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KNOWLEDGE EXCHANGE ON EPR FOR CIRCULAR ECONOMY

PRESIDENCY DOCUMENT

JULY 2023

TECHNICAL DOCUMENT DEVELOPED FOR THE G20



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Disclaimer: The report does not necessarily provide exhaustive documentation of all Resource Efficiency and Circular Economy related activities by G20 members and guest countries, rather it is an outcome of work that was conducted between November 2022 and July 2023.

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List of Acronyms

Abbreviation	Definition
AGEC Law	Anti-Waste Law for a Circular Economy
ARF	Advanced Recycling Fees
BAFU	Federal Office for the Environment
BIAC	Business and Industry Advisory Committee
CE	Circular Economy
CONAMA	National Council of the Environment
COP	Conference of the Parties
CPCB	Central Pollution Control Board
CSR	Corporate Social Responsibility
DMC	Domestic Material Consumption
DPG	German Deposit System
DSD	Duales System Deutschland
ECSWG	Environment and Climate Sustainability Working Group
EKONID	German-Indonesian Chamber of Industry and Commerce
EMC	Environmental Management Centre Pvt. Ltd.
EPA	Environmental Protection Agency
EPR	Extended Producer Responsibility
EPS	Extended product stewardship
EU	European Union
EV	Electric vehicle
FMCG	Fast-moving consumer goods
GDP	Gross domestic product
GHG	Greenhouse gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GVA	Gross value added
HDPE	High Density Polyethylene
IASS	Institute for Advanced Sustainability Studies
IEEP	Institute for European Environmental Policy
IIIEE	International Institute for Industrial Environmental Economics
ILO	International Labour Organization
IPRO	Indonesia Packaging Recovery Organization
ISO	International Organization for Standardization
KECO	Korea Environment Corporation
KLHK	Ministry of Environment and Forestry, Indonesia
KORECO	Korea Recycling Corporation
LGPGIR	General Law for the Prevention and Integral Management of Waste
LiFE	Lifestyle for Environment
MoEFCC	Ministry of Environment, Forest and Climate Change of India
MSW	Municipal Solid Waste



OECD	Organisation for Economic Co-operation and Development
ORDEE	Ordinance on 'The Return, the Taking Back and the Disposal of Electrical and Electronic Equipment'
PCR	Post-consumer recycled content
PEBD	Low density polyethylene
PET	Polyethylene terephthalate
PIBO	Producers, Importers and Brand Owners
PPP	Public Private Partnerships
PRN	Packaging Recovery Note
PRN	Packaging Waste Recovery Note
PRO	Producer Responsibility Organization
PRO Europe	Packaging Recovery Organization Europe
PS	Polystyrene
PV	Photovoltaic
PVC	Polyvinyl Chloride
PWM	Plastic Waste Management
RCRA	Resource Conservation and Recovery Act
RCRA	Resource Conservation and Recovery Act
RCV	Refuse collection vehicles
RE	Resource Efficiency
RED	Resource Efficiency Dialogue
RMC	Raw Material Consumption
RMF	Recycling Modernisation Fund
RRV	Resource recovery vehicles
SCAP	Sustainable Clothing Action Plan
SDG	Sustainable Development Goals
SEMARNAT	Secretariat of Environment and Natural Resources, Mexico
SENS	Swiss Foundation for the Disposal of Wastes
SEPA	State Environment Protection Agency
SMM	Sustainable Materials Management
SPCB	State Pollution Control Board
SWICO	Swiss Economic Association for the Suppliers of Information, Communication and Organizational Technology
UNEA	UN Environment Assembly
UNEP	United Nations Environment Programme
WEEE	Waste Electrical and Electronic Equipment
WWF	World Wide Fund for Nature



1. Context

Global population and higher income levels have resulted in a huge increase in global material consumption over the last few decades. Between 1990 and 2017, the global population surged from 5 to 7.5 billion people, while global GDP per capita climbed by 50% (World Bank 2021). As a result, material consumption globally increased from 37 billion tonnes in 1990 to 88 billion tonnes in 2017, while the average daily material consumption per capita increased from 22 kg to 33 kg during the same period (OECD 2019). Materials consumption is expected to roughly double by 2060 in the absence of further policies improving resource productivity (ibid). This adds stress to the natural ecosystem as the pace of consumption has by far surpassed the pace of replenishment of the environment to its natural order, causing resource security challenges. Also, consumption of materials, components, and products can have adverse implications downstream and create environmental externalities when they become waste (WWF and IEEP, 2020).

G20 members account for almost 75% of worldwide material usage, 60% of the world's population, 80% of global GDP, and 75% of global trade (OECD 2021; UNEP 2019). During the period 1990-2020, the material consumption by the G20 members has doubled from around 35 billion tonnes to over 70 billion tonnes (Figure 1).

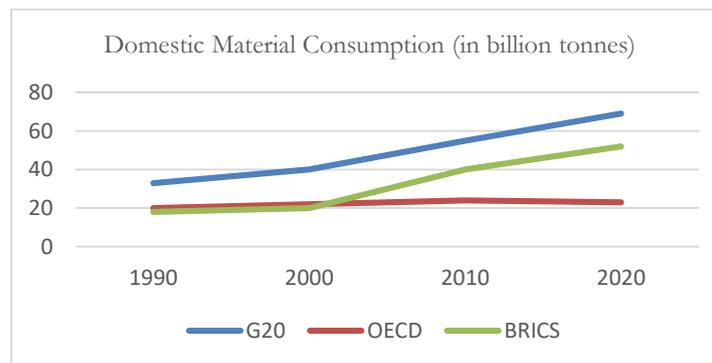


Figure 1: Domestic Material Consumption
Source: UNEP Global Materials Flows database

In this context, the circular economy (CE) approach will greatly help to decouple economic growth from (virgin) material consumption and waste generation. The three fundamental principles of circular economy include reducing waste and pollution, keeping materials in use as products or raw material and regenerating natural systems by improving the natural environment. It seeks to extend the lifespan of products following the ‘circular Rs’, which include- *rethink, refuse, reduce, redesign, reuse, repair, refurbish, remanufacture, repurpose, renovate, return, recycle, and recover*. CE challenges the linear economy model that is characterized by “take-make-dispose” pattern.

CE enables improvement in environmental outcomes (slowdown in the use of natural resources, reduced landscape and habitat disruption), better management of supply chains and decrease in risks faced related to resource availability and its prices. The role of CE in slowing down and eventually halting biodiversity loss, reversing its decline, by restoring ecosystems and rebuilding natural capital is also growing (Schröder, P., et. al 2021).

CE has several important co-benefits including creation of green jobs, promotion of business models and creating associated entrepreneurial and livelihood opportunities, building of innovation capital and provision of opportunities for sustainable finance to move towards green and circular investment. In



addition, the emission reduction resulting from CE approaches, such as use of secondary raw material to substitute virgin raw material or reducing mismanagement of waste has the potential to contribute to achieving net zero goals.

