Accelerating Extended Producer Responsibility implementation in Indonesia to combat plastic pollution: Insights from successful case studies

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Abstract

Plastic pollution is a growing environmental concern, especially in developing countries. This paper explores the severity of plastic pollution and gaps in current measures in Indonesia. It then investigates Extended Producer Responsibility (EPR) as a strategy to mitigate this problem. First, I identify four countries (Germany, Japan, Norway and South Korea) with highly effective EPR systems and do in depth exploration of each system. From that I identify six generalisable strategies for successful waste management. To conclude, I present seven targeted recommendations for Indonesia using said factors, including the establishment of a unified EPR coordination agency and implementation of public awareness programmes. By adopting these strategies, Indonesia could accelerate EPR implementation leading to reduction in plastic pollution and foster a more sustainable future.

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1. Overview of plastic waste problem in Indonesia

Current situation

Indonesia generates as much as 12 million tonnes of plastic waste per year which is 60% of the total waste produced. About 72% of the total waste generated is handled. The remaining waste (28% of annual waste) is left unmanaged.

According to a study by SEA circular, at least 20% of unmanaged plastic waste ends up in rivers and coastal waters (SEA circular project, 2020). Four of Indonesia's rivers, the Brantas, Solo, Serayu and Progo are among the top 20 most polluted rivers in the world (CCET, 2020). This plastic pollution damages the country's rich marine biodiversity and extensive mangrove, seagrass, and coral reef habitats. Marine animals such as fish and turtles may also ingest the plastics which can lead to injury or death. According to research by BBC, almost every marine species tested in Indonesia contained some plastic particles, including fragments and fibres – tilapia were the worst with 85% seen with plastic (Shukman, 2018). The presence of plastic waste in the environment can contribute to health problems. Microplastics can enter the human body through the consumption of seafood. These microplastics contain toxins that can cause cancer, neurological and immune system damage (Lee et al., 2023).

Given the positive demographics of the country, we expect this plastic waste problem to grow. There have been many initiatives to tackle plastic waste including the Solid Waste Management Act in 2008,which made it illegal to open and operate dump sites, the Presidential Regulation on Marine Debris Management in 2018, which aims to combat marine debris through raising stakeholder awareness and managing waste, and the MoEF decree on Roadmap to Waste Reduction by Producers in 2019, which prevents the use of excessive and unnecessary packaging and aims to make packaging more recyclable and durable (Ratnawati, 2020). However, the plastic waste problem has continued to grow.

Indonesia's regulatory progress in plastic waste management

(Ratnawati, 2020)

Over the years, the Government of Indonesia, its various agencies and local governments within the country have issued laws and regulations to manage plastic waste. There have been 18 such laws and regulations that have become the foundation of the EPR framework in Indonesia.

	Year	Law / Regulation	Name/Purpose	Agency
1	1993	Keppres No. 61/1993	Ratification of the Basel Convention on Hazardous Waste Disposal	Presidential Decree
2	2005	Keppres No. 47/2005	Ratification of the Basel Convention on Hazardous Waste Disposal	Presidential Decree

3	**2008**	**UU No. 18/2008**	**Law on Solid Waste Management**	**Ministry of Environmental and Forestry**
4	2009	UU No. 32/2009	Law on Environmental Protection and Management	Ministry of Environmental and Forestry
5	**2012**	**PP No. 81/2012**	**Management of Household and Household-like Waste**	**Ministry of Environmental and Forestry**
6	2013	Perpres No. 3/2013	Solid Waste Infrastructure and Facilities	Ministry of Public Works
7	2014	PP No. 101/2014	Hazardous Waste Management	Ministry of Environmental and Forestry
8	2015	Ministry of Industry Regulation No. 48/2015	Income Tax Facilities Implementation	Ministry of Industry
9	2015	Ministry of Trade Regulation No. 48/2015	Provisions for Importer Identification Number	Ministry of Trade
10	2015	Perpres No. 18/2015	Income Tax Facilities for Business Investment	Presidential Regulation
11	2016	Ministry of Trade Regulation No. 31/2016	Non-Hazardous Waste Import	Ministry of Trade
12	2016	Regional/Local Regulations	Single-use Plastics Ban	Local Government
13	2017	Perpres No. 97/2017	National Waste Management Strategy	Presidential Regulation
14	2018	Pergub Bali No. 97/2018	Single-use Plastics Ban	Local Government
15	2018	Perwali Bogor 61/2018	Single-use Plastics Ban	Local Government
16	2018	Perwali Balikpapan 8/2018	Single-use Plastics Ban	Local Government

17	2018	Perpres No. 35/2018	Development of Waste-to-Energy Installations	Presidential Regulation
18	**2019**	**P.75/2019**	**Roadmap to Waste Reduction by Producers**	**Ministry of Environment and Forestry**

Table 1: List of key laws on waste management passed in Indonesia at a Federal level and in local provinces (Ratnawati, 2020)

Three laws are important in the context of Indonesia's EPR framework:

1. UU No. 18/2008, Law on Solid Waste Management by Ministry of Environmental and Forestry
2. PP No. 81/2012, Management of Household and Household-like Waste by Ministry of Environmental and Forestry
3. P.75/2019, Roadmap to Waste Reduction by Producers by Ministry of Environment and Forestry

Indonesia's EPR framework was initiated in 2008 through the Solid Waste Management Law No.18/2008. This law serves as the main framework for waste management in the country. It outlines the duties of both central and local governments in managing waste and highlights obligations of producers to handle their waste responsibly. The law requires businesses to minimise waste by using materials that are reusable, recyclable, or biodegradable.

Building on this, 'Government Regulation No. 81/2012' reinforces the producers' responsibility to reduce waste, particularly concerning production materials and packaging. The regulation requires producers to progressively reduce waste in their products through a 10-year plan, leading to the creation of the 'Roadmap to Waste Reduction by Producers' under the 'EPR regulation'.

In 2019, the Government of Indonesia passed the Ministry of Environment and Forestry Regulation No. P.75/2019, which strengthened the Solid Waste Management law and laid out a roadmap to achieve 30% waste reduction at the source by 2029. This waste reduction includes targets for cutting single-use plastics such as plastic bags, straws, and small packaging.

This latest regulation targets a wide set of stakeholders, including manufacturers, importers, and retailers. It mandates efforts toward reducing, reusing, and recycling plastic waste. As a part of this legal requirement, producers are required to submit strategic waste reduction plans and annual reports on their progress. The government conducts assessments of waste reduction efforts every six months as part of the monitoring activities in the EPR framework. Producers have financial incentives through penalties and rewards for target compliance.

