



A MATERIAL FLOW STUDY OF POST-CONSUMER PVCs AND DATABASE OF PVC RECYCLING IN INDONESIA (UPDATED DATA FOR 2024)

Tuesday, 16th December 2025

OUTLINE



Introduction



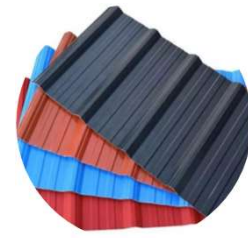
Objective&Scope



Research Timeline



Methodology



Result, Discussion &
Recommendations



01

Introduction

Background



PVC

Polyvinyl chloride

is **one of the most widely used synthetic resins** due to the inherent properties, such as durability, resistance to corrosion, cost-effective, and high performance.

Product

- Pipes
- Fittings
- Profiles
- Roofing
- Cables
- Hoses
- Sheets & Films
- Bottles
- Household Appliances
- Footwear
- Toys
- Medical Applications
- etc

Environmental Issues

- ❖ The widespread use of PVC → increased PVC waste in landfills.
- ❖ **Risks:** Soil pollution (poor landfill), dioxins (improper burning)
- ❖ **Recycling** = the best option to reduce environmental impact.

Previous Study (2024)

- Recycling capacity database: 60.36 KT
- estimated future potential: ≥165.32 KT
- Need to identify more PVC recyclers to unlock this potential.



Need for Better Data

- The limited availability of data
- Lack the necessary foundation to design well-informed strategies.



Material Flow Analysis

can act as key indicators to evaluate PVC flow throughout its lifecycle and identify areas for improvement in material usage.

input policy improvements

Background



INDONESIA's Gaps

- ✗ There is no integrated data on the entire life cycle of PVC
- ✗ Limited information on environmental impact.
- ✗ Rely heavily on informal sector (waste pickers/junkshops)



Need for MFA

An understanding of the PVC supply chain is needed for regulatory improvements and waste management.



Study Continuation (Phase 3)

Sampling Development

- + MFA value update.
- + Addition of 20,000 tons to the recycling database.
- + Expansion of open dumping sampling.
- + Phase 1: Bantargebang site (Non SNI)
- + Phase 2: Cipeucang site (SNI method)
- + **Phase 3: (SNI method)**
 1. Jatiwaringin site
 2. Jalupang site
 3. Cilowong site

Location Criteria

- Population
- Waste Generation
- Waste Collection
- Industry estate
- Coastline

02

Objective & Scope

Study Objectives



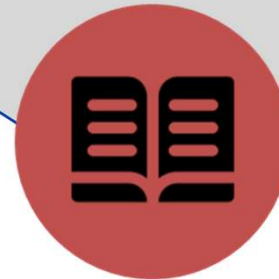
To **conduct sampling at three open dumping sites** to determine the post-consumer PVC composition that represents cities in Java island based on the sampling matrix created for Java island



To **identify the national PVC recycling capacity** in Indonesia in order to acknowledge the current PVC recycling amount with additional of 20,000 tonnes of post-consumer PVC and to update the current PVC recycling capacity data (2023 & 2024)



To **enhance the accuracy of Application Service Lifetime and Service Life Distribution** in order to improve the reliability of the MFA study in estimating amount of post-consumer PVC generation in 2024



To **determine** the most up-to-date **amount of post-consumer PVC** in 2024 through a Material Flow Analysis (MFA) study, providing baseline for designing effective post-consumer PVC management strategies.



03

Research Timeline

Research Timeline



Sampling at Bantargebang

Sampling at Cipeucang site

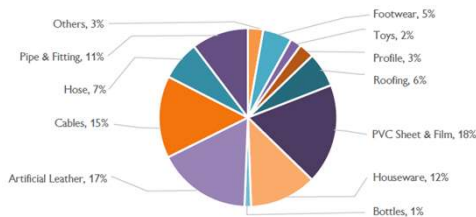


Jatiwaringin, Cilowong and Jalupang site



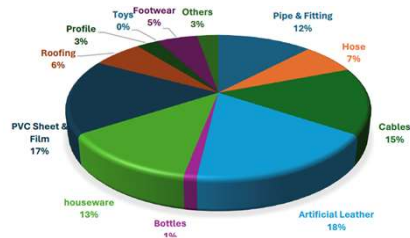
YEAR-1 (2022)

- PVC sampling at Bantargebang site in West Java Province
- Site visit to junkshops
- Site visit to recycler (5 recyclers)



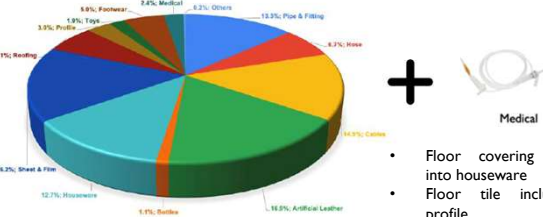
YEAR-2 (2023)

- PVC sampling at Cipeucang site
- Site visit to junkshops
- Site visit to recycler (+3 recyclers)



YEAR-3 (2024)

- PVC sampling at 3 sites (Jatiwaringin, Cilowong and Jalupang)
- Site visit to junkshops
- Site visit to recycler (+5 recyclers)