2. About this Presidency Document

This Presidency Document discusses the sub-theme of Extended Producer Responsibility for Circular Economy under the broader theme of Encouraging Resource Efficiency and Circular Economy for India's G20 Presidency. Accordingly, a high-level stocktaking of EPR implementation in G20 members and compilation has been facilitated in the form of this Technical Document, bringing out learnings on mechanisms across the EPR design and implementation cycle. It reflects a distillation and compilation of G20 members' experiences and may serve as a toolkit for designing EPR mechanisms for countries across the world. This compilation:

- Discusses the principles that may be considered while embedding EPR policy in the country context recognizing the differing national priorities and circumstances and need for local adaptation (for e.g. integration of the informal sector in the EPR implementation mechanism in developing countries such as India)
- Provides an overview of policy instruments that support goal setting and enforcement of EPR obligations.
- Suggests mechanisms followed for collaborative engagement between different stakeholders including regulators, producers and brand owners, local authorities, consumers, retailers, producer responsibility organizations, recyclers, and the suppliers of secondary raw materials.

The document has been prepared basis the review and analysis of published literature-journal articles, academic papers, policy documents and reports on country level EPR implementation.

This Technical Document has been prepared by Environmental Management Centre Pvt. Ltd (EMC) with support from the Shakti Sustainable Energy Foundation and in collaboration with Ministry of Environment, Forests and Climate Change, Government of India.

Government of India has tried to continuously engage all the G20 members, International Organizations (IOs) and the invited countries at the Environment, Climate and Sustainability Working Group (ECSWG) meetings and beyond to gather their inputs on this technical document. The inputs received from this engagement have been valuable and insightful.

3. Rationale and Relevance of Extended Producer Responsibility (EPR) for Circular Economy

A formal definition of EPR as presented by Thomas Lindhqvist¹ notes- *Extended Producer Responsibility is an environmental protection strategy to reach an environmental objective of a decreased total environmental impact from a product,*

¹ Thomas Lindhqvist is a Swedish Professor and introduced the concept of Extended Producer Responsibility (EPR) in 1990. Schemes like the container deposit schemes in some parts of the world such as in Europe and Australia have been in existence prior to the introduction of concept of Extended Producer Responsibility (EPR). Deposit refund system is also an important EPR policy instrument to shift the responsibility for waste management from the public sector to producers



by making the manufacturer of the product responsible for the entire life-cycle of the product and especially for the take-back, recycling and final disposal of the product. The Extended Producer Responsibility is implemented through administrative, economic and informative instruments. The composition of these instruments determines the precise form of the Extended Producer Responsibility (Lindqvist, T. (2000)).

EPR strategies require not only sound design, but also robust governance for its smooth and effective operation. Local municipalities may operate programs where they provide collection and sorting/processing services with substantial funding support by producers, notably through a producer responsibility organization.

The Business and Industry Advisory Committee (BIAC) to the OECD also supported the concept of Shared Product Responsibility, which they equalised with Extended Product Responsibility. The concept was expressed as- *A voluntary system that ensures responsibilities for the environmental effects throughout a product's life cycle by all those involved in the life cycle. The greatest opportunity for extended product responsibility rests with those throughout the commerce chain – designers, suppliers, manufacturers, distributors, users, and disposers – that are in a position to practice resource conservation and pollution prevention at lower cost* (Business and Industry Advisory Committee (BIAC)(1997))

EPR holds the promise to advance circular economy by bringing in the much-needed responsibility (financial and/or physical) that will enable the 'closing the loop' in material and product value chain. EPR instruments can, therefore, theoretically incentivise producers to adopt the circular economy model in three ways:

- a. Promote responsible selection of materials (environmentally friendly and less toxic materials) and design of products.
- b. Mandate producers to take ownership over end-of-life products through recycling mandates and targets,
- c. Adjust costs and revenues of processing end-of-life products beneficially through fees and charges or take back mechanisms

Though the access to better technology for waste management has been helpful in advancing circular processes, it is waste prevention (including through design changes and material use) that should be prioritized by the producers, followed by the processes of reusing, recycling, recovering and final disposing.

3.1 Benefits of EPR and Potential Opportunities for Circular Economy

If well-designed and implemented, EPR can provide significant environmental, economic and social benefits. These include-

- a. **Decrease in the extraction of virgin resources:** An EPR legislation may set targets on reuse, recycling and use of recycled content for producers, importers and brand owners.. Meeting this requirement will reduce the mismanagement of waste and foster recovery and recycling of waste into secondary raw material. The substitution of virgin materials with this secondary raw material will reduce the resource extraction pressure and associated impacts on land degradation, emissions to atmosphere, water use and help protect the biodiversity that is usually threatened due to mining and extracting resources.
- b. **Improvement in waste management and resource recovery** as establishing efficient system for collection of end-of-life products from consumers and supporting the creation of effective recycling infrastructure and processes will reduce the amount of waste disposed in the landfills (Akenji, L. et al 2011)



- c. **Reduced financial burden on public sector:** EPR moves the cost of managing end-of-life products partially or fully from local governments to the producers.
- d. **Innovation and design for environment:** Since EPR asks the industry to take back products at the end of a product's life it incentivizes the development of designs that boost their recyclability and minimize the impact of products that could otherwise remain in the waste stream. EPR implementation mechanisms can also integrate incentives towards design for environment (Akenji, L. et al 2011), leading to design changes that make recovery of materials easier or products easier to reuse or recycle. EPR will boost innovation to actualize design for environment considerations.
- e. **Promotion of eco-entrepreneurship and business models:** that support the implementation of EPR and may generate livelihood opportunities for many.

Figure 2 presents the different opportunities for EPR to create an impact across the lifecycle stages.

