

- Compare treatment costs across different facility types (manual dismantling vs. automated processing).
- Study existing e-waste recycling plants in Indonesia and neighbouring countries to benchmark costs.

Financial modelling



Data Sources

- Financial reports from e-waste treatment facilities
- Commodity price indices for recovered materials
- Interviews with recycling plant operators

Summary of cost estimation methodology

Component	Estimation Approach	Key Data Sources
Access to Waste	Surveys, price benchmarking, supply chain analysis	Consumer surveys, informal sector interviews, trade-in programs
Collection	Infrastructure costing, workforce analysis,	Waste management cost data, stakeholder consultations, industry benchmarks
Transportation	Route mapping, vehicle cost modelling, load frequency analysis	GIS mapping, transport service pricing, logistics firm interviews
Treatment	Direct processing cost calculation, market price assessment, facility benchmarking	Recycling facility reports, commodity price indices, recycler interviews

Once the individual cost components are estimated, the total annual cost of e-waste management for each product category will be derived using:

Total Cost= \sum (Access Cost + Collection Cost + Transport Cost + Treatment Cost)

Proposed implementation timeline

Conduct site visits and interviews with recyclers, waste collectors, treatment facilities, and municipal authorities.
Analyse informal sector involvement in e-waste management.
Benchmark e-waste handling costs with other similar markets.

Validate cost estimates through stakeholder consultations.
Conduct impact assessment on consumer affordability, market competitiveness, and compliance feasibility.



- Define criteria for selecting the province based on e-waste generation, infrastructure, and stakeholder engagement potential.

- Collect preliminary data on e-waste flows, existing policies, and informal sector involvement.

- Conduct initial consultations with key stakeholders (industry associations, recyclers and consumer groups).

- Calculate operational costs for collection, transportation, and treatment of small IT and telecom equipment product categories.
- Determine cost allocation per product category and establish per ton cost estimates.

- Develop an implementation roadmap for the EHF system, outlining roles and responsibilities of stakeholders.
- Present key findings and recommendations to policymakers and industry representatives. Finalize and submit the study report.

Outcomes

- A provincial-level estimation of technical costs for small IT and telecom equipment.
- A structured fee model based on real cost assessments.
- A data-driven approach to inform national regulation on e-waste.

This study will provide a foundation for sustainable ewaste management financing in Indonesia, ensuring ensuring a fair and economically viable steady flow of financing for e-waste management, while balancing economic and environmental considerations.



Discussion



Approvals

Determining what approvals, if any, would be required at the provincial level and from the Ministry of Interior/Home Affairs to conduct the study.

Establishing a clear plan to secure necessary commitments.

Identification of suitable province

Determining factors:

Population density

D E-waste generation trends

□ Existing waste management infrastructure

□ Stakeholder engagement potential



Identification of suitable province

Any other determining factors?



Figure 4: Percentage of households and businesses in Kenya that possess at least one product

98%



Possession rate - Kenya households Possession rates - Kenvan businesses

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Scope of Products to be covered

EPR registration renewal and payment



Import approval basis EPR registration





Quick Questions Group Activity

Group One

- 1. What content would you put in future EPR management plans?
- What information should the national registry contain? – permits, products, fee details
- 3. How long should the EPR permit be valid for? How frequently should the EPR Management Plan be submitted? How often should reporting be made on the implementation of the EPR Management Plan?

Groups Two and Three

- Do you agree with the tier system for producers? What should be the limits be for the tiers based on your current understanding? Do you think the two tiers must be broken down into additional tiers?
- 2. Do you agree with the tier system for distributors? How would you tier them (e.g. by floor space / sales etc.)?
- 3. Do you agree with making payments through the OSS (i.e. for the payment by producers upon registration renewal)?

Informal Sector Group Activity

You are strategy manager for one of the Provincial EEHF Schemes and your objective is to increase involvement and engagement, to improve, the integration of the informal sector in your province. What strategies and initiatives would you propose deploying to the head of the scheme?

THANK YOU