- Floor covering included into houseware
- Floor tile included in profile

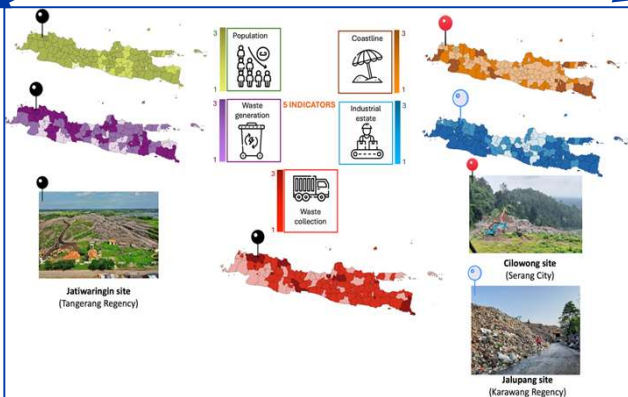
03

Methodology

Methodology – sampling activity

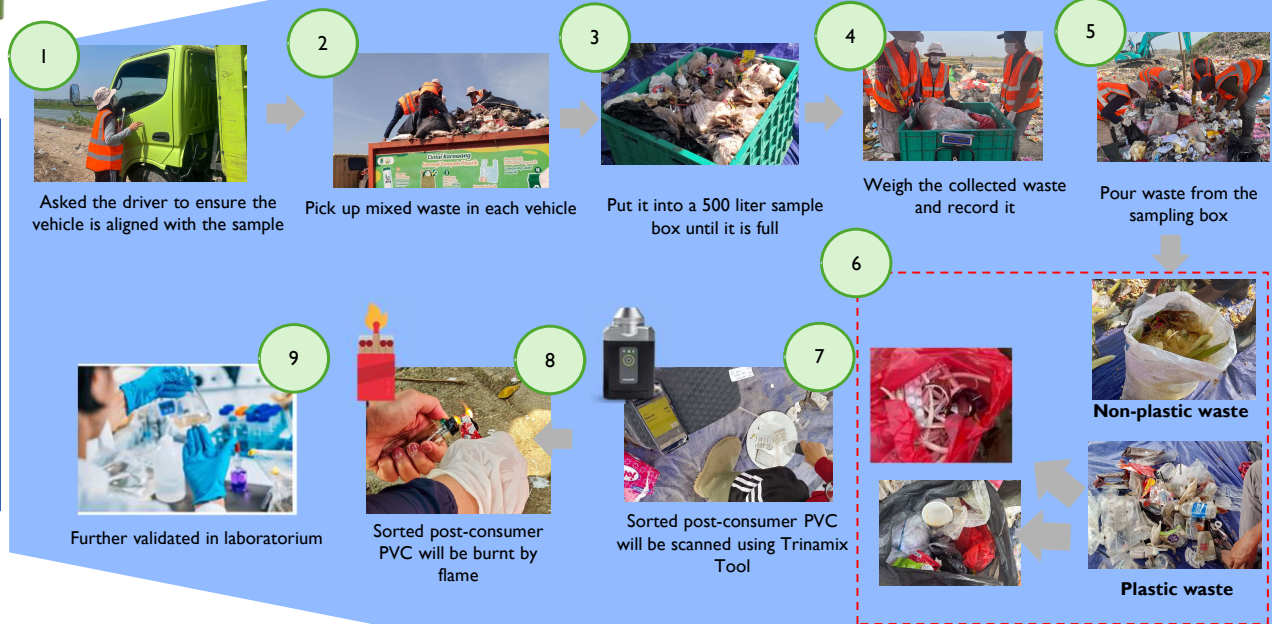


56% of Indonesia population

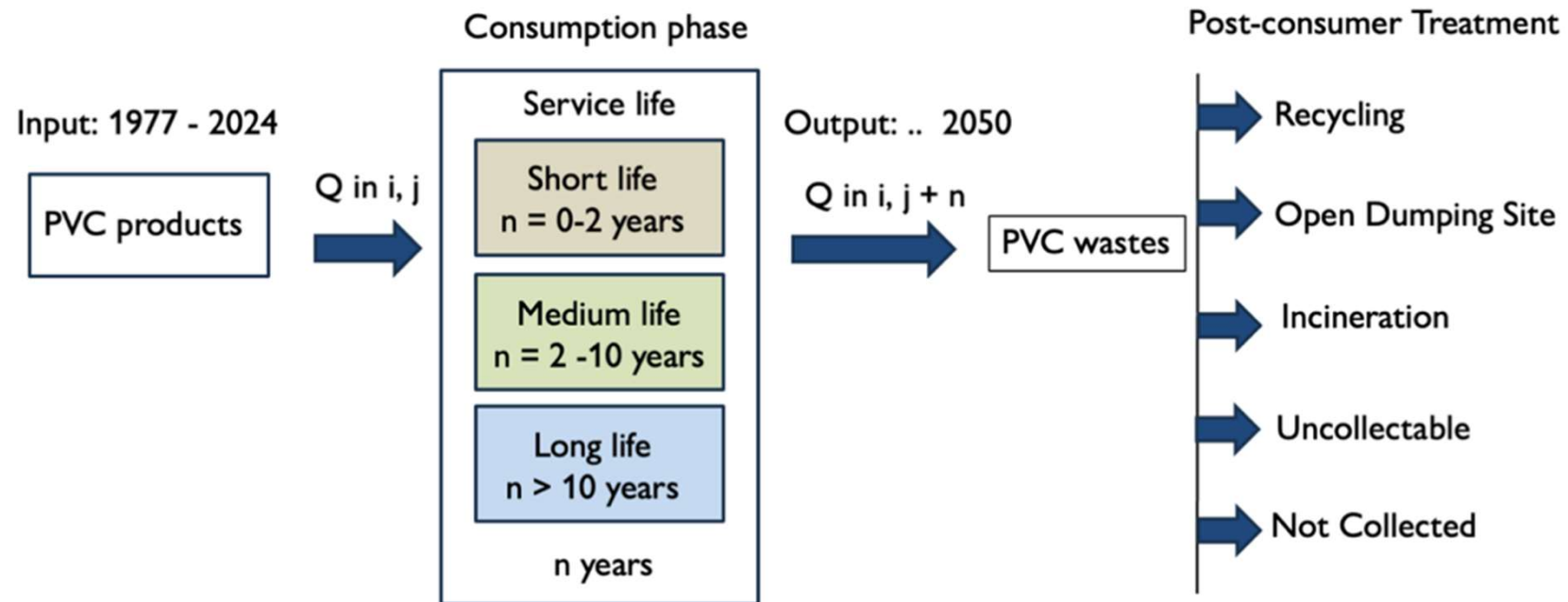


Matrix was used to determine the sampling location. There are 5 indicators used:

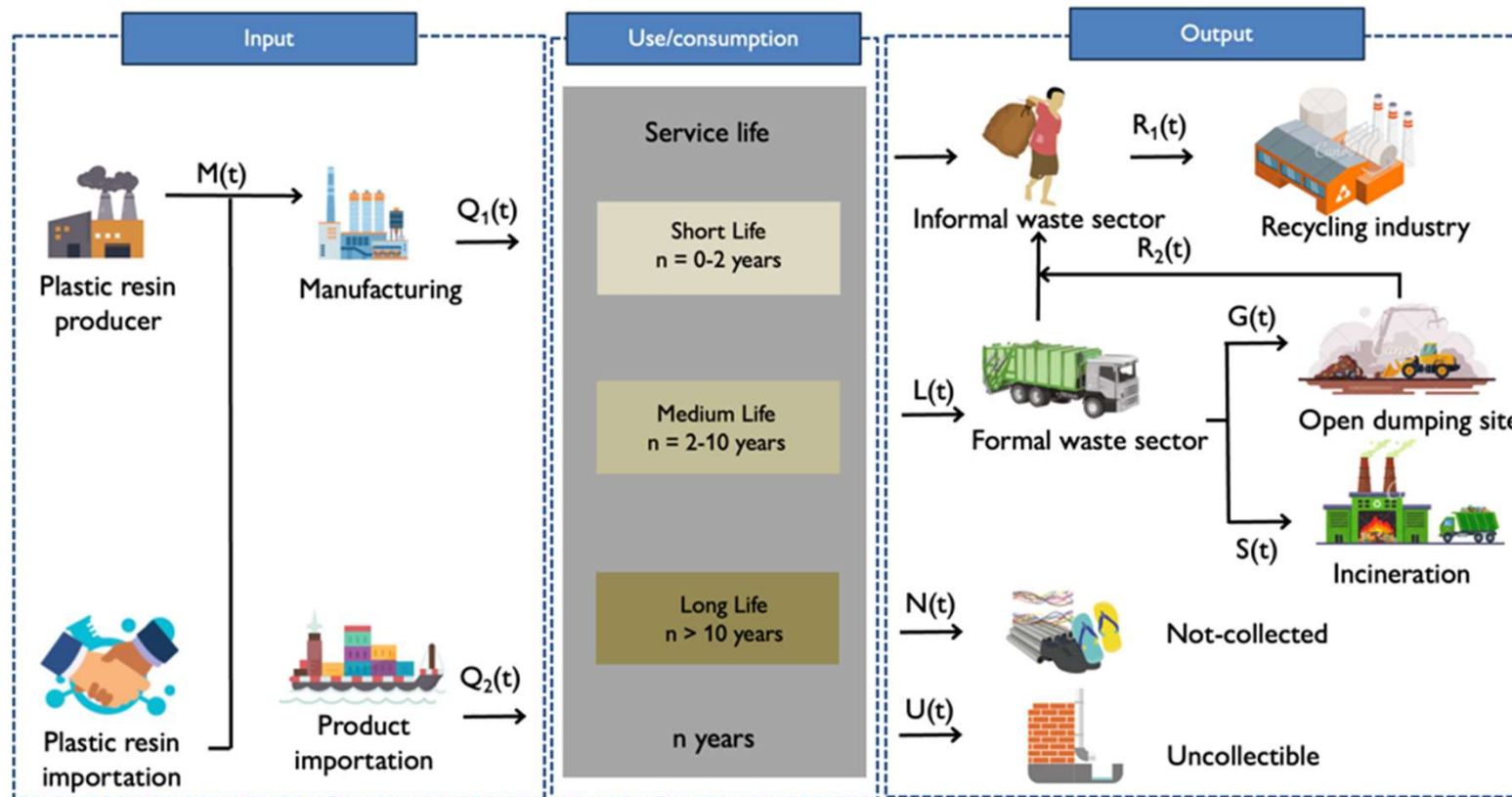
- Jatiwaringin site (population, waste generation and waste collection)
- Jalupang site (industrial estate)
- Cilowong site (coastline)



Methodology – Material Flow Analysis (MFA)



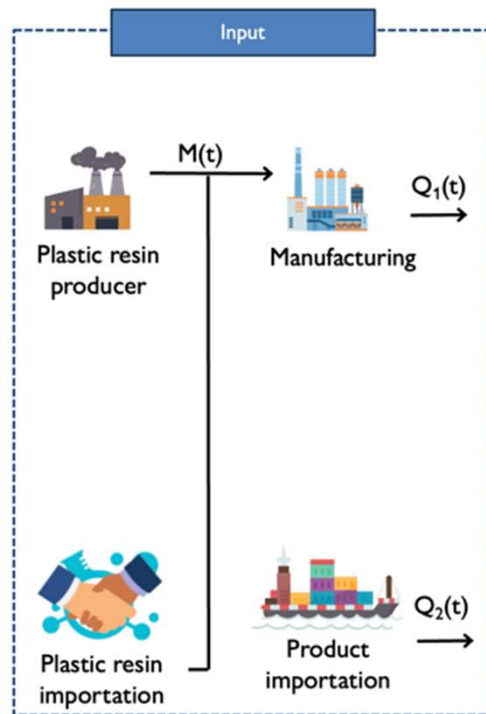
Methodology – Material Flow Analysis (MFA)