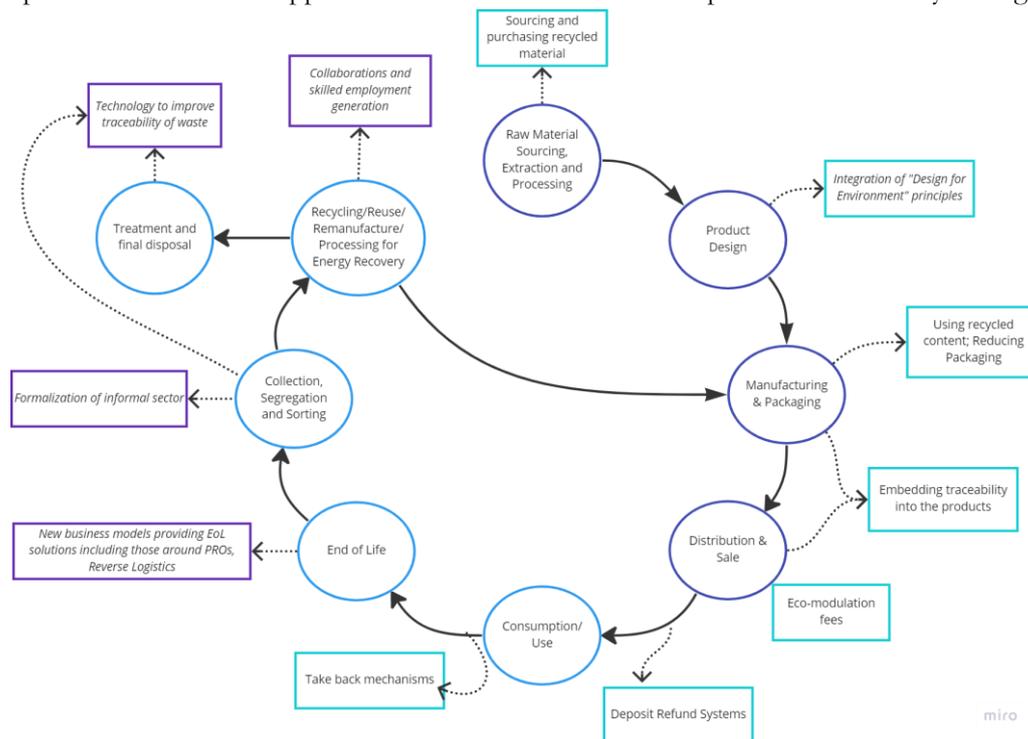


Figure 2: Opportunities for EPR to create an impact across the lifecycle stages

EPR promotes innovative and sustainable business models around waste management and product design and material alternatives. These business models can provide considerable environmental benefits by offsetting the production of new products and materials and at the same time promoting competitiveness and job creation. Annexure 1 presents a typology of business models that are seen as part of the implementation of EPR and selected examples from G20 members of enterprises under the typology.

3.2 Global Trends

As per an OECD analysis depicted in Figure 3, globally there were found to be about 400 operational EPR-based schemes (OECD 2016). Approximately 35 percent are addressed to Waste Electrical and Electronic Equipment (WEEE), 17 percent to tyres and rubber, 11 percent to vehicle/auto batteries and the remaining to other products such as end-of-life vehicles, plastic packaging, used oil, etc. (OECD 2013b). These schemes define/elucidate the ways of putting EPR concept into implementation.



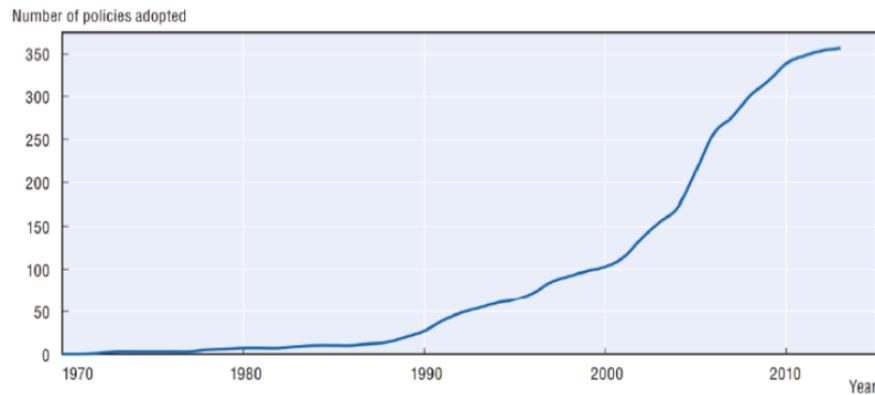


Figure 3: Cumulative EPR adoption at the global level
Source: (OECD, 2016) (OECD, 2021).

The EPR may be mandatory through legislation (for example as clearly stated financial and/or organizational obligations of the producers, importers, brand owners, retailers, distributors, under waste management rules) or in the form of voluntary initiatives (such as in the form of product take back mechanisms set by the producers) led by individual industries or industry associations or group of industries that set industry-agreed standards and may even organize awards and industry awareness programs to recognize the efforts made. Many countries that have mandatory EPR systems transitioned from an initial voluntary scheme (Bünemann, Brinkmann, Dr. Löhle, et al. 2020).

Voluntary EPR has been considered by some to be superior to mandatory mechanisms because of their potential flexibility and lower costs (Galeano, 1996; Renckens, 2008). These lower costs are due to minimal or absence of compliance and enforcement costs, given the voluntary nature and no mandate by the government. However, voluntary EPR can be hindered by the failure to progress beyond business as usual and may face challenges linked to accountability due to absence of monitoring, free riding, and transaction costs (Barde, 2004). There are also challenges in terms of performance, governance, data availability, measurement, and transparency for the voluntary approaches.

Challenges in terms of EPR implementation, irrespective of mandatory or voluntary legislation within the countries exist. For instance, poor collection and recycling infrastructure, exclusion of the informal sector, multi-agencies involvement in policy-making processes, and the high chance of overreporting by the producer pose serious issues.

Many countries like India have introduced EPR in their waste management rules with an objective to achieve a circular economy, improve materials security, and increase competitiveness. More generally, EPR is being used as a strategy to engage stakeholders within the borders of a country. However, given the increasing importance of trade flows and global supply chains, the context of application of EPR across borders also has relevance. For example, internationally traded waste often finds its final destination in the developing countries (Secretariat of the Basel Convention 2018; Gregson et al. 2015). Though many of the Asian countries including China and Malaysia have designed measures related to import ban, in many other developing countries including India, import of waste continues. Some types of waste such as the e-waste and paper waste may move from the developed countries to the low-income/developing countries in the form of exports of waste/export of second-hand products². There is no producer responsibility linked to

² In India, the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 have banned the import of e-waste, except for refurbishment and re-exportation of second-hand goods. However, the Harmonized



this waste (or even the so called “second hand goods” being imported) exercised by the producer after these products/waste leaves the exporting country. This can be facilitated through the regulations on EPR in the receiving country where the importer takes the responsibility for first extending its lifetime as much as possible through remanufacturing/refurbishment/reuse and then the end-of-life management of the product when it becomes non-functional or non-usable due to any other reason.

The discussions in G20 over the last few years have highlighted the importance of EPR particularly in the context of plastic waste (Bakshi et.al. 2020), but has not specifically deliberated at a G20 platform on its importance as an important strategy for promoting circular economy and meeting sustainable development goals. There is significant scope for learning between countries and potential for this strategy to foster circular economy and be integrated with higher-priority sustainability initiatives in the respective countries.

4. Categories of EPR Models

There are two broad categories of EPR implementation models- **Fee-based model** and **Market-based model** seen across the world, though there are many types of schemes operational under these models.

Category 1: Fee-based Models

Under the fee-based models for EPR implementation, a fee (modulated or unmodulated) linked to the quantity (volume/weight) of the products and/or packaging brought by the producer to the market is levied on the producer. Modulating the EPR fees can incentivize actions at various stages of the product lifecycle (Product Stewardship Institute 2020). The fee is contributed to an EPR fund or directly to the waste management and recycling entities and the payment of this fee is considered equivalent to fulfilling a producer’s EPR obligation.

The fee could be paid directly by the producer as an Advanced Recycling Fee or could be channelized through the Advanced Disposal Fees levied on the customer and used to meet the EPR fee obligation by the producer.

The fee collected from the producers may be used to fund:

- **Producer Responsibility Organization (PRO)-** Here the producers funded and/or industry-self-managed PROs are responsible to meet member-producers’ waste management obligations (targets) in terms of collection and channelization for recycling and recovery. The fund finances the collection and sorting of waste generated by the producers. The PROs may also partner with other waste management agencies or the urban local bodies (ULBs) or municipalities to facilitate responsible waste management.
- **Urban Local Bodies (ULBs)/Municipalities-**Here the ULBs or municipalities carry out the collection and sorting of waste and its channelization for recycling and recovery and thereby assist the producers in the achievement of the producer’s EPR targets. The transfer of funds to the ULBs from the EPR fund may be linked to the relative share of waste generated in the ULBs.