Effectiveness of current plastic waste management regulations

Indonesia's EPR regulation has taken full effect in 2023 and there are key gaps that need to be considered. The efforts have not been very effective and experts say they need to be significantly strengthened. According to a World Bank Report in 2018 there is very low enforcement of solid waste laws on individual polluters. Furthermore, another policy which required plastic bag users at supermarkets to pay for each bag used, but it was revoked due to the country's weak legal system (Agustina Hidayat et al., 2019). In its whitepaper published in 2022, Plastic Smart Cities, an initiative by World Wide Fund For Nature (WWF), identified 7 key gaps (Mustard, 2022):

1. *Ambiguous scope and targets of the EPR regulation(s)*
2. *Lack of plastic waste management infrastructure*
3. *Lack of coordination and synergy between stakeholders*
4. *Limited awareness of plastic waste in the general public*
5. *Lack of financial support from the government and waste producers*
6. *COVID-19 pandemic hampered plastic reduction efforts*
7. *High demand for products with low after-use packaging*

Focus of this paper

The focus of the paper is to identify case studies of successful EPR implementations, analyse the EPR policies in the case studies and develop recommendations for Indonesia. To accelerate EPR implementation in Indonesia, we can benefit from studying evolved markets in EPR for plastics waste management. In particular, markets which have matured from basic EPR frameworks to more advanced systems can provide valuable lessons for EPR. Learning from such markets can help Indonesia avoid common pitfalls, implement efficient regulations and develop robust solutions.

2. Insights from successful EPR implementations

Case studies approach

Four markets have been identified as successful case studies EPR in plastics waste management: Japan, South Korea, Germany, and Norway. These markets offer deep insights due to their well-documented evolution of their EPR framework. The evolution of plastic waste management in these markets showcases a transition from simple waste collection and recycling to advanced circular economy/eco-efficient setups. Data for these countries is accessible, extensive and well documented. Hence, the markets offer insights on key success factors that Indonesia can adapt for its EPR framework. The paper has relied on secondary research to develop insights across the EPR policies and activities of the chosen case study markets.

Overview of case study markets

Japan, South Korea and Germany have high plastic recycling rates and effective EPR policies. Norway started relatively late with stringent plastic waste management and recycling, but has made rapid progress in this area, giving us a case study of rapid and effective evolution.

Country	Indonesia	Japan	South Korea	Germany	Norway
Population *(million)*	281.6	123.2	52.1	84.1	5.5
Population median age	32	50	46	47	41
GDP per capita *(USD '000)*	14.1	46.3	50.6	61.9	90.5
Total waste produced per year per capita *(kg)*	210.0	323.9	317.2	550.6	360.7
Plastic waste produced per year per capita *(kg)*	28.3	106	74.1	167.9	114.9
Non recycled plastic waste per capita per year *(kg; proportion of waste produced)*	25.5 (90.1%)	13.8 (13%)	37.05 (17.2%)	37.8 (22.5%)	54.6 (47.5%)

Table 2: Comparison of key statistics pertinent to waste management (CIA, 2024)

Japan and South Korea are trendsetters of successful EPR implementation in Asia with high recycling rates (Japan - 87%, South Korea - 50%) and mature EPR frameworks, with both countries establishing EPR in 1992 (Hotta et al., 2009). They are the only countries in Asia to have fully established EPR structures with options for individual recycling systems for producers (EPI, 2021). Japan was the first country to have a compulsory law based EPR in 1997. Germany was the first country in the world to establish EPR in 1991 and has since evolved over many years to address market needs and has shown consistent success in managing plastic

waste with a recycling rate of 67.5% (Ramasubramanian et al., 2023). Norway is another country with a mature EPR framework and its government places high priority on waste management (VIR, 2024).

Country	Japan	South Korea	Germany	Norway
Name of Legislation	Law for Container and Packaging Recycling National Environment Protection (Used Packaging Materials)	Resources Recycling Act	German Packaging Act (VerpackG)	Regulations relating to the recycling of waste (Waste Regulations) Chapter 7: Packaging waste
Regulatory authority	Ministry of the Environment (MOE)	The Korea Environment Corporation	Ministry of Environment	Norwegian Environment Agency
Initial plastic waste management legislation	1995	1999	1972	2017
Materials	Glass bottles, PET bottles, plastic and paper packaging	PVC, coloured PET bottles	Plastic, Metal, Glass, Paper, Wood	Plastic, Metal, Glass, Wood
Plastic recycling rate	87%	50%	67.5%	52.5%
EPR law	Producers are financially responsible for recycling of packaging waste.	Requires packaging to be graded and labeled by producers. Bans the use of hard to recycle plastic packaging.	Producers are financially responsible for the sorting and recycling of packaging waste.	Producers are charged per kilogram of packaging. Fees vary in the type of material and packaging category.

Table 3: Overview of plastic EPR regulations in case study countries

Japan, South Korea, Germany, and Norway have been successful in implementing EPR to tackle plastic waste, as evident in the table above. The following insight areas have been

identified based on detailed review of EPR implementation in these advanced markets (OECD, 2016):

1. Clearly defined EPR frameworks
2. Strict enforcement of EPR policies
3. Strong financial obligations with encouraging incentives
4. Active collaboration between key stakeholders
5. Efficient handling of plastic waste
6. Mobilising communities for successful implementation

Insight area #1: Clearly defined EPR frameworks

The first key success factor is having a clearly defined EPR framework with identification of roles, responsibilities, compliance requirements and targets. This is essential as it establishes specific expectations for all stakeholders and sets measurable goals to work towards reducing overall plastic waste. Setting clear frameworks reduces ambiguity and ensures that all parties have a clear understanding of their contributions. (OECD, 2016)

One example would be the strong government regulations set with clear targets surrounding EPR laws enforced by Japan. Japan introduced “Act on the Promotion of Sorted Collection and Recycling of Containers and Packaging” in 1995 and has used this law as the basis for regulating plastic waste within the country and implementing EPR. Key highlights of the law include (*Act on the Promotion of Sorted Collection and Recycling of Containers and Packaging - English - Japanese Law Translation*, 2018):

1. **Producer responsibility**: The law mandates producers and businesses to take responsibility for recycling of packaging materials post use. The mandate includes various types of containers and packaging made using plastic, glass, paper, and aluminium.
2. **Recycling obligations**: Producers are obligated to ensure that a certain proportion of the packaging waste they originate is recycled. For this, the producers are required to contract with recycling businesses and are responsible for the costs associated with recycling.
3. **Recycling targets**: The law sets specific recycling targets for different materials. These targets are periodically reviewed and updated to reflect advancements in recycling technology and changes in waste generation trends. By 2025, the government aims to reduce single-use plastic waste by 25% from 2000 levels. To achieve this goal, businesses are required to participate in recycling programs and ensure that 60% of their plastic packaging waste is recycled. The 60% recycling rate has been set for achievement by 2030. (*Japan’s Resource Circulation Strategy for Plastics*, 2019)

Since its introduction in 1995, the law has undergone several amendments (including two key amendments in 2006 and 2018) to address changes in market, consumer trends and evolution

of packaging technologies. These amendments have helped address challenges and improve the clarity and effectiveness of the law, strengthen recycling targets and expand the range of materials covered, promote the use of recycled materials and enhance the efficiency of the recycling process (*Act on the Promotion of Sorted Collection and Recycling of Containers and Packaging - English - Japanese Law Translation*, 2006).