Methodology – Material Flow Analysis (MFA)

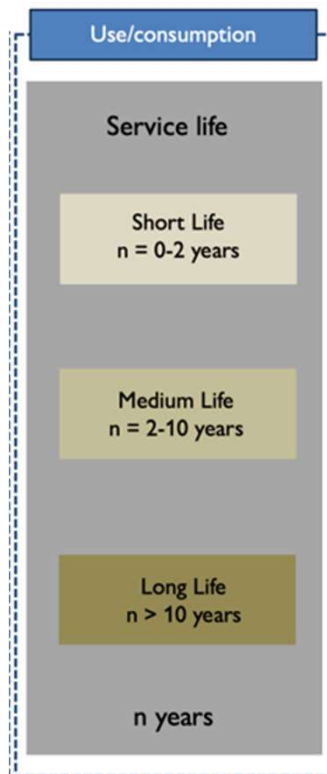


Input Phase of PVC Product



Methodology – Material Flow Analysis (MFA)

Use Phase of PVC Product

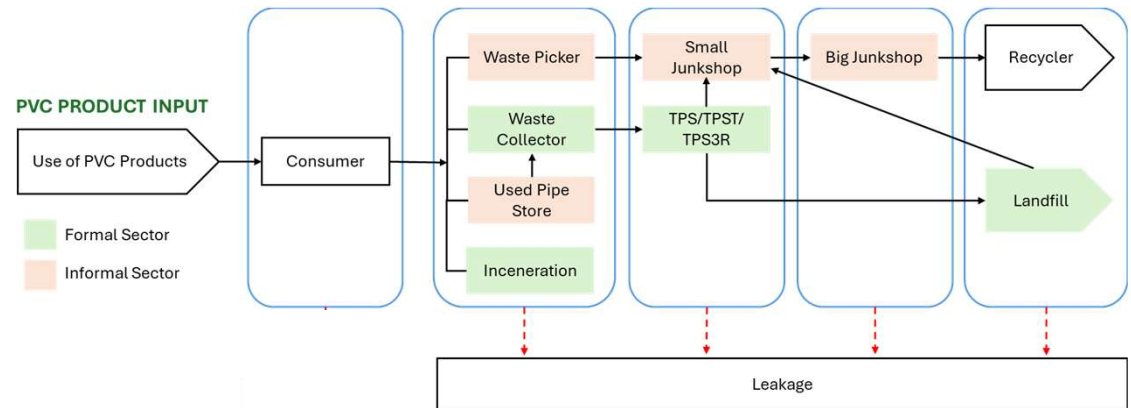
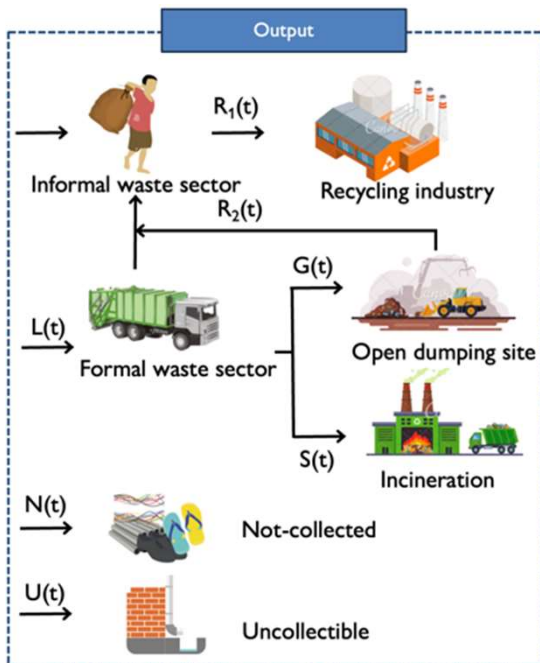


PVC Products	Average Service Lifetime (μ)	Service Life Distribution (σ)
Pipes & Fitting	35	± 15
Profile	20	± 10
Cable	20	± 10
Roofing	20	± 10
Artificial Leather	8	± 5
Houseware	8	± 5
Footwear	4	± 2
Toys	4	± 2
Hose	4	± 2
Sheet & film	4	± 2
Medical	2	± 1

(Source: Manufactures, literature, 2025)

Methodology – Material Flow Analysis (MFA)