Fee-based models are financially feasible for small and medium-scale enterprises as overhead costs are not as high and it may help in reducing the costs linked to EPR implementation. These models may be easy to adopt subject to arriving at a method to calculate the EPR fees to be levied.

EPR fees usually include the end-of-life cost of a product (i.e., the cost of collection, sorting, and treatment/recycling), and fee modulation is meant to incentivize Design for Environment to decrease end-of-life costs (Hogg et al. 2020). Modulated fees can also target upstream measures such as use of secondary

Code for waste and second-hand equipment are the same, which makes it practically impossible to stop the flow of e-waste into the country. And lack of protocol, resources and expertise makes it difficult for excise and customs officials to differentiate between e-waste and second-hand goods.



raw materials, reduction in use of toxic materials, thereby advancing circularity.

A recent study based on EU and OECD has done a classification of modulation fees (Laubinger et al. 2021; Sachdeva, Araujo, and Dr. Martin Hirschnitz-Garbers 2021). Basic modulation fees applies a simple average of materials, such as weight. The advanced modulation fees are based on more nuanced and granular aspects that would reflect the end-of-life costs and allow bonuses and maluses related to the environmental costs to also be integrated in the fees levied. Table 2 provides a list of criteria that have been used in different countries including G20 members for levying advance eco-modulation fees.

Table 1: Criteria for application of modulation fee along with applicable sectors and countries practicing it

	Criteria	Applicable sector	Countries with modulation fees
Based on end-of-life	Product recyclability- Lower fees for Mono-material or mono-layer packaging	Packaging, WEEE, Batteries, Vehicles	Chile (modulation fee for packaging with complex structures), Belgium, France, Portugal, Italy (modulation fees for packaging with bonus and malus structures)
	Recycling rate- Linked to quantity of waste that is recycled	Packaging, WEEE, Batteries, Vehicles	
	Usage of toxic materials- Penalize use of hazardous materials or incentivize reduction in toxic materials	Packaging, WEEE	France (modulation fees on the usage of hazardous substances based on bonus and malus structures), Portugal (penalties for glass bottles using ceramic and steel stoppers)
	Consumer awareness- initiatives taken by producers on building consumer awareness would result in lower EPR fees	All	France
Based of Lifecycle	Use of recycled material- Reward the use of recycled content	Packaging, WEEE, Batteries, Vehicles	Canada, Germany, Chile, France (modulation fees based on bonus and malus structure), USA, Portugal (fee waiver to tyre manufacturers using recycled content)
	Lifespan of the product- Reward products with longer product life as reflected in its reusability, repairability	Durable goods	Estonia (reusable packaging excluded while calculating EPR obligation), Belgium, Italy, Canada (modulation fees in the Quebec region intended to reduce single-use plastic packaging)

Sources: (Ministerio del Medio Ambiente Chile 2021); (Hogg et al. 2020; The 2020 rate for recycling household packaging 2019), (Sociedade Pontoverde 2021), (Watkins et al. 2017), (California Legislative Information 2020) (BMJV Germany 2019; Ministerio del Medio Ambiente Chile 2021; The 2020 rate for recycling household packaging 2019), (Laubinger et al. 2021)

Category 2: Market-based Models

The market-based models are primarily driven by the market forces wherein the producer engages in a market-based transaction with the entities -PROs and WMAs to meet its EPR obligations. This can happen through-

- **Tradeable EPR Certificates**, wherein tradeable credits/certificates are issued by authorized recyclers/regulators, and the producers, importers, brand owners, retailers, distributors are allowed to trade the same with other producers. The cost of the certificate is determined by the market, and it also determines the cost implication on the the producers, importers, brand owners, retailers, distributors for meeting their EPR obligation. While this model is easy to implement and adopt, it may dissuade producers from implementing actions upstream to reduce their EPR obligations, as certificates would be easily available at a price in the market.
- **Product Buy Back Scheme**, wherein the producer individually or collectively establishes infrastructure like Reverse Vending Machines or Collection Centers to collect end of life products



from consumers by providing them with an incentive. This incentive or the buyback price would determine the extent of participation in such models. This model is difficult to implement and may be financially burdensome for producers. However, this model will also create a larger impact on society as it will help in raising awareness amongst the customers on responsible disposal of end-of-life products.

- **Deposit Refund Scheme**, wherein the producer establishes a network with retailers to collect waste from consumers and channelize it for responsible end of life management after refunding the deposit to the customers given at the time of purchase. This deposit also acts like an incentive for the consumers for responsible disposal of their end-of-life products. Under this model, there may be constraints on the space available to the retailers, thereby making implementation difficult. The deposit fee may infact need to include a handling fee to compensate the retailers and depots where the returns of the product are made.

Some features of these different schemes operating under the two broad EPR implementation models often overlap, and they have been customized to integrate the existing socio-economic conditions and levels of institutional and infrastructure maturity in the respective countries.

Figure 4 highlights the market-based model adopted by India.

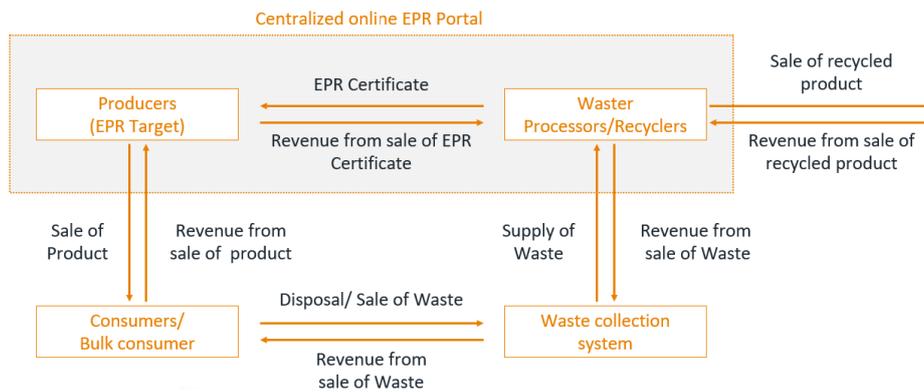


Figure 4: Market-based EPR Framework in India



Box 1 elaborates on the market-based model of EPR implementation in India through the case of trading of EPR Certificates in India for e-waste.

Box 1: Trading of EPR Certificates in India for e-waste: A Market Based Approach to EPR Implementation

E-Waste (Management) Rules, 2022 in India, notified in November 2022 and effective from 1st April, 2023 have brought in a system of Trading of EPR Certificates for e-waste, which is similar to the carbon credits system. Under this, Central Pollution Control Board (CPCB) shall generate EPR certificate through its online portal in favour of a registered recyclers or refurbishers. A producer may purchase these EPR certificates limited to its EPR liability of current year (Year Y) plus any leftover liability of preceding years plus 5 per cent of the current year liability. As soon as the producer purchases extended producer responsibility certificate, it shall be automatically adjusted against its liability and priority in adjustment shall be given to earlier liability and the EPR certificate so adjusted shall be automatically extinguished and cancelled. As soon as producer purchases refurbishing certificates its extended producer responsibility liability shall be deferred automatically for the relevant quantity of the product, for the duration as laid down by the CPCB.