The EPR framework has also been bolstered by circular economy requirements in 2000 by the ***Law for Establishing a Recycling-Oriented Society*** which established the principle of a waste hierarchy. This was further enhanced with a focused approach through the **Plastic Resource Circulation Strategy (2019).** In April 2022, the Japanese government introduced “3R [Reduce, Reuse, Recycle] + Renewable” initiatives to promote resource circulation of plastics in each stage of the entire lifecycle of plastic products. The current focus of the law is to reduce the overall generation of packaging waste and to support broader environmental policies on sustainability and circular economy. (WEF, 2019)

The clarity of law, the regular updates to regulations and targets have been key tools in Japan's approach to managing waste, promoting recycling, and reducing environmental impact. The government also imposes penalties on companies that fail to meet these targets, providing a strong incentive for compliance. The law and its enforcement mechanisms ensure effective implementation and that producers take their responsibilities seriously.

Another country that has been successful in having a clearly defined EPR framework is Germany. Germany has a robust legal framework supporting EPR with financial and operational responsibilities on producers.

Germany's EPR framework is comprehensive in the context of environmental responsibility and shifts financial and operational responsibility of waste management onto producers. The EPR system is governed by several key laws: the Packaging Act (VerpackG) (Bünemann et al., 2021), the Electrical and Electronic Equipment Act (ElektroG), and the Battery Act (BattG). The system enforces a "producer pays" principle, where manufacturers are responsible for the entire lifecycle of their products. This responsibility includes collection of used products, recycling, and disposal. The framework ensures that no product type escapes responsibility, making it comprehensive from the perspective of coverage of waste origination. Key highlights of the system that make the legal framework robust and contribute to the success of the EPR are:

1. **Mandatory registration of producers and distributors:** All producers and first-level distributors in the market must register with an appropriate central authority such as the Central Packaging Register (LUCID) for packaging. This requirement brings accountability for all products brought into the market and used by consumers. (Bünemann et al., 2021)

2. **Well defined producer obligations in take-back operations for recycling:** Beyond financial responsibilities, the producers must offer take-back services for their products. This includes setting up used product or packaging return/collection systems, or joining collective schemes that handle the collection and recycling of waste. Retailers with a certain threshold of floor space are required to provide drop-off points for consumers to return electronic waste. (Bünemann et al., 2021)

3. **Emphasis on circular economy in recycling process:** The recycling infrastructure is designed to support circular economy and the system has created a market for resources/materials recovered from recycling. The industries are encouraged to use recycled materials in manufacturing with involvement of local and national buyers. This ensures that recycled materials/resources are in demand and, hence, promotion of sustainability. (Minerva Studio, 2018)

4. **Integration with European Directives:** Germany's EPR framework is closely aligned with the European Union's environmental directives. This ensures that the framework has high standards set by EU policies and also ensures consistency for producers of products to comply with EU as a region. This alignment also helps Germany stay at the forefront of waste management innovation. (Ahlers et al., 2021)

South Korea has also been successful in the implementation of EPR through a unified waste management system with clear producer responsibilities. South Korea introduced its Extended Producer Responsibility (EPR) framework in 1992 as part of a national effort to tackle increased waste generation, manage waste handling and promote recycling (Hotta et al., 2009). The key highlight of the EPR framework is that it shifts the responsibility for waste management from municipalities to producers, making them accountable for the entire lifecycle of their products, including waste generated post-use.

South Korea's unified waste management system has been a key factor in the nation's successful implementation of Extended Producer Responsibility (EPR) policies and managing waste. The system is comprehensive and integrates all aspects of waste management across products' lifecycle and has been effective for plastic waste management.

1. **Centralised coordination and regulation:** The system has a centralised regulatory framework where the Ministry of Environment in Korea coordinates waste management activities across the country. This centralization ensures uniform application of waste management policies, reduces inconsistencies, and improves waste management efficiency. Local governments are empowered to implement policies within the guidelines and regulations set by the central authority. (SEA circular project, 2020)

2. **Mandatory recycling targets with regular updates:** The government sets specific recycling targets for various types of materials. These targets are periodically reviewed and adjusted to increase recycling rate and enhance recyclability of products. The targets are backed by significant fines for non-compliance. (SEA circular project, 2020)

3. **Promoting recycling and circular economy friendly design:** The system encourages design of products conducive recycling and circular economy. For example, it could be using materials that are easier to sort and recycle and low complexity packaging. The enforcing agency assesses recyclability of packaging materials and products to adjust fees. This rewards and motivates companies to adopt more eco-friendly and recycling friendly designs. (SEA circular project, 2020)

Lastly, Norway's mandatory EPR participation with strict compliance requirements for producers enforced is another example of effective EPR implementation. Norway first implemented EPR regulations in the mid-1990s. The EPR regulations were applicable to packaging, batteries, vehicles, and consumer electrical and electronic devices (Nordic Council of Ministers, 2024). In 2017 regulatory update (No. 1289) extended producers' responsibility and made the framework comprehensive (Lorax EPI, 2017). Norway's successful EPR implementation can be attributed to its stringent mandatory requirements for producer registration, participation in schemes, financial accountability, and reporting. Norway's EPR framework emphasises packaging waste reduction and use of sustainable packaging materials in line with the country's broader environmental goals and its commitment to achieving a circular economy (Norwegian Environment Agency, 2024). This has resulted in lower plastic from packaging waste coming into the waste management process. There are some key mandatory requirements in this extension that has made the EPR framework successful:

1. **Mandatory registration and comprehensive reporting:** Producers and importers with volumes exceeding 1,000 kg of packaging annually must register with the Norwegian Environmental Agency or an authorised PRO. This is applicable to a wide range of packaging materials including plastics, paper, glass, and metals. With the registration, producers are obligated to report quantities and composition of packaging they sell in the market as part of their products. The quantity and composition determine the producer's financial contributions to the recycling process. (Albertins, 2024)

2. **Regulations to reduce packaging waste:** Producers are required to minimise packaging waste. Regulations encourage companies to reduce the amount of packaging used and to design products that require less packaging. Producers are mandated to conduct regular waste audits and report the results to the Norwegian Environment Agency. These audits help identify areas where packaging waste can be reduced, ensuring continuous improvement in packaging practices. (Norwegian Environment Agency, 2020)

3. **Promotion of sustainable packaging solutions:** The EPR framework includes incentives for producers who use sustainable materials or recycle-friendly packaging designs. This has led to innovation in packaging design and usage of eco-friendly materials that are either recyclable or biodegradable (*Norway's Deposit Return Scheme Is World's Recycling Role Model*, 2022).