End-of-life Management of PVC Product



04

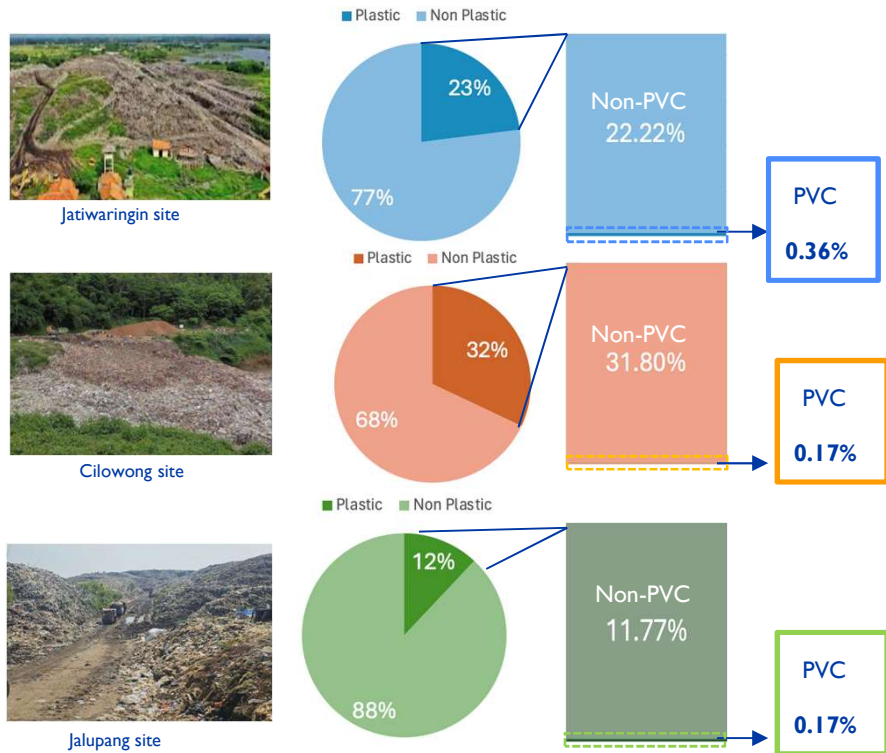
Result & Discussion

Result & Discussion – Sampling result



Post-consumer PVC composition at open dumping site

PVC was found in a **very small amount** compared to other plastic



Type of PVC found



Result & Discussion – Recycling Capacity Database



Updated Total Recycling Capacity in 2024



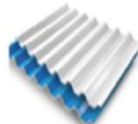
Pipe & Fitting
50.4 KT



Artificial Leather
4.2 KT



Cables
15.6 KT



Roofing
0.2 KT

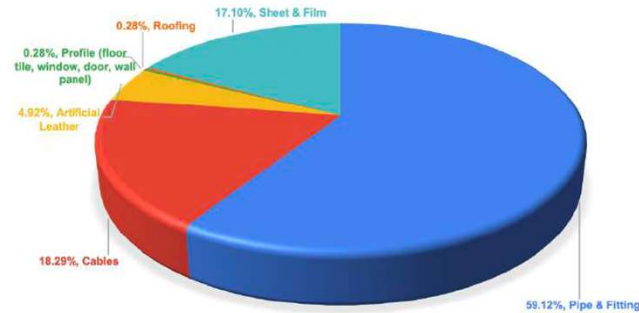


Sheet & Film
14.5 KT

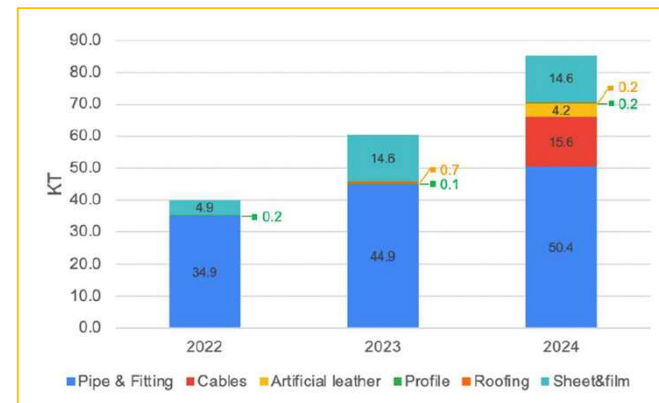


Profile
0.2 KT

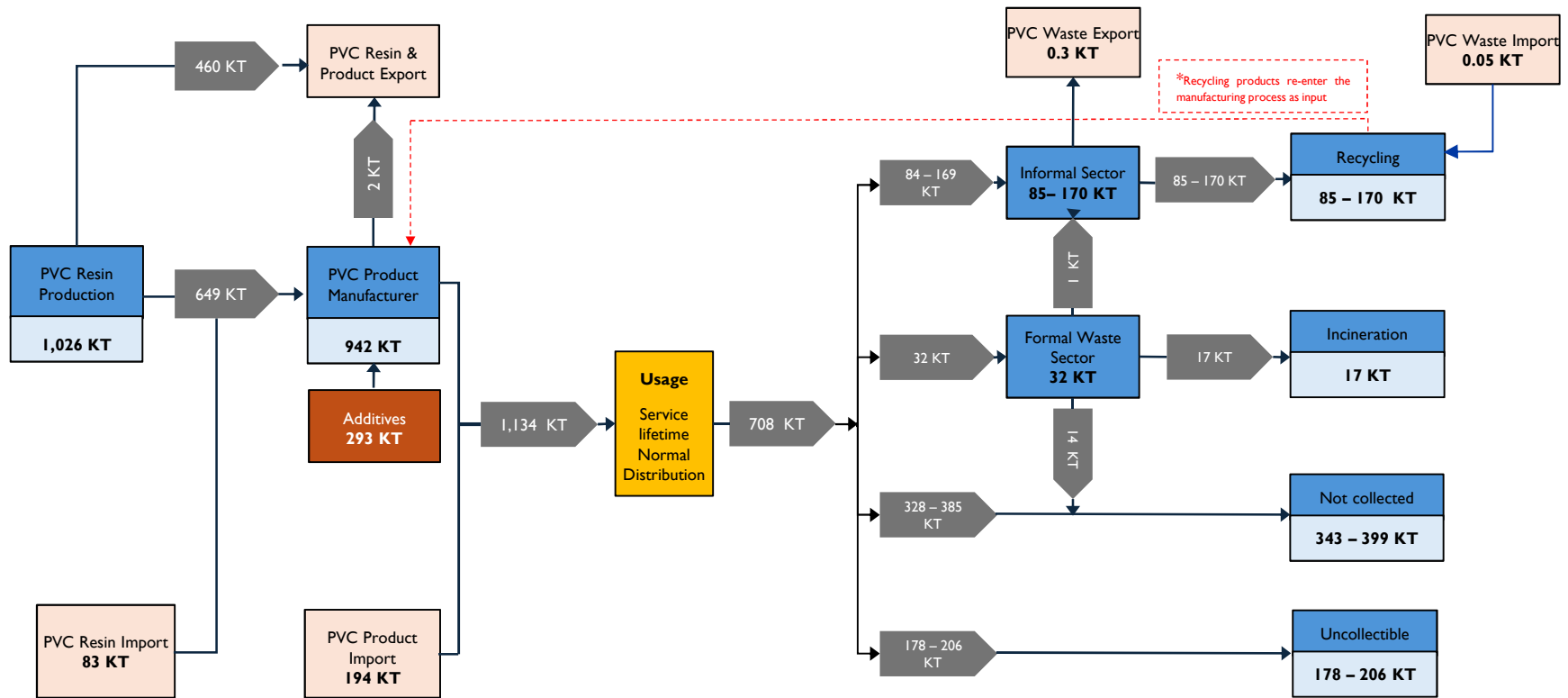
Pipes & fittings are the most recycled products, followed by cables, sheets and films, artificial leather and roofing and profiles with the same composition.



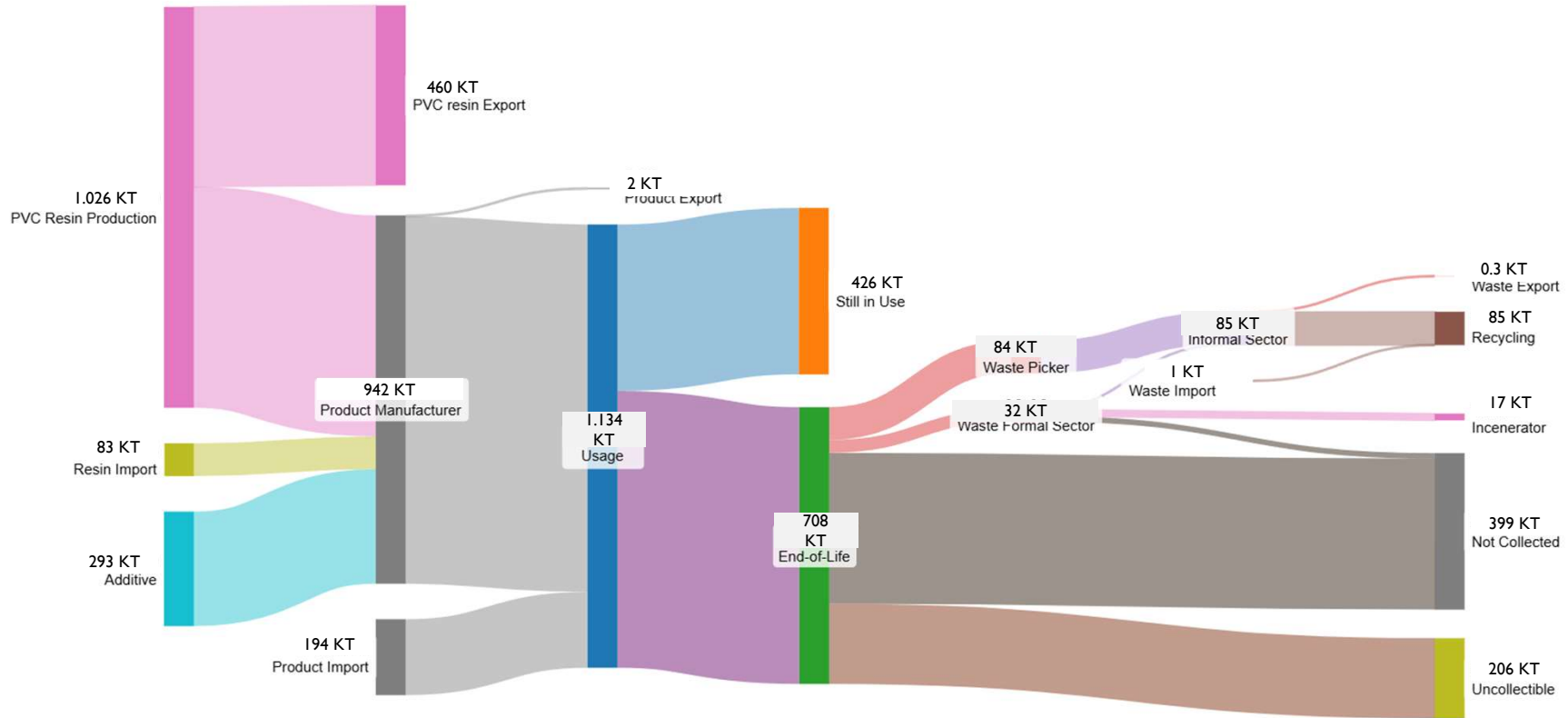
Total recycling capacity database in 2024 reached **85.28 KT**



Result & Discussion – Material Flow Diagram



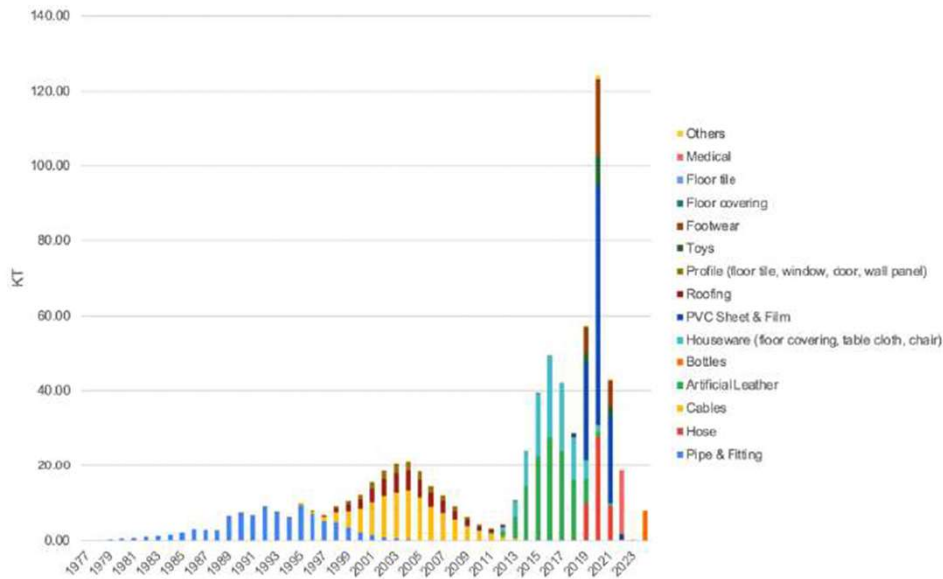
Result & Discussion – Material Flow Diagram