Producers will have to register on the online portal where they will have to detail their annual production and e-waste collection targets. Recyclers, refurbishers, and bulk consumers also have specific rules listed out for them.

The monetary flows associated with the sale of EPR certificates may be utilized by the recycler to invest in the recycling infrastructure, ultimately increasing the recycling and material recovery rates. Furthermore, the refurbishment certificate promotes the extension of the life of EEE. However, the EPR obligations of a producer would be considered fulfilled only after the EPR certificate is obtained from a registered recycler and not after refurbishment. This ensures there is no leakage in the EPR certification mechanism and that none of the e-waste enters the chain again.

Under the Plastic Waste Management Rules in India, PRO/Producers/Importers can also obtain certificates from accredited processors [recyclers, W2E plant operators, cement co-processors, users utilizing plastic in road] in exchange of an evidence of recycling or recovery, which will act as EPR compliance.



5. EPR Design and Implementation across G20 members

Table 2 presents the comparative assessment on EPR design and implementation across G20 countries using key criteria, listed in the following legend. The detailed matrix of EPR design and implementation mechanism across G20 members is presented in Annexure 2.

Legend			
Legislative and policy framework	Robust	In transition phase	Aspirational
Coverage of waste streams	Extensive	Limited	Aspirational
Any Generic (overall) EPR	Generic/Overall EPR	Somewhat Overall/Generic Focus on EPR	No Overall/Generic EPR
Implementation model	Robust	Aspirational	
Enablers	Extensive	Limited	
Engagement of the informal sector	Yes	No	
Use of economic instruments	Yes	No	
Use of administrative instruments	Yes	No	
Upstream focus	Yes	No	
Responsibility of producer including cost	Extensive	Limited	
Reporting of EPR performance	Yes	No	



Table 2: Matrix of EPR across G20 members

Criteria Country	Evolution of Legislative and Regulatory Framework	Coverage of waste streams	Any generic (overall) EPR?	Implementation model	Enablers	Engagement of the informal sector	Use of Economic instruments	Use of administrative instruments	Upstream focus	Responsibility of producers including cost	Reporting of EPR performance
Japan											
South Africa											
Republic of Korea											
UK											
Brazil											
Australia											
Argentina											
Canada											
Germany											
Turkey											
Mexico											

Italy											
India											
Russia											
China											
Saudi Arabia											
USA											
Indonesia											
France											

5.1 Commonalities and Uniquities across G20 Members

The existing mechanisms under EPR implementation models vary considerably across countries and different approaches can be observed in terms of the engagement of entities such as PROs, WMAs and local authorities and their roles and responsibilities, differing fee structures, use of targets and product take-back schemes, and roles and responsibilities of the stakeholders including local municipalities and producers, importers, brand owners, retailers, distributors.

Some key observations include-

- EPR has started gaining traction in the formal legislative process in most of the G20 countries and in some cases, this started almost two decades ago.
- Few countries started with an overall plan for EPR but did not follow the trajectory, instead created legislation and regulations for specific waste streams, such as e-waste.
- In most cases, EPR focuses on packaging, electronic and electric equipment, batteries, tyres and end-of-life vehicles. Some G20 members are widening the scope of their EPR systems to cover more products, such as furniture, textiles, carpets and used oil.
- The last decade witnessed several modifications in the existing waste and environmental legislation and of frameworks based on the circular economy, in which EPR has played a major role.
- No G20 country has an overall EPR-specific directive, though in some countries, there are national-level regulations that push EPR. In case of EU, the EU Waste Framework Directive has EPR specific clauses which are relevant for EU countries in G20.
- As shown in figure 3, most of the countries have a collective EPR which helps lower the cost of EPR implementation. However, some countries are promoting a combination of individual and collective EPR to incentivise producers to design their products for higher material recovery.
- EPR in developing countries is majorly implemented with shared responsibility between the producers and local authority.
- Enablers of EPR include registration of PROs, digitalization including creation of online platforms for registration of producers and brands and for trading of EPR certificates, labelling of products.
- Most of the developing nations have a large engagement of the informal sector; the role of the informal sector to some extent is played by PROs in the developed nations.
- Whilst EPR fees are usually set on a per-unit or per-weight basis, countries such as France, Italy or Canada have worked towards more advanced EPR fee, by introducing eco-modulated EPR fees to better incentivize eco-design (OECD, forthcoming). The criteria and magnitude of fee modulation determine the direction and strength of design for environment (DfE) incentives for producers. Figure 5 depicts the distribution of countries on implementation of modulated fees.
- There is use of economic instruments such as product taxes, subsidies, advance modulation fees and recycling credits by G20 members for the implementation of the EPR. Unique economic instruments such as 'green bonds' to attract investors and issue of Packaging Recovery Note (PRN) broaden the scope of implementation of EPR using economic instruments.





Figure 5: Distribution of members on Collective versus Individual EPR and with and without use of modulated fees

- Setting up recycling targets, monitoring, and auditing the implementation of EPR, and material recovery targets are some of the common administrative instruments used across G20 countries. Figure 6 depicts the usage of recycling targets across G20 members.
- Recycling targets for key rising waste streams such as construction and demolition waste are not yet that prominent in the EPR. Figure 6 showcases the implementation of recycling targets for two waste streams-plastic and construction & demolition waste across G20 members.
- In conjunction with the recycling and material recovery targets, the upstream focus to promote the usage of recycled materials also exists through set targets on use of recycled content.
- In most cases, to adhere to the compliance of EPR, annual reporting by the producers or registered PROs is done on online web portals. This portal ensures accountability, traceability, and transparency among the stakeholders of EPR. The unique practice of reporting by an independent registered third party is also evident. Voluntary reporting by the producers is also an evident practice for reporting EPR.



Figure 6: Use of recycling targets

5.2 Successful EPR cases around the globe

To understand the implementation of EPR, three country-cases were deep dived- Switzerland, Germany and Indonesia.

Switzerland, though not part of EU and G20 has long been recognized as one of the most advanced countries in the areas of waste management and recycling policies, due to a strong policy framework established in the 1980-90s. Although limited to a few waste streams, Switzerland has a well-developed and high-functioning EPR schemes in place (Circular Economy Switzerland, 2021) for batteries, e-waste and packaging waste.

Germany is often used as a model for implementing EPR policy and programs. EPR policy has existed in Germany since the early 1990s. Over time, EPR was used as a tool for managing multiple waste streams. Germany's EPR currently covers a comprehensive set of waste streams, for example, packaging, WEEE,



and batteries.

Indonesia adopted a roadmap to develop Extended Producer Responsibility (EPR) legislation in 2019 in line with the global vision of a Circular Plastic Economy (Amin, S. et al 2022). This legislation is trying to foster the adoption of circular plastic strategies including designs for sustainability, take back systems for reuse of packaging and take back systems for recycling of packaging.