Insight area #2: Strict enforcement of EPR policies

The second key factor in successfully implementing EPR is the strict enforcement of EPR laws via close monitoring by governing bodies, requiring reports on EPR implementation from producers and imposing penalties for non-compliance. This ensures that producers are held accountable through regular audits, promotes transparency, and deters non-compliance. (OECD, 2016)

An example is the mandatory EPR participation with strict compliance requirements for producers enforced in Norway. Continuous monitoring by regulatory bodies ensures that producers meet their environmental obligations, contributing to high recycling rates and promoting a circular economy (Norwegian Environment Agency, 2024). There are some key

mandatory requirements in this extension that has made the EPR framework successful (Norwegian Environment Agency, 2024):

1. **Mandatory participation in recycling schemes:** Companies must join government established/authorised recycling schemes, which manage the collection, sorting, and recycling of packaging waste. The schemes are funded by producers' contributions. The EPR system and schemes promote recycling and reuse. There are high targets for material recovery, particularly for plastic, paper, and aluminium packaging.

2. **Enforcement and monitoring by central authority:** EPR in Norway is overseen by the Norwegian Environmental Agency, which ensures compliance through regular audits and strict monitoring. The Ministry of Climate and Environment oversees compliance and enforces penalties on producers that fail to meet reporting and recycling obligations. Companies failing to comply face heavy penalties, which can include fines or denial of access to the Norwegian market. Consistent enforcement has ensured high compliance in the market and reduced free rider companies which benefit from the recycling and waste system without contributions.

3. **Periodic waste audits on producers:** Producers are mandated to conduct regular waste audits and report the results to the Norwegian Environment Agency. These audits help identify areas where packaging waste can be reduced, ensuring continuous improvement in packaging practices.

Another country that has effective monitoring and enforcement mechanisms is South Korea. South Korea has set targets to reduce plastic wastes by 50% and achieve a recycling rate of 70% for plastics waste by 2030 (SEA circular project, 2020). The Ministry of Environment oversees the monitoring and enforcement. It also sets recycling quotas that producers must meet (Korea Environment Institute, 2010). These quotas are determined based on the amount and type of materials used in products, with a particular focus on plastics. The key highlights of the monitoring and enforcement mechanisms are:

1. **Detailed information reporting by producers to government:** Producers are required to submit detailed reports on the quantity of products sold in the market and the amount of waste recycled. The integrity of this reporting is ensured through potential audits by the Korea Environment Corporation (KECO). The audits are to ensure the reporting is accurate and reflect actual outcomes. (Korea Environment Institute, 2010)

2. **Public reporting of recycling outcomes:** Outcomes of recycling efforts and compliance information are made publicly available (Korea Environment Institute, 2010). This increases transparency and allows for wider scrutiny. This transparency to the end users of products encourages producers to comply.

3. **Detailed tracking of recycling through technology:** Recycling initiatives in South Korea have integrated technology in the monitoring process to enable tracking of waste flows and recycling activities (Korea Environment Institute, 2010). This enables easier monitoring, efficient enforcement and reduces non-compliance.

The German EPR system enforces compliance through strict monitoring and hefty fines for non-compliance. Companies are liable for significant penalties, trade bans and fines if they fail to meet their obligations (Bünemann et al., 2021). The system also requires detailed reporting on the volume of products placed on the market and the volume of products/packaging recycled (Bünemann et al., 2021). The Central Packaging Register (LUCID) oversees activities of PROs and ensures compliance with recycling quotas and financial obligations (Sunderdiek, 2021). This reporting ensures transparency and accountability and helps with monitoring and enforcement.

Insight area #3: Strong financial obligations with encouraging incentives

One of the critical requirements to successfully enforce EPR is the financial obligation for processing of waste generated post use of their product. This financial obligation needs to be the key for market access and needs to be set up in the context of the market. Successful EPR implementations have combined this critical requirement with encouraging incentives that align producers and consumers for the success of plastic waste management. These incentives encourage producers to minimise waste at design stage, the market and the encouragement offering incentives to producers, which encourages them to make packaging more eco-friendly. This reduces enforcement efforts and ensures that producers are more sustainable. (OECD, 2016)

A good example of this is South Korea, which has implemented a robust framework of incentives for producers within its Extended Producer Responsibility (EPR) system to incentivize them to reduce plastic use and enhance the recyclability of products. Some key highlights are (SEA circular project, 2020):

1. **Financial obligations as part of EPR scheme:** Private companies are typically part of a collective responsibility system. They have the option to handle recycling directly or through an agency/operator that undertakes recycling. For the agency/operator option, the private companies pay the costs involved for recycling.

2. **Differential recycling fees:** The EPR system imposes varying recycling fees based on the recyclability of materials. Producers using easily recyclable materials like (e.g., transparent PET bottles) pay lower fees, while producers using fewer recyclable materials pay higher fees. This creates a direct financial incentive for producers to choose materials that are easier to recycle and streamlines waste into fewer materials which can be put through the recycling process. For products that do not meet recyclability standards, fees can be up to 3 times higher than for those which meet recyclability standards. This acts as a substantial financial deterrent against using non-recyclable materials.

3. **Implementation of recycling quotas and penalties:** Producers are mandated to meet specific recycling quotas annually. If these quotas are not met, producers face fines, which are typically higher than the cost of achieving the recycling target. Hence there is a strong financial incentive for compliance.

4. **Incentives for recycling-friendly and circular economy friendly design:** The system encourages design of products conducive recycling and circular economy. For example, it could be using materials that are easier to sort and recycle and low complexity

packaging. The enforcing agency assesses recyclability of packaging materials and products to adjust fees. This economic incentive, in the form of reduced EPR fees, rewards and motivates companies to adopt more eco-friendly and recycling friendly designs.

5. **Support for research and development:** The government has supported research and development in recycling technologies and waste management lifecycle. Financial incentives in the form of grants are provided for companies creating innovative solutions for reducing plastic waste and enhancing recyclability.