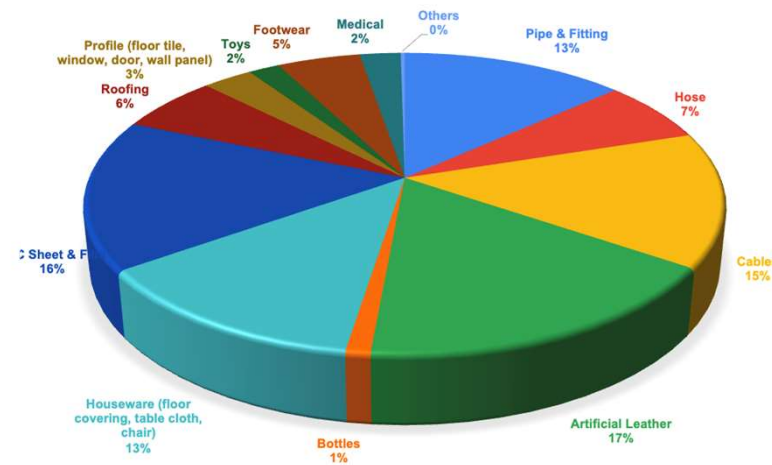
Result & Discussion – Material Flow Diagram

Waste composition in 2024 based on the year input

PVC consumption is dominated by artificial leather, sheet&film, cable, pipe&fitting, and houseware. Other groups such as roofing, hose, footwear, profiles, toys, bottles, and medical contribute much less.



From total waste of 708 KT



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CONCLUSION

Conclusion



01

PVC composition at open dumping site



The amount of PVC waste found in open dumping sites is very small, accounted for **0.36%** at the Jatiwaringin site and **0.17%** at the Jalupang and Cilowong sites.

02

Recycling capacity database



The national PVC recycling capacity identified in total is **85.28 KT**. This recycling capacity is dominated by pipes and cables, although other products such as door and profile components, mica, shrink labels, raincoats, roofing, artificial leather, and floor coverings are also represented.

03

Average lifetime & service lifetime



Enhancements were made to the estimated average lifetime and service lifetime of PVC products, updated as follows: (a) pipes and fittings (**35±15 years**), (b) profile, cable, roofing (**20±10 years**), (c) artificial leather and houseware (**8±5 years**), (d) footwear, toys, hose, sheet&film (**4±2 years**), and (e) medical products (**2±1 year**).

04

PVC waste generated in 2024



Based on the updated calculations, incorporating production, import, export (resin and finished products), and revised product lifetimes, the total PVC waste generated in 2024 is estimated at **708 KT**