These three case studies are discussed in detail in Annexure 3 in terms of their EPR design and implementation mechanism. Annexure 3 also presents an overview of the EPR for plastic waste in India, which is currently in its initial stages, but is being looked at by the government of India as a robust market-based model with a strong potential to foster circularity.

Box 2 elaborates on the example of ‘Green Dot System’ of Europe that was established based on EPR and has presented many opportunities to foster circularity.



Box 2: Green Dot (German: Der Grüne Punkt)

The Green Dot (German: Der Grüne Punkt) is the financing symbol for the organization of recovery, sorting and recycling. Duales System Deutschland (DSD) AG was the first company to introduce this system in Germany in 1991.

In 1995, DSD decided to extend the use of the Green Dot System in the form of a general license to a European organization through the Packaging Recovery Organization Europe (PRO Europe). This allows the European countries to transfer their obligations to this organization which develops integrated packaging management systems to implement the recycling legislations at both national and European level. Each country has a private or municipal waste management company for running the Green Dot System. Today, producer responsibility organizations in 29 EU countries are using the Green Dot as financing symbol to finance the organization of the collection, sorting and recovery of used (mainly household) packaging.

PRO Europe gives the license to the European manufacturer for the use of Green Dot logo. Thus a ‘Green Dot’ on the packaging indicates that a financial contribution has been made to a national waste management organization or a national packaging recovery organization established in line with the standards stipulated in the European Directive for such packaging. This financial contribution happens through a contract with the specific private or municipal waste management company. The Packaging Recovery Organization Europe provides European producers with a license to use the Green Dot. Each country's producers and manufacturers sign contracts with a specific waste management organization, which is then in charge of collecting, sorting, and recycling the packaging material.

The EU Directive on WEEE includes many obligations for the producers as listed in Box 3.



Box 3: Obligations for Producers in EU Directive on WEEE (2012)

The EU Directive on WEEE mandates the manufactures to establish a separate collection, recovery and treatment facilities for the respective end-of-life products. The directive also encourages the reuse and treatment of WEEE through design regulations such that it prevents from waste generation in the first place. The definition of a producer is clearly defined in the directive which is as follows:

"a person who manufactures a product, or has such a product designed or manufactured and marketed under his name or trademark, but only if such a person performs these acts within the territory of the Member State where he/she/it is established or through distance communication directly to private households or users other than private households in a Member State and is established in another Member State or a third country"

Member States shall 'encourage cooperation between producers and recyclers and measures to promote the design and production of EEE, notably in view of facilitating reuse, dismantling and recovery of WEEE, its components and materials'.

WEEE from households and producers (individual/collective) should provide finance for the recovery, collection, treatment, and safe disposal at specified sites managed by the municipality or the producers themselves. The waste which is introduced in the market on or before August 13, 2005, designated as historic waste would be managed and financed by the manufacturers on the market proportionately. The cost of assessing used EEE suspected of being waste may be levied on the producer, the third party on their behalf or the exporter.

6. Impacts of EPR-Experience from G20 members

6.1 Strengthening of Collection and Recycling Infrastructure

EPR implementation is confronted with unique challenges which also includes lack of collection and recycling infrastructure. The fees paid by producers under their participation in EPR schemes can be used to create/strengthen this infrastructure and make the waste management processes more efficient and lucrative. In the long run, as the EPR matures, EPR targets and mandates are also expected to lead to increasing collection of difficult to collect or recycle end-of-life products such as the low value plastic waste. EPR obligations can also foster creation of the relevant processing and recycling infrastructure that is capable of recycling these collected wastes. Observing the effects of the EPR mechanism in the five most populous countries of the EU – Germany, France, Italy, Spain, and Poland, it is seen that the EPR mechanism for plastics has contributed to the financial sustainability of the waste management system as well as the reinforcement of the recycling infrastructure, ultimately resulting in higher collection and recycling rates (Zhang, Lorang, and Zhang 2022).

EPR legislation in developing countries has led to a growth in the formal recycling infrastructure. China evidently shows that due to EPR, the number of recycling infrastructure facilities has nearly doubled between 2013 and 2016 (CHEARI 2017). Pilot initiatives have also been created to give producers technological and policy support as they build their recycling facilities (MIIT 2016). Domestic companies in China (for example, TCL and Changhong) have established some of the world's largest and most modern recycling facilities (CHEARI 2017; Homea Electronics 2012).

Subsidizing the cost of running recycling facilities may provide incentives to individual producers to start their own recycling facility and incentivize companies to optimize the design of their products to facilitate its recycling at their facilities. A special fund of 18.35 billion Yuan in China was injected to reinforce the waste sector under China's 13th Five-year plan (2016-2020). In China, for example, firms that invest in formal recycling facilities might get government incentives for each unit of product processed there. A fast-track system was designed to authorize producer investment in recycling facilities (OECD 2013a). This may further incentivize the producer to invest in creating recycling infrastructure.

The context of individual versus collective producer responsibility also becomes relevant for the creation



of recycling infrastructure. For example, the approach of a collective producer responsibility can enable sharing of recycling technology, human resources and equipment, and reverse logistics channels, which reduces the fixed cost of establishing a recycling infrastructure and distributes the overall cost associated with the collection and recycling of end-of-life products over multiple producers. The concept of collective systems has already found its way into legislation in developing nations (MoEFCC 2015; OECD 2013a).

In the case of individual responsibility as the mode for EPR, the producers invest independently and may optimize and develop a facility that best meets their needs. Independent recycling facilities have worked well in the case of general processing and disassembly (Gui 2020; Zhang, Lorang, and Zhang 2022).

A study formulating a Nash bargaining model highlights that the collective system is more likely to result in a stronger recycling infrastructure than the individual system because sharing costs mitigate the mismatch between producers' costs and investment incentives as they pay for the recycling of the same set of goods collectively (Gui 2020). If the cost of recycling is substantially differentiated for products due to different materials being used by producers, making it important to separate these materials and thus creating problems in using technologies that are hard to automate, the collective system may result in a poor outcome such as a low material recovery rate (Gui 2020). Another drawback linked to collective scheme is that the collective EPR recycling infrastructure may provide inferior design incentives to the producers compared to individual systems, where the producers directly benefit from the investment in design improvements. (Gui et al. 2018). In the context of these two approaches to creating recycling infrastructure, therefore, making the choice between individual versus collective becomes a key decision for policymakers.

6.2 Job Creation due to EPR

Adopting EPR would not only provide a solution to the environmental challenges but also create jobs including those at the lowest end of the occupational spectrum for basic vocations (Morgan and Mitchell 2015).

A study showcased that zero-waste fostering strategies such as EPR and alternate strategies to incineration led to the development of thousands of new jobs throughout the selected modal cities. Job growth was even more significant in cities with low recycling rates. Cities with lower collection rates may experience more job growth as local waste services expand. The research also revealed that for every job lost in linear economic practises, 10-60 jobs were generated in the circular economy sector (Global Alliance for Incinerator Alternatives 2022).

In a study on Input-Output model for EPR and capturing its opportunity cost, it was estimated that EPR policy leads to a net creation of 4.32 M€ of gross value added (GVA), 3.35 thousand jobs and emission of 2.67 tonnes carbon dioxide-equivalent (t CO₂-eq) (Rodrigues et al. 2016).

Literature on employment opportunities in countries, due to EPR for a particular sector with the informal sector is limited. A study done in South Africa for EPR in tyres depicted (Figure 7) that achieving 25% recycling of tyres would generate 346 jobs, whereas 100% recycling of tyres would generate 1448 jobs (Hartley, F., Caetano 2016). In the case of Canada- it was found that about 2300 jobs can be generated for managing mixed waste of commodity market value of \$47 million through EPR (Veronica, Christina, and Glenda 2016).



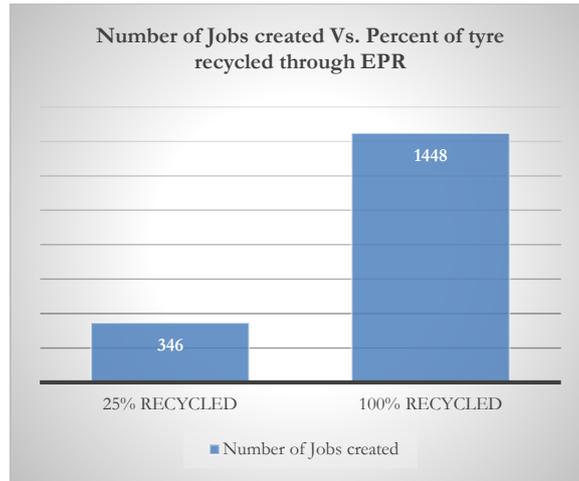


Figure 7: Percentage of tyre recycled through EPR and number of jobs created in South Africa

Source: Hartley, F., Caetano 2016

A review by ILO provided a key finding that transitioning to a ‘Circular economy,’ which includes activities boosted by EPR such as recycling, repair and remanufacture – replacing the conventional linear economic model of “extracting, creating, utilising, and discarding,” can create 6 million jobs by 2030 (ILO 2018).

Despite the challenge of analyzing quantifiable jobs created and statistics on economic impact, the studies demonstrate a significant extent of agreement on the major finding relating to the positive employment and economic advantages of EPR (Duncan Bury Consulting 2012). Furthermore, revenue generated through EPR can support low-barrier environmental jobs (Rutkowski 2020), further preventing the marginalization of workers running out of income-generating sources. Companies would also find this lucrative as they would gain credibility by giving jobs to informal workers (Henzler et al. 2018).

6.3 Integration of the Informal Sector

The OECD encouraged the early development of EPR policies, with mechanisms predominantly inspired by the economic realities of the developed nations (Stephenson, D. 2018) where the major drivers of the circular economy have been economic and environmental, having left out social aspects (Rogoff and Ross 2016; Woggsborg and Schröder 2018). However, the wide application of EPR in the developing countries has brought the social aspect to light (Woggsborg and Schröder 2018). Annexure 4 presents the engagement of informal sector in G20 members in context of the EPR implementation.

In developing nations, recycling has mostly been driven by a vast informal sector at the bottom of a complicated global supply chain. To foster inclusivity, EPR presents an opportunity to create business models for EPR implementation which integrate and ultimately formalize the informal sector. There are also several occupational and environmental hazards in the informal waste collection and segregation practices, for which appropriate recycling infrastructure created under the EPR implementation can make a positive difference. In context of a just transition to the circular economy, EPR may present an opportunity to create a future where the harm caused to environment and health by irresponsible waste disposal are significantly reduced and job opportunities created in the space of product recycling, refurbishment and remanufacturing and recovery of materials. The processes and practices followed under EPR can be aligned with national and international social regulations including guidelines on occupational and health safety at workplace (for the workers), human rights, fairness and justice.

However, there are certain challenges to building an effective and resilient supporting ecosystem for integrating the informal sector into EPR implementation. These include- lack of research and data, barriers



to entry and promotion of a parallel recycling economy, lack of transparency, excessive producer power and inclusion of false solutions that threaten recycling systems (Cass, T., et al 2022). This could be addressed by mapping waste systems including their flows and those participating in managing these flows, so that informal players may be identified and included for designing the implementation of an EPR framework and competition between the formal EPR processes and the informal sector can be reduced.

To minimise the risk of alienation of the informal sector from EPR, there should be enforceable mandates and targets for the integration of informal waste pickers in EPR implementation systems. There should also be an emphasis on their training and skill building. This would help move towards an inclusive EPR that will integrate the informal sector into the formal waste management sector and open up opportunities for their improved occupational outcomes.

A recent study has also shown that organized waste picker groups tend to be highly motivated to collect and share data to help demonstrate their impact, make strong partners in an EPR system and strengthen material traceability and data collection (Rutkowski, 2021). Additionally, as the current systems in the sector treats women in the informal sector discriminately (with respect to wages and provision of infrastructure), the need for inclusive EPR schemes is ever-present. A recent study has concluded that achievement of EPR targets is especially difficult if the informal workforce is not involved in designing the EPR systems and suggests that an inclusive EPR systems should include providing decent working conditions as well as growth opportunities to the marginalized groups (including women) (Cass et. al. 2022).

In the developed countries, the social aspect in EPR is tackled through engaging social and solidarity entities, which can provide solidarity-based alternatives and promote inclusivity in the waste management sector. These entities can provide and facilitate access to social protection and services such as finance, insurance, housing, childcare and children’s education, in addition to skills development and training. And recruitment of persons with special needs and providing decent work conditions.

6.4 Other Impacts

The impacts of EPR also include decreased emissions attributed to the use of material by businesses as they use post-consumer recycled content (PCR). Large-scale EPR compliance would mean decreased costs of post-consumer recycled materials (PCR), which is critical to driving the circular economy. Unattended adverse impacts on consumers could also be generated through pricing changes brought about by the producers when they design their strategies based on life-cycle approach for EPR implementation. Some impacts estimated for the G20 members are presented in Table 3.

Table 3: Examples of impacts in G20 members attributed to EPR

Impact	Type of Impact
- In France, the EPR policy has contributed to a threefold increase in the collection and recycling rates of post-consumer textiles between 2006 and 2018. Since its implementation, there has been a 13% annual increase in post-consumer textiles collection. The material recovery rate of post-consumer textiles can reach 90%, out of which 50% can be directly reused.	Increase in collection rates
- In Portugal, EPR has achieved a collection rate which is 86% higher than the targets mentioned in the legislation.	
- In 2018, EPR lead to the collection rate of potable batteries in Germany reaching 48%.	
- Due to the implementation of EPR, Spain achieved a collection rate of 45% in 2018 for the WEEE.	
- South Africa collected 58% of packaging waste materials in 2016 via voluntary EPR.	