Germany's EPR framework has achieved efficiency in outcomes through mandating various financial obligations on producers while encouraging reduction of plastic waste and eco-friendly designs. Key highlights of the system are

1. **Financial responsibilities with incentives for eco-friendly products:** The registered companies are required to cover the costs of collecting, sorting, and recycling the waste generated by their products. Costs covered are based on the material type and recyclability of the packaging or products. In particular, product packaging generates over €1 billion annually in fees or costs paid into the EPR system. These fees are used to carry out waste management and recycling activities and infrastructure development. The fees are higher for materials that are harder to recycle and, hence, incentivises producers to adopt recycling friendly or eco-friendly designs and packaging. (Bünemann et al., 2021)

2. **Producer funding of recycling infrastructure and activities with incentives for higher recyclability of products:** Producers are required to participate in a dual system that finances the collection, sorting, and recycling of materials. The fees paid depend on materials used in products and the recyclability of the waste generated (Sachdeva et al., 2021). Non-recyclable materials incur higher fees. This incentivizes producers to use more sustainable or eco-friendly materials. The EPR framework ensures that the waste management infrastructure is funded by public funds and is supported by the producers creating the waste.

Germany's collection and recycling infrastructure is mainly funded by producer fees as part of the EPR system obligations (Bünemann et al., 2021). The producers or distributors bear responsibility for the waste generated by their products, from collection to recycling. Several key factors contribute to the efficiency of the collection and recycling activities.

3. **Targeted financial initiatives to solve persistent waste problems:** Waste management and recycling eco-system is constantly reviewed and targeted initiatives are launched to tackle persistent problems. For example, a new Single-Use Plastic Fund has been launched in 2024 to enhance the EPR system. This initiative requires producers of single-use plastics to cover the costs of waste collection and street cleaning (Enders et al., 2024).

Norway has taken a direct approach in the context of financial obligations of producers and incentivising the producers for good behaviour. This has resulted in lower plastic from packaging waste coming into the waste management process. The focus areas have been:

1. **Recycling fees based on environmental impact:** Producers pay fees based on the quantity and type of packaging waste that their products bring to the market (Norwegian Environment Agency, 2024). Materials that are harder to recycle, such as multilayer plastics, incur higher fees. This incentivizes companies to use eco-friendly/recycling-friendly materials and designs in packaging and innovate in packaging design (*Norway's Deposit Return Scheme Is World's Recycling Role Model*, 2022).

2. **Promotion of sustainable packaging solutions through incentives:** Norway's EPR framework emphasises packaging waste reduction and use of sustainable packaging materials in line with the country's broader environmental goals and its commitment to achieving a circular economy. The EPR framework includes incentives for producers who use sustainable materials or recycle-friendly packaging designs. This has led to innovation in packaging design and usage of eco-friendly materials that are either recyclable or biodegradable. (Norwegian Environment Agency, 2024)

3. **Joint initiatives and pilot projects:** The government has worked with the industry to jointly launch pilot projects and test new EPR approaches. Norwegian Retailer's Environment Fund collaborating with the United Nations Environment Programme (UNEP) to develop globally acceptable EPR guidelines for local implementation is an example of a joint initiative (*About the Norwegian Retailers' Environment Fund*, 2017). Such continuous cooperation has brought innovation in waste management practices including efficient recycling technologies and implementation of new business models for circular economy.

4. **Government sponsorship of R&D:** The government has funded research into sustainable packaging in partnership with industry and academic institutions. to fund research into new sustainable packaging materials (*Achieving Circularity*, 2021). Such R&D has led to the development of efficient and eco-friendly packaging.

Finally, Japan has implemented the necessary financial requirements and incentives to ensure successful outcomes in the EPR framework for plastics.

1. **Financial obligations to undertake costs of waste management and recycling:** Producers are obligated to ensure that a certain proportion of the packaging waste they originate is recycled. For this, the producers are required to contract with recycling businesses and are responsible for the costs associated with recycling. (OECD, 2016)

2. **Penalties for non-compliance**: Companies which do not meet their recycling obligations are subject to penalties, including fines and other legal actions. (OECD, 2016)

3. **Incentives by local governments to increase recycling:** Reward systems where citizens can earn points or discounts on local services have been used by local governments to increase participation in recycling. For example, residents who bring in a

certain amount of recyclable materials can receive vouchers. (*This Japanese Word Is Helping the Country Recycle and Waste Less*, 2019)

Insight area #4: Active collaboration between key stakeholders

The third key factor in successful EPR implementation and management is the active communication between key stakeholders such as the producers and government agencies (OECD, 2016). This allows for the exchange of ideas and constant monitoring and improvement of the EPR scheme.

In Japan, the government works closely with local governments and industry stakeholders to implement EPR, monitor compliance and ensure that the plastic waste management targets are met (Tamaki & Wada, 2023). This approach has been a key factor in successful implementation of EPR for plastics in Japan (*Business Innovations Boost National Recycling Efforts*, 2023). The Plastic Resource Circulation Strategy actively promotes the development of technologies that can enhance the quality and efficiency of recycling processes and innovation in resource circulation through development of new business models for a circular economy (Osamu, 2022). Collaboration across industry, government, and academia is also encouraged to create innovative solutions for plastic waste management. Given the global nature of the plastic problem, the strategy emphasises the importance of international cooperation. For example, Japan wants to be at the forefront of efforts to reduce marine plastic pollution and provide assistance to developing countries in plastic waste management (*"Plastics Smart" Campaign*, 2019).

Norway has also managed EPR through close cooperation between government agencies and industry stakeholders. The Norwegian government, through the Ministry of Climate and Environment, has worked closely with industry stakeholders, including manufacturers, importers, and waste management companies, to develop and enforce EPR regulations (VIR, 2024). This collaboration has led to high compliance rates, innovations and effective policy implementation. The cooperation is achieved through various initiatives:

1. **Regular dialogues between the government and industry stakeholders:** These dialogues have allowed for exchange of ideas, feedback, and concerns, leading to an industry accepted EPR system which continues to evolve and improve. The government, through the Norwegian Environment Agency, frequently consults with industry stakeholders to ensure that regulations are practical and effective. (VIR, 2024)

2. **Joint initiatives and pilot projects:** The government has worked with the industry to jointly launch pilot projects and test new EPR approaches. Norwegian Retailer's Environment Fund collaborating with the United Nations Environment Programme (UNEP) to develop globally acceptable EPR guidelines for local implementation is an example of a joint initiative (*About the Norwegian Retailers' Environment Fund*, 2017). Such continuous cooperation has brought innovation in waste management practices including efficient recycling technologies and implementation of new business models for circular economy.