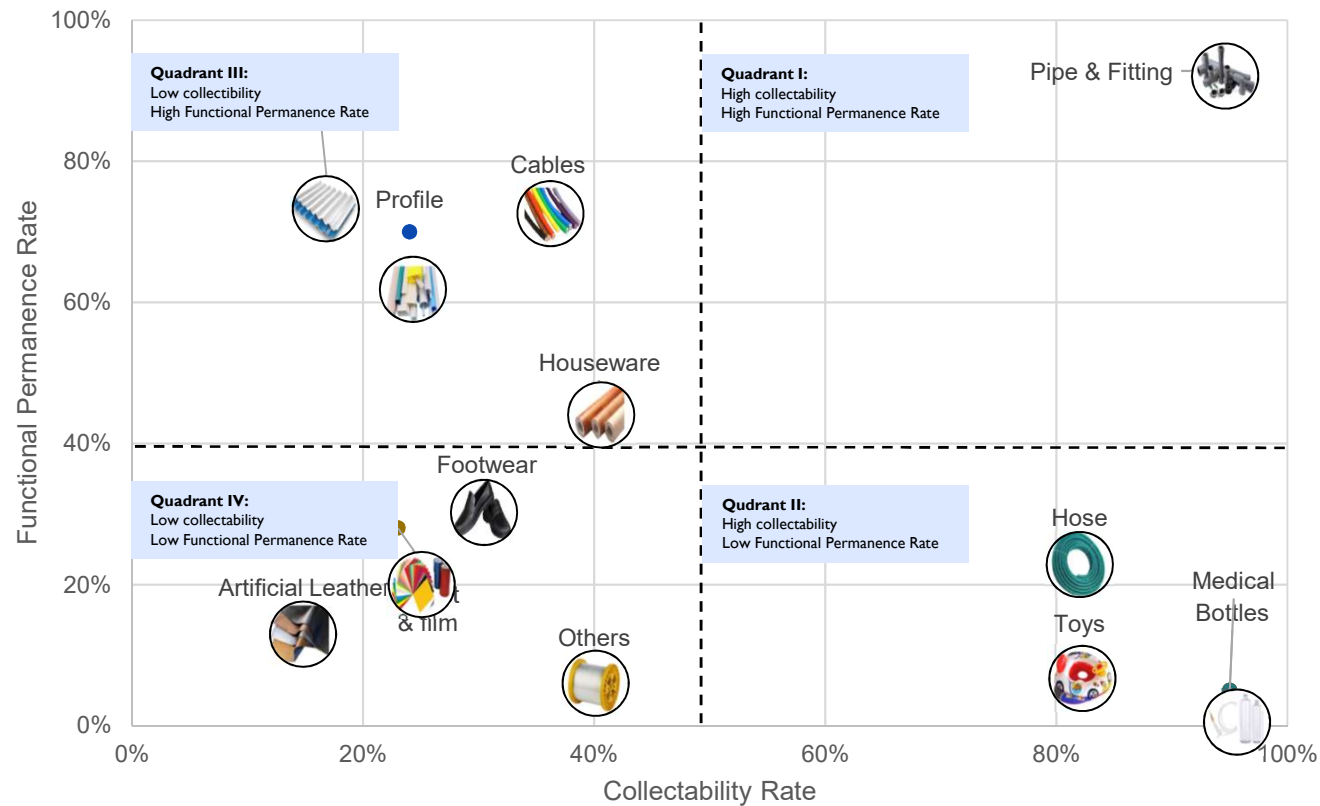


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RECOMMENDATION

Post-consumer PVC mapping

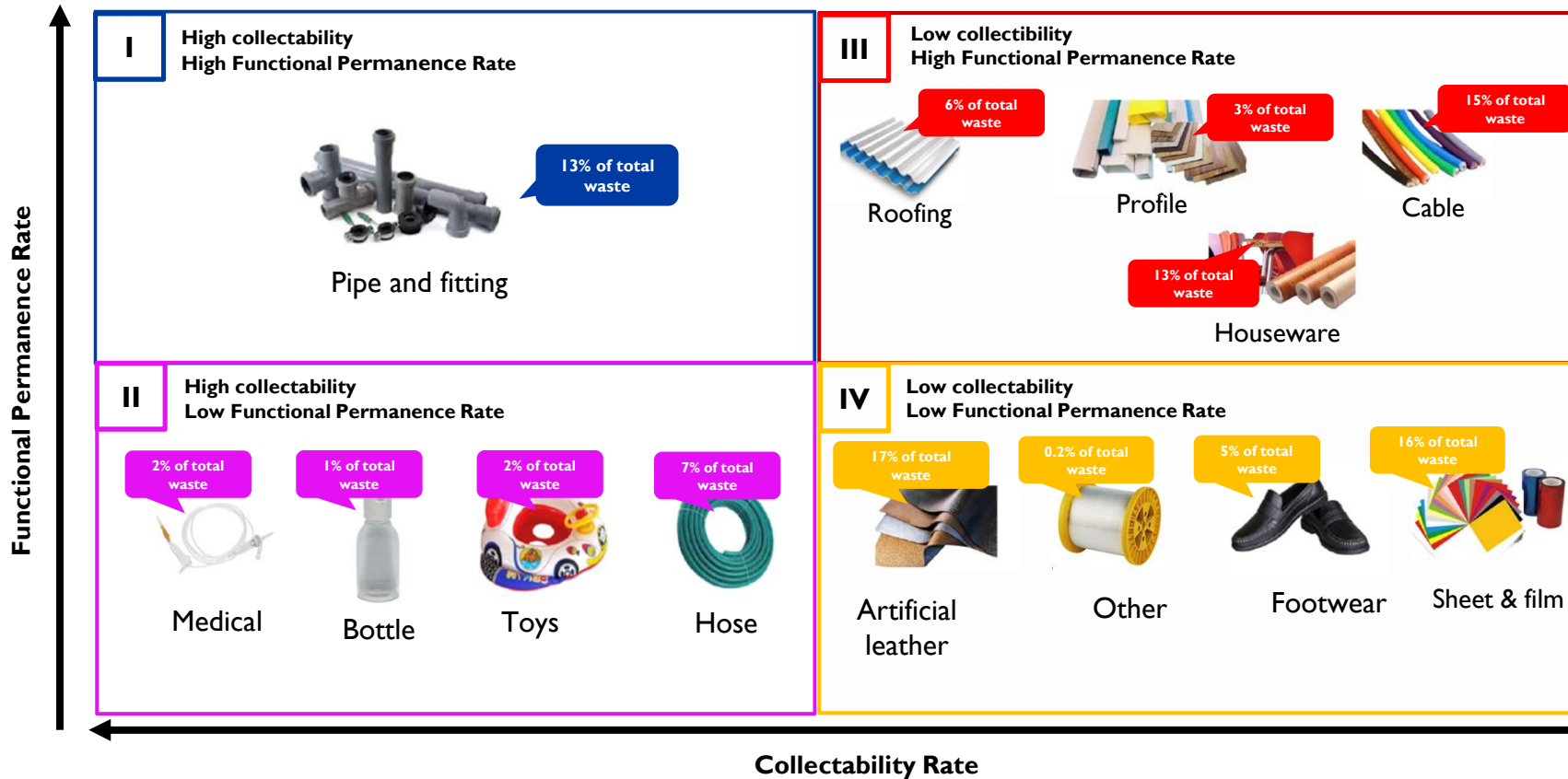
The following is a mapping of post-consumer PVC based on their **collectability rate** and **functional permanence rate**



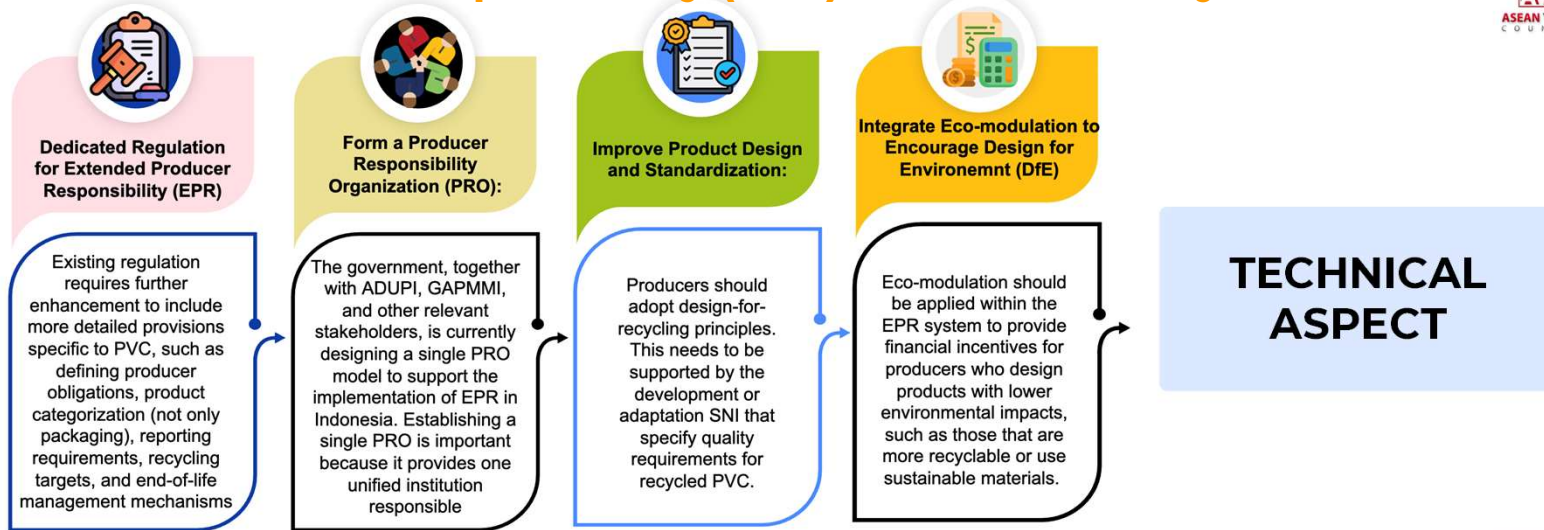
The X-axis shows the collectability rate, indicating the share of each product that is typically recovered and recycled within the Indonesian waste management system

The Y-axis represents the functional permanence rate, which reflects the portion of material that generally remains uncollected because it stays embedded in buildings, installations, or long-life applications and seldom enters the collection stream

Post-consumer PVC mapping



Extended Producer Responsibility (EPR) for PVC Industry



BENEFITS FOR INDUSTRY

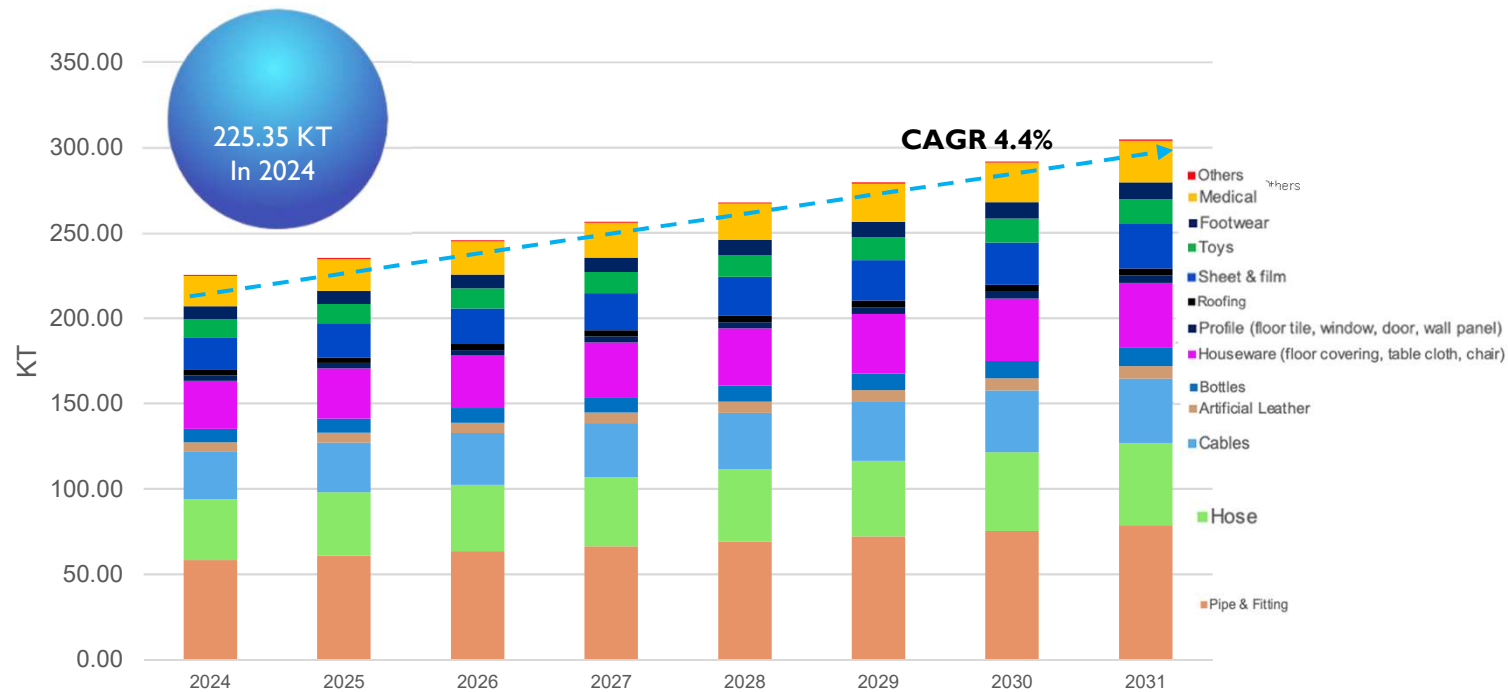


Extended Producer Responsibility (EPR) for PVC Industry



Extended Producer Responsibility (EPR) can act as a key driver for improving recycling rates, yet the framework must be adjusted to Indonesia's conditions. This includes the dominant role of the informal sector, uneven waste management infrastructure, varying levels of industry readiness, and the need for standards that match local recycling capabilities.