<ul style="list-style-type: none"> - In British Columbia in Canada, recovery rates for paper, metal, plastic and glass have increased. - From 1998 to 2004, EPR raised overall recovery rates by 68% and material-specific recycling rates in the range of 45%-137% in Canada. - According to the 2011 evaluation report EPR resulted in 88% of recovery of the used tyres in Belgium. - Total recovery in the UK climbed by 68% between 1998 and 2004, while material-specific recycling rates increased by 45%-137%. 	<p>Increase in material recovery rates</p>
<ul style="list-style-type: none"> - Germany achieved a 3% annual reduction in 1990s in packaging, compared to a 2%-4% yearly growth before to the EPR implementation. - 	<p>Reduction in virgin material usage</p>
<ul style="list-style-type: none"> - EPR led to a change in packaging design and a 16% reduction in packing quantity in Japan. - In the US, EPR implementation has led to ‘eco-design’, which is designing packaging to reduce waste and sustain recycling rates. 	<p>Design for the environment and reduction in packaging material</p>
<ul style="list-style-type: none"> - EPR in the EU helped abolish the usage of hazardous materials in electronics with an explicit ban. 	<p>Reduction in the use of hazardous material</p>
<ul style="list-style-type: none"> - Recycling rate of wastepaper in China increased from 27.5% in 2001 to 46.7% in 2015 due to the implementation of EPR. - Germany collected 132.85 kg/inhabitant of packaging (transport, secondary, and sales packaging) in 2014 and achieved total recycling and recovery rates of 71.4% and 97.8%, respectively due to EPR implementation (Destatis 2017). - Implementation of EPR in Portugal has successfully increased the waste recycling rates from 69 to 98%, although improvement in consistency of the management was needed 	<p>Increase in the recycling rate</p>

7. Guidance Framework for Effective EPR Design and Implementation

This section presents the key elements of a guidance framework for domestic/national EPR design and implementation. Continuous monitoring of the efficacy using comprehensive impact metrics that capture the potential and actual impact of EPR across the different life cycle stages will be one of the key elements of this framework as it will guide further improvements in EPR design and implementation.

7.1 Goals

The first step under the domestic/national EPR design is the identification of goals to be met through the EPR implementation. These could include-

- a. **Environmental goals:** Ensure that the use of materials and substances that present risks to human and environmental health are avoided and manufacturers design their products to facilitate easy re-use of components and recovery of materials.
- b. **Social goals:** Recognize the role of the informal workers in the waste management sector where it exists and create livelihood opportunities.
- c. **Economic goals:** Make secondary raw materials available for production as a substitute for virgin raw materials and generate revenue through business models for EPR implementation.

7.2 Roles and Responsibilities of Stakeholders

- Producers’ Responsibility: System Effectiveness, Informational, Physical, Financial
- Consumers’ Responsibility: Physical, Financial
- Local government Responsibility: System Effectiveness, Informational, Financial
- Retailers’ Responsibility: Informational, Physical
- Producer Responsibility Organization’s Responsibility: Physical, Financial, Informational
- Recyclers’, dismantlers’, processors’ responsibility: Physical, Financial, Informational



- Guiding/Steering/Advisory Committee: System effectiveness, Guidance, Informational

7.3 Coverage of Products/Product categories/Waste streams (Current and Emerging) and Criteria for coverage

- Current and Emerging waste streams
 - Lead acid batteries-one of the oldest
 - Plastics (& plastic packaging) and e-waste-Most common
 - End of life vehicles
 - Waste tyres –easy implementation
 - Textile waste- emerging focus
 - Paper
 - Used oil
 - Solar PV waste- critical and strongly in discussions
 - Emerging new technology batteries including those from EV
- Criteria for coverage
 - Product usage trends and resulting waste generation trends.
 - Total volume of mismanaged waste- littered, illegal dumping
 - Total volume being disposed in landfills and not being channelized for recycling/recovery/reutilization.
 - Toxicity implications of the waste stream/product category
 - Hazard to human or environmental health from the end-of-life product
 - Total lifecycle impact of the product
 - Level of end-of-life management infrastructure currently in place
 - Effectiveness of other waste management programs currently in place
 - Current role of local government in managing the waste stream
 - Challenges linked to managing the waste/end-of-life product

7.4 Key guiding principles for consideration while embedding EPR policy in the country context

- **Consideration of the specific context of the country-** Embed EPR strategy in the local context of the country, recognizing its national context and priorities, with local adaptation such as integration of the informal sector.
- **Prioritization of actions according to waste hierarchy-** Assign top priority to waste prevention, followed by re-use, recycling, recovery and finally disposal.
- **Adopt life-cycle approach-** Assign the responsibility of the producers not only for end-of-life management, but also to design better to mitigate the environmental impacts of their products throughout the entire product life cycle
- **Defining product coverage under EPR to ensure fair distribution on responsibility-** Targets under EPR should be defined in a manner that distributes the EPR obligations in a fair manner over the different types of products, recognizing the existing challenges linked to their collection and recycling.
- **Promotion of compliance and enforcement-** Integrate instruments that encourage enforcement, and compliance towards targets and discourage free riding.
- **Be inclusive and enable integration of all stakeholders-** Respect varied groups of stakeholders and their opinions in EPR design and governance.
- **Clearly defined roles and responsibilities for all stakeholders-** Well-defined scope, clear roles and responsibilities of all stakeholders to foster effective implementation.
- **Transparent process of collaboration and engagement-** Define modalities of collaboration and engagement and make stakeholders aware of the same.



- **Reduce the overall costs linked to managing the waste-** Reduce inefficiencies linked to the system of waste management and supporting urban local bodies in waste management.
- **Transparency, Traceability and Accountability-** Have access to information that is captured in performing the process and traceability of products with proper documentation related to these processes.
- **Should have quantitative targets for its objectives-** Have phased set of comprehensive targets along the value chain for the producer and those related to end-of-life management for the waste reaching the recycler that fosters recovery and channelling the secondary raw material back into the system.
- **Balance between government oversight and industry participation** in the governance mechanism associated with the EPR implementation. Sound governance is crucial for the performance of an EPR system and ensuring the system is efficient. Given the changing and complex nature of waste management problems, it necessitates governance mechanism that engage multiple actors including producers and retailers, local authorities, consumers, retailers, producer responsibility organizations, recyclers, and the market for secondary raw materials.

7.5 Institutional blocks

Establishing Producer Responsibility Organizations (PROs): Since PROs play a key role in the implementation of the EPR, a mechanism for setting up a PRO (e.g., non-profit versus for-profit systems, one versus multiple, full cost coverage versus subsidies from the government budget, phased contribution from producers), what they are expected to do and assessing their achievements should be defined. The relationship of PROs with producers and retailers, other PROs, collection and treatment operators, targets for collection and reporting framework should be clearly delineated.

Comprehensive targets for product/waste management from a life cycle perspective: In the legislations on EPR, targets should be clear, measurable and comprehensive in terms of their coverage that includes prevention, re-use, recycling, recovery and use of recycled content and set in a way that minimizes the scope to mis-interpret, misreport and should be easy to monitor.

Developing reporting modalities: Precise reporting modalities for each waste stream should be clearly stated and made compulsory to all stakeholders to rigorously monitor target achievement and these reporting details should be integrated with an online portal.

Data collection formats: Formats for standardized data collection, verification should be designed that will enable transparent tracking and traceability of waste flows and monitor EPR targets.

Common national online portal to capture material flows for all the waste streams together and also allow verification of claims by the