3. **Government sponsorship of R&D:** The government has funded research into sustainable packaging in partnership with industry and academic institutions. to fund

research into new sustainable packaging materials. Such R&D has led to the development of efficient and eco-friendly packaging. (VIR, 2024)

In South Korea, the unified waste management system promotes collaboration between public agencies and private companies. Recycling is handled by private companies under government regulations. Private companies are typically part of a collective responsibility system. They have the option to handle recycling directly or through an agency/operator that undertakes recycling. For the agency/operator option, the private companies pay the costs involved for recycling. (SEA circular project, 2020)

The efficiency of Germany's recycling system is also due to close collaboration between public agencies and private companies (Minerva Studio, 2018). Producers, municipalities and waste management companies work together to ensure high recycling rates under the oversight of government agencies such as the Central Packaging Register and the German Environment Agency (Bünemann et al., 2021).

Insight area #5: Efficient handling of plastic waste

Another important factor in the successful implementation of EPR is efficient collection and recycling infrastructure funded by producer fees. As producers are responsible for the entire cycle of activities in the waste management process, it makes financial sense for producers to ensure that the collection and recycling activities are handled through efficient processes and infrastructure. This minimises costs that the producers have to bear, as part of the EPR system, through waste management or recycling fees.

In Germany, collection and recycling infrastructure is mainly funded by producer fees as part of the EPR system obligations. The producers or distributors bear responsibility for the waste generated by their products, from collection to recycling (Bünemann et al., 2021). The system has evolved to ensure efficiency in waste collection, processing and recycling. Several key factors contribute to the efficiency of the collection and recycling activities.

1. **Producer funding of recycling infrastructure and activities with incentives for higher recyclability of products:** Producers are required to participate in a dual system that finances the collection, sorting, and recycling of materials. The fees paid depend on materials used in products and the recyclability of the waste generated. Non-recyclable materials incur higher fees. This incentivizes producers to use more sustainable or eco-friendly materials. The EPR framework ensures that the waste management infrastructure is funded by public funds and also supported by the producers creating the waste. (Bünemann et al., 2021)
2. **Promotion of multiple-PRO system:** Germany's ERP system has multiple Producer Responsibility Organizations (PROs) and this approach has been a key factor in improving the efficiency of recycling and plastic waste management. The multiple PRO system has provided
    a. Higher competition leading to efficiency: The system sets up competition among PROs handling collection, sorting and recycling of packaging materials. Producers have the choice to select the PRO offering best services at competitive prices.

This has resulted in cost efficiency and better services for producers/municipalities. This competition incentivizes PROs to optimise logistics and operations, leading to more effective collection and processing of recyclable materials. (Sachdeva et al., 2021)

b. Specialisation and innovation by PROs: In the multiple PROs system, the PROs have focussed on waste handling and recycling from specific types of waste or sectors. This specialisation has resulted in efficiency and innovations in recycling operations and technology. Specifically, in plastics, Germany has achieved high recycling rates using advanced mechanical recycling techniques. (OECD, 2016)

c. Comprehensive coverage of operating geographies and higher accountability: With multiple PROs producers, users and local municipalities get comprehensive coverage across different regions and products. This has led to very minimal waste being unhandled. Given the requirements of performance reporting and target requirements in the EPR system, there is high accountability and this has grown recycling rates and ensured comprehensive plastic waste management. (Bünemann et al., 2021)

d. Flexible, scalable and agile waste management: Competition has enabled flexible, scalable and agile waste management systems. In a multiple PROs system, the PROs are competing for market share and hence they are ready to adapt and respond to new regulations, such as the Single-Use Plastic Fund Act (Enders et al., 2024). The PROs integrate these changes quickly to stay ahead in their business.

3. **Installation of advanced recycling infrastructure:** Germany has invested in state-of-the-art recycling facilities, including mechanical recycling for plastics and advanced battery recycling systems. Mechanical recycling processes approximately 50% of Germany's plastic waste, with the rest used for energy recovery (Bünemann et al., 2021). The system also recycles batteries by implementing EU regulations that mandate high recycling rates for materials like lithium and cobalt (*OECD*, 2023).

4. **Producer take-back services for products:** The producers selling in German markets must offer take-back services for their products. This includes setting up used product or packaging return/collection systems, or joining collective schemes that handle the collection and recycling of waste. Retailers with a certain threshold of floor space are required to provide drop-off points for consumers to return electronic waste. (Bünemann et al., 2021)

Japan has focussed on efficiency in the EPR implementation through requiring sorting and collection requirements and setting guidelines for producers/suppliers on handling plastic waste:

1. **Sorting and collection by local governments**: Local governments are required to implement sorting and collection facilities to separate packaging waste from other types of waste. Citizens are encouraged to sort their waste according to the guidelines provided by local authorities. (OECD, 2016)

2. **Sales and supply stage guidelines for producers/suppliers: Japan's** "3R [Reduce, Reuse, Recycle] + Renewable" initiatives, **introduced in** 2022, promotes resource circulation of plastics in each stage of the entire lifecycle of plastic products. In particular it established guidelines for suppliers on how to handle plastic products more responsibly with the goal of reducing plastic waste through efficient use/introduction of products. Efficiency is addressed at the origination stage of the waste and, hence, helping the EPR implementation be efficient as a whole. (*"Plastics Smart" Campaign*, 2019)

The approach taken by South Korea to improve efficiency in plastic waste processing is tight integration of the waste processing activities and use of technologies:

1. **Integration of waste collection, sorting, and recycling:** The system integrates the collection, sorting, recycling, and disposal into a streamlined process to minimise waste and maximise materials recovery. This sorting is crucial for the efficiency of the recycling process, as it reduces contamination and increases the quality of recyclable materials. (SEA circular project, 2020)

2. **Advanced technologies implementation:** As a result of a unified waste management system, the government is able to invest in advanced technology at scale to support waste management (Korea Environment Institute, 2010). Technology implementation is focussed on advanced sorting facilities, automated recycling plants, and waste-to-energy technologies. Technology implementation improves the efficiency of waste management.

Insight area #6: Mobilising communities for successful implementation

The last key factor to successfully implement EPR is the involvement of the public in recycling efforts through encouraging participation and creating awareness.