Collection and Handling Target for Recycling



Collection voluntary scheme for quadrant I



I High collectability and high functional permanence rate

Global Practice for EoL Management



Indonesia Scheme

European Union

Pipe and fitting

Regulation

- UU No. 18/2008 on Waste Management
- PP No. 81/2012 on Management of Household Waste

Companies

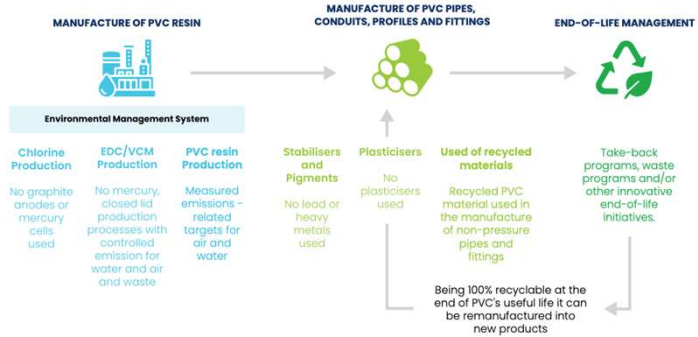
- PT Rucika Indonesia, PT Vinilon, PT Maspion

Collection and Handling Target

Year	Target (KT)
2004	55
2005	60
2006	65
2007	68
2008	70
2009	72
2010	75
2011	78
2031	80

Recommendation Voluntary Scheme

Retail/Distributor drop-off point



EoL management (PIPA, 2024)

Collection voluntary scheme for quadrant II

II High collectability and low functional permanence rate

Global Practice for EoL Management

European Union (EU)

HEALTHCARE SECTOR
 Voluntary European PVC industry commitment through VinylPlus (2021)

- Projects aimed at improving existing collection and recycling schemes, It dedicated to advancing circularity in the healthcare sector

TAKE-BACK SYSTEM
 Installers, contractors, and recyclers can **return used or dismantled PVC items** to designated collection points.
 The collected PVC is then mechanically recycled into high-quality recycle that is used for new products.

Indonesia Scheme

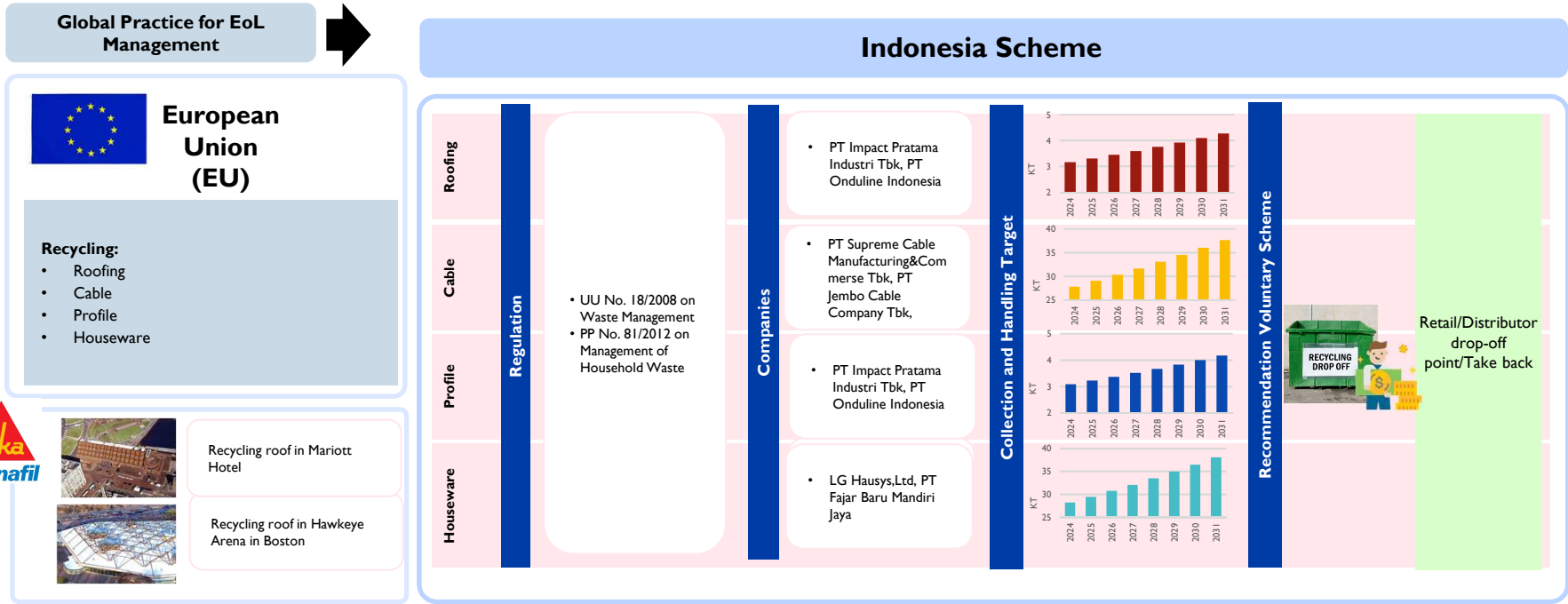
	Regulation	Companies	Target	
Hose	<ul style="list-style-type: none"> UU No. 18/2008 on Waste Management PP No. 81/2012 on Management of Household Waste 	<ul style="list-style-type: none"> PT Cahaya Pasifik Utaran CV Jaya Raya Sakti PT Bawalaksana Central Industrial 		<p>Retail drop-off; small buy-back incentives</p>
Toys	<ul style="list-style-type: none"> UU No. 18/2008 on Waste Management PP No. 81/2012 on Management of Household Waste 	<ul style="list-style-type: none"> PT Sinar Harapan Plastik PT Liqi Plastik Indonesia 		<p>Take-back via retail & e-commerce platforms</p>
Bottle	<ul style="list-style-type: none"> UU No. 18/2008 PP No. 81/2012 Permen LHK P.75/2019 on Roadmap for Waste Reduction by Producers 	<ul style="list-style-type: none"> N/A 		<p>Retail/Distributor drop-off point</p>
Medical	<ul style="list-style-type: none"> Permenkes No. 18/2020 on Medical Waste Management Permen LHK No. 6/2021 on Hazardous Waste 	<ul style="list-style-type: none"> PT Riken Indonesia 		<p>Hospital PVC recycling pilot and household medical collection point</p>

Global PVC initiatives, especially in the healthcare sector, have advanced collection and recycling systems, while Indonesia still relies on general regulations with low functional recycling performance. Despite rising targets, PVC waste collection remains limited, highlighting the need for stronger **voluntary take-back schemes** to improve circularity.

Collection voluntary scheme for quadrant III



Low collectability and high functional permanence rate



Collection voluntary scheme for quadrant IV



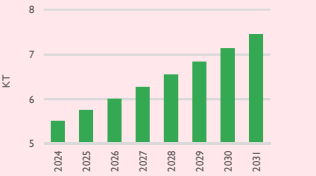


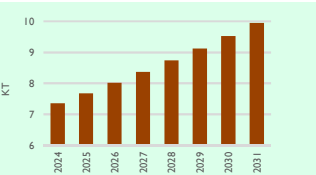
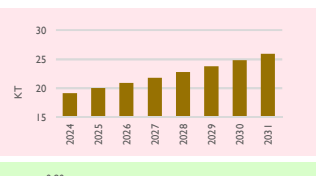
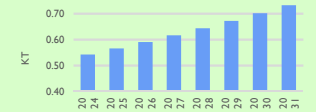
IV Low collectability and low functional permanence rate

Global Practice for EoL Management

Indonesia Scheme

 **United Kingdom**

RECYCLING BOOTS
 Hunter Boots ReBoot
 Hunter (brand) has a **take-back program** where customers can return old boots. The boots are sent to a recycling facility to be processed into materials for playgrounds, roads, or other rubber products.