The Japanese government has put in place initiatives to raise public awareness including measures to raise public awareness about plastic waste issues and promote behavioural changes, and education campaigns focussed on encouraging consumers to reduce plastic waste and proactively recycle plastic (*"Plastics Smart" Campaign*, 2019). These initiatives have been critical to the success of plastics EPR initiatives and have helped reduce plastic waste. The initiatives have focussed on the following:

1. **Education and public awareness campaigns:** Extensive public education campaigns emphasising the importance of waste sorting and recycling have been run by Japan at various levels of governments. These campaigns are tailored to the needs of local communities and typically include distribution of educational materials on plastic recycling and detailed guides on how to properly sort waste, community events to educate citizens on recycling practices, and usage of media channels to reach a wide audience. (*"Plastics Smart" Campaign*, 2019)

2. **Community programs for recycling:** Local governments have also fostered community involvement in recycling efforts. They work with community groups to organise and run neighbourhood recycling programs, where residents participate in collective waste sorting

and collection activities. In some communities, volunteer groups in communities manage local recycling stations. (Runzo, 2022)

3. **Incentives by local governments to increase recycling:** Reward systems where citizens can earn points or discounts on local services have been used by local governments to increase participation in recycling. For example, residents who bring in a certain amount of recyclable materials can receive vouchers. (*This Japanese Word Is Helping the Country Recycle and Waste Less*, 2019)

4. **Education and awareness through school programs:** Recycling and general environmental education is a part of school curriculum. Students learn about the importance of recycling and sustainability from an early age. Schools also organise sustainability and recycling oriented projects regularly to engage students and bring about awareness. (Runzo, 2022)

Germany is another country that has been successful in having high recycling rates driven by public participation and continuous innovation. Germany's success in recycling, particularly in plastic, has been underpinned by strong public participation and continuous innovation and improvements in recycling infrastructure supporting its waste management system.

1. **Public participation and mandatory sorting requirements:** Germany's EPR encourages and depends on public participation in the recycling process. The framework has mandatory waste sorting policies, where citizens are required to separate waste into various categories (plastic, glass, paper, etc.) prior to disposal (Bünemann et al., 2021). This pre-sorting keeps waste streams consistent, reduces contamination and improves the recyclability of waste streams, making the processes more efficient. The government and EPR stakeholders run public education campaigns and ensure waste collection infrastructure such as recycling bins are easily accessible (Minerva Studio, 2018). The recycling programs and waste management processes have made sorting of waste a norm in society.

2. **Continuous innovation in recycling technology and processes:** PROs have continuously invested to innovate in recycling technology to increase efficiency across the waste management process (Sachdeva et al., 2021). For plastics, mechanical recycling processes have been optimised with results of 67.5% recycling rate for plastic packaging in 2022 (Santos, 2023). The use of eco-friendly and recyclability focussed packaging by manufacturers have also contributed to recycling rates. Initiatives like the "Catalaix" project aim to transform plastic recycling by developing catalytic technologies for converting conventional plastics into renewable materials (Bulut, 2024).

Similarly, South Korea has used centrally unified platforms to target wide public participation and improve awareness on EPR and plastic recycling in general. Centralised systems engage citizens across the nation through awareness campaigns to improve awareness and participation. These campaigns engage citizens particularly for improvement of waste sorting practices to ensure that the waste collected for recycling/management can be efficiently processed. (SEA circular project, 2020)

3. Way forward for Indonesia

Based on the analysis of successful case studies of EPR implementation, this paper proposes 7 key strategies for Indonesia to implement in order to accelerate EPR implementation. These strategies have built on analysis of success case studies and would need to be tailored based on consultations across stakeholders in Indonesia and further analysis of any key data that would influence these strategies.

Recommendation #1: Simplification of EPR requirements

"Simplify existing EPR requirements with segmentation"

To deal with ambiguity in scope and targets of EPR regulations, Indonesia can benefit from the case studies of Japan and Germany. These markets have detailed and specific EPR frameworks. The frameworks define the roles and responsibilities of producers and stakeholders, including clear targets and compliance requirements.

In particular, Japan's Act on the Promotion of Sorted Collection and Recycling of Containers and Packaging is a good example - it outlines precise obligations for producers, including waste reduction and recycling targets, and mandates contracting with certified entities (OECD, 2016).

Indonesia can adopt a similar approach by introducing a detailed segmentation of producers based on size, type of material/plastic used, and waste volumes generated. The EPR regulation can specify clear eligibility criteria for the segmentations and set mandatory targets for different segments of producers (e.g., large, medium, and small producers). This segmentation would be very specific to the Indonesia market, provide clarity to market stakeholders on their obligations and avoid a one-size-fits-all approach. For example, larger producers could be required to meet higher recycling targets while smaller producers could take on simplified obligations.

Non-compliance should trigger financial penalties and/or restrictions on market access appropriate for the segments of producers. These penalties coupled with incentives for exceeding targets or contributions towards Indonesia's waste management strategy would encourage participation and compliance from producers.

Recommendation #2: Unified EPR coordination agency

"Establish unified EPR coordination agency for EPR compliance"

For developing coordination and synergies between stakeholders, Indonesia can draw inspiration from South Korea's centralised waste management system and "single window" systems used by countries to streamline foreign investment processes (Papamichael et al., 2022).

Korea Environment Corporation (KECO), in South Korea, is the unified agency that oversees waste management across the country and ensures coordination across public agencies, producers, and waste management companies (Li, 2024).

Indonesia can develop a central agency similar to South Korea's KECO to oversee EPR implementation - including registration, reporting, and enforcement of EPR regulations across all regions. This agency would need to be the single authority and point of contact for all stakeholders, including producers, waste management companies, local governments and local community representatives. The agency would be able to streamline communication, plans and initiatives for effective plastic waste management.

Recommendation #3: Centralised digital platform

"Set-up centralised digital platform ("EPR single-window platform") for producer registration, tracking and enforcement"

Germany and Norway have shown efficiency in enforcing EPR policies using mandatory producer registrations, detailed reporting, and financial penalties for non-compliance (Dessau-Rosslau, 2021). This has led to high compliance rates. Germany's Packaging Act mandates producers to register with a central authority, report packaging volumes, and meet specific recycling quotas, or face penalties for non-compliance (Dessau-Rosslau, 2021).

Indonesia could introduce strict enforcement mechanisms similar to Germany's system. The government can set up a centralised digital platform for producer registration, submission of waste reduction plans, progress monitoring and reporting. This system would centralise all regulatory processes related to EPR.

The platform would need to enable real-time collaboration between the Ministry of Environment and Forestry (MoEF), local governments, and producers. This would greatly enhance coordination and improve producers' approach towards EPR implementation. Stakeholders would also have access to shared data, helping them align their plans and goals more effectively.

Recommendation #4: Multi-stakeholder task force for investments

"Set-up multi-stakeholder task force for progressing waste infrastructure investments"

Active collaboration between government, industry stakeholders, and local communities in Japan and Norway has contributed significantly to the success of EPR implementation.

Japan's Plastic Resource Circulation Strategy emphasises collaboration across municipalities, businesses, and consumers (*Japan's Resource Circulation Strategy for Plastics*, 2019). This collaboration focuses on circular economy, development of recycling and waste management infrastructure, and waste reduction at source. Similarly, Norway has promoted joint initiatives between public agencies, private companies, and local communities to achieve investments in waste management (VIR, 2024).

Indonesia can form a multi-stakeholder task force(s) headed by the *unified EPR coordination agency* and including representatives from local governments, private waste management companies, producers, and representatives of local communities. The task force(s) can identify localised infrastructure requirements, such as waste collection facilities and recycling centres, and develop projects for the infrastructure. Public-private partnerships (PPP) can be promoted to leverage private sector investment in recycling infrastructure.

The task force should organise regular workshops, consultations and learning sessions to ensure all stakeholders are up-to-date and aligned with the latest regulations, initiatives and progress in plastic waste management. This approach would foster collaboration between various stakeholders.

Recommendation #5: Government-producer partnership for infrastructure

"Develop infrastructure in collaboration with producers, and implement outcome-based fees and incentives"

Norway has collaborated with producers to develop waste management infrastructure and fund research on sustainable packaging solutions (VIR, 2024). This collaborative approach ensures the government and producers contribute to and benefit from the waste management infrastructure.

Indonesia can follow a similar approach and form partnerships with waste producers to co-fund recycling infrastructure. Producers could receive reduced EPR fees or preferred access to recycling as benefits. This government-producer collaboration would expedite and enhance the development of waste management facilities.

To further align on outcome based EPR implementation, Indonesia could implement "differential recycling fees" similar to the scheme implemented in South Korea (Ministry of Environment, 2021). Producers will be charged based on the type and recyclability of the packaging they use. Producers using easily recyclable materials, like PET bottles, pay lower fees, while those using fewer recyclable materials incur higher costs. This creates a direct financial incentive for producers to choose eco-friendly and recyclable packaging, thereby reducing the overall cost burden on the waste management infrastructure.

Incentives could be the third pillar after co-funding investments and differential recycling fees. Japan and Norway use financial incentives to encourage eco-friendly product and packaging designs (Albertins, 2024). For example, Japan rewards producers using minimal packaging or recycled materials (OECD, 2016).

Indonesia could follow these examples and incentivise practices that are eco-friendly including use of recycled materials and low wastage packaging. The incentives could be in the form of reduced EPR fees and financial rebates.

Solution for Indonesia: Indonesia can create an EPR fund, where producers contribute based on their packaging materials' volume and environmental impact. The fund would finance the development of waste management infrastructure, public awareness campaigns, and recycling technologies. In return, producers can receive financial incentives, such as tax breaks or reduced fees, for adopting sustainable packaging practices or exceeding recycling targets.

By implementing collaborative investments and outcome-based incentives, Indonesia can drive sustainable participation in EPR and achieve its waste management targets.

Recommendation #6: Competitive market structure

"Establish a competitive market structure with emphasis on local workforce for handling waste"

Germany's EPR system has been made efficient through competition between multiple PROs (Bünemann et al., 2021). This has also led to innovations in recycling technologies and more effective waste management.

Indonesia can adopt a similar multi-PRO system to create a competitive environment for waste management. This will encourage innovation and efficiency in the collection and recycling of plastic waste. The government can prioritise programmes in major urban centres where high volumes of plastic waste can support a competitive market.

Mobilisation of local communities and informal economy workers would be able to supplement the multi-PRO system and make it successful by lessening the need for heavy infrastructure in collection and sorting of plastic waste.

Recommendation #7: Public awareness programmes

"Engage with the public at all levels to develop awareness and recycling culture"

Japan has implemented extensive public education and awareness campaigns which have been instrumental in raising awareness about plastic waste management. These include two layers of campaigns: media campaigns for the general public's awareness along with distribution of educational materials by local governments, and environmental education integrated into school curriculums across schools (Runzo, 2022). Similarly, Germany emphasises mandatory sorting at the community level and encourages it through public awareness programs (*OECD Environmental Performance Reviews: Germany 2023*, 2023).

For the success of plastic EPR implementation, Indonesia must develop and implement nationwide public education campaigns through mass media and social media along with local government outreach programs. Schools would also need to integrate plastic waste education into their curricula to teach young students the importance of recycling.

At local community level, initiatives to teach and inculcate sorting of plastic waste and highlight the environmental impact of improper disposal would help achieve waste management targets set by Indonesia. These initiatives can be supplemented with incentives for households to participate in them. Such incentives in Japan (*This Japanese Word Is Helping the Country Recycle and Waste Less*, 2019), South Korea (SEA circular project, 2020) and Norway have proven to drive up engagement of the community in EPR initiatives.

Finally, one of the most important strengths that Indonesia can leverage to make the EPR implementation successful is the Informal Recycling Sector (IRS). A 2021 study has shown that the IRS has a substantial contribution to waste management and the circular economy in Indonesia (Medrilzam, 2023). Formally integrating the IRS workers can yield a readily available workforce, immediate engagement at community level and accelerate recycling initiatives.

4. Conclusion

Indonesia faces a significant plastic waste problem, generating around 7.8 million tonnes of plastic waste annually, with a large portion ending up in rivers and coastal waters. About 28% of the waste is currently unmanaged and this pollution harms marine biodiversity and poses health risks to the population. (SEA circular project, 2020)

Indonesia has set itself steep targets (70% reduction in plastic waste by 2025) with regards to waste management and recycling (The World Bank, 2021). To progress on these targets, a well-functioning EPR system is critical. The government has developed an Extended Producer Responsibility (EPR) framework to address the problem - it has made regulatory progress for waste management with the Solid Waste Management Act (2008) and the Roadmap to Waste Reduction by Producers (2019), along with various initiatives to reduce and manage plastic waste (Ratnawati, 2020).

Despite various initiatives and regulations, waste management and recycling has had limited progress in the country. WWF has highlighted 7 key reasons for limited progress in EPR implementation (Mustard, 2022). The research highlights that the limited progress has been due to the ambiguous scope of the EPR regulations and implementation gaps such as lack of enforcement and insufficient public awareness.

Insights from successful case studies of EPR implementation can help Indonesia accelerate its EPR implementation. Through analysis of EPR implementations in Japan, Japan, South Korea, Germany, and Norway six insight areas were identified. These include focusing on well-defined frameworks, strict enforcement, financial obligations for producers, and strong stakeholder collaboration.

Based on insights from case studies, seven recommendations have been developed to accelerate EPR implementation in Indonesia and effectively manage plastic waste. The recommendations focus on addressing the gaps in Indonesia’s EPR framework. They include simplification of EPR, creating a single window system for EPR implementation, ensuring collaboration with producers and creating public awareness. These strategies would need to be tailored to local context through consultations across stakeholders.

By implementing simple and proven strategies, Indonesia can look to accelerate the EPR implementation and ensure effectiveness.

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