Artificial Leather	Regulation	Companies	Target	Recommendation	Voluntary Scheme			
Footwear						<ul style="list-style-type: none"> PT Indo Sakura Indah PT Multi Anugerah Lestari Intiniti Utama 		  Take-back programs with retail stores; mall-based drop-off
Sheet&Film						<ul style="list-style-type: none"> PT Ardiles Indonesia PT Sepatu Bata Tbk 		
Other						<ul style="list-style-type: none"> UU No. 18/2008 on Waste Management PP No. 81/2012 on Management of Household Waste 		
	<ul style="list-style-type: none"> PT Indo Sakura Indah, PT Multi Anugerah Lestari 							
		<ul style="list-style-type: none"> N/A 						

Solid Waste Management Challenges & Improvement

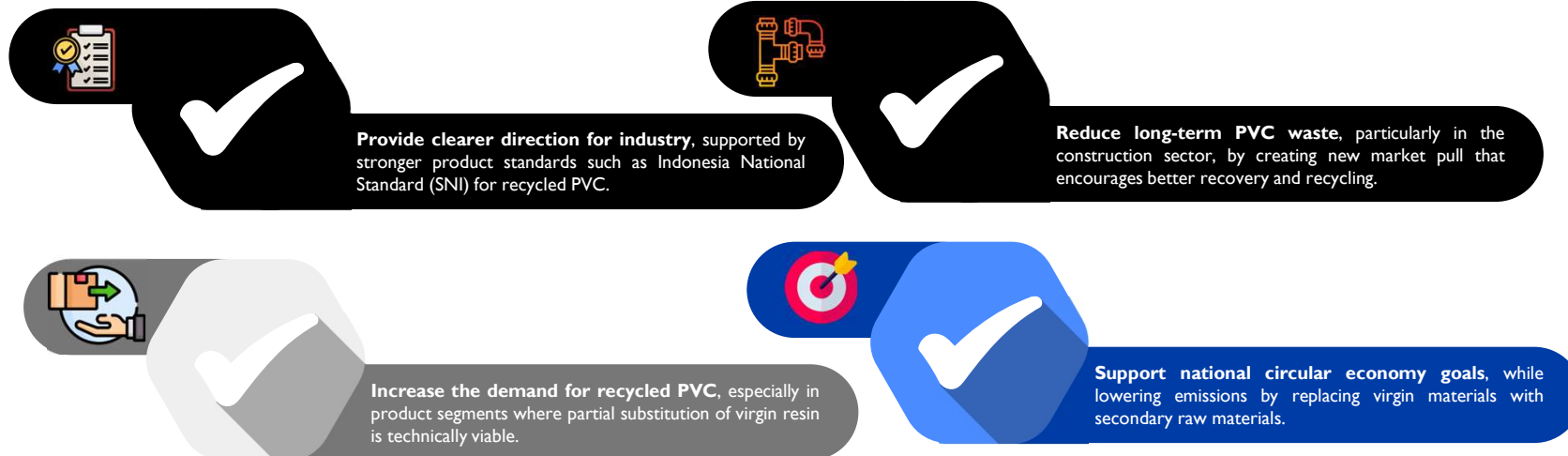


	SWM Challenges	SWM Improvement
Regulation	<ul style="list-style-type: none"> Lack of professional socialization regarding regulations Regulatory implementation is still weak, for example, the implementation of waste sorting. 	<ul style="list-style-type: none"> Strengthen implementation provisions and compliance sanctions, especially for source sorting efforts Mandatory Waste Sorting at Source Driven by Local Regulations Strengthen EPR Mechanisms and Specifically Regulate Extended Producer Responsibility
Institutional	<ul style="list-style-type: none"> Weak coordination between stakeholders The division of roles between regulators and operators is unclear. 	<ul style="list-style-type: none"> Strengthening coordination between government agencies and establishing clear divisions of authority and responsibility. Strengthening collaboration with the informal sector, namely junk shops and recycling.
Financial	<ul style="list-style-type: none"> Lack of regional waste management budget (<1% of APBD) The amount of waste levies does not cover operational costs. 	<ul style="list-style-type: none"> Increase the regional waste management budget (min. 3% of the regional budget) Collaborate with Public Private Partnerships (PPPs) through EPR to support waste management infrastructure Retribution fees need to be re-evaluated based on existing need
Technology	<ul style="list-style-type: none"> Many technologies in TPS3R/T do not work No technology updates 	<ul style="list-style-type: none"> Developing technology implementation strategies for the short term (1-5 years), medium term (1-10 years), and long term (1-20 years). Optimizing existing waste treatment facilities (TPS, TPS3R/T, waste banks) as material recovery facilities.
Socio-Culture	<ul style="list-style-type: none"> Lack of public awareness regarding overall waste management Still difficult to sort at source 	<ul style="list-style-type: none"> Increasing public awareness about the importance of sorting and recyclable PVC products. Changing public perception that waste is everyone's responsibility, as mandated by law.

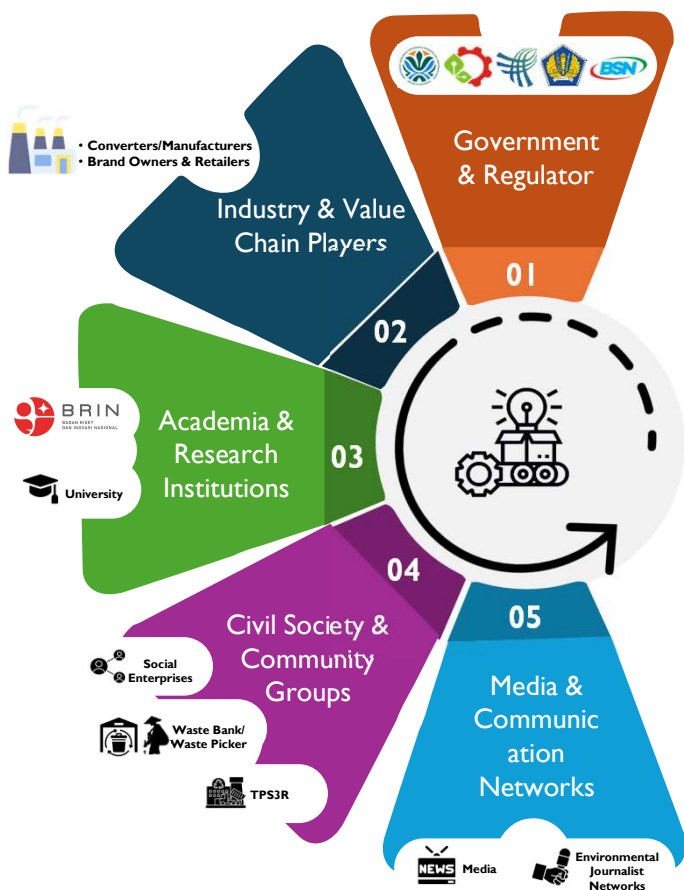
Recycled content

To strengthen PVC circularity and create a more stable market for recycled materials, the government should begin developing regulations that set minimum recycled content requirements for selected PVC product categories. By introducing recycled content requirements, the government can help establish a more reliable market for recycled PVC and encourage producers to adopt product designs and manufacturing practices that align with circular principles.

Benefit of recycled content regulation



Multi-stakeholder Collaboration



- 01**
 - Provide policy direction, regulatory coherence, and national standards for PVC waste management.
 - Establish fiscal and non-fiscal incentives
 - Ensure monitoring, reporting, and compliance mechanisms for waste handling
- 02**
 - Ensure data transparency to support MFA and traceability.
 - Invest in design-for-recycling, reverse logistics, and quality improvement of recycled PVC
 - Support segregation at source and ensure stable purchasing of post-consumer PVC
- 03**
 - Provide scientific analysis, technology assessment, behavioral research, and long-term circularity modeling.
 - Validate MFA data and develop frameworks for continuous improvement.
- 04**
 - Promote behavioral change and ensure proper segregation and disposal at the household and community levels.
 - Strengthen the role of waste pickers and community collection systems (waste bank, TPS3R)
- 05**
 - Shape public perception, disseminate accurate information, and amplify key messages on PVC circularity.
 - Promote transparency and accountability in waste management practices..

Action Plan



	2026-2030	2030 and beyond
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Targeted Product

Priority 1		
Priority 2		

Regulatory and Leadership

- Lead and initiate the collective effort to transition the PVC industry toward circular economy practices
- Lead and initiate the study regarding the PVC waste material such as continues MFA study, Lyfe Cycle Analysis (LCA), Social Cost Benefit Analysis (SCBA) study, etc.
- Community engagement and participation in solid waste management, can be done by engaging local communities in collecting the post-consumer PVC and recycling efforts through educational programs, workshops, and local recycling initiatives.
- Advocate the government regarding PVC standard, policy recommendation, and PVC industry commitment

	Transition effort toward circular economy, research/study
	Community engagement
	Advocacy



THANK YOU

Tuesday, 16th December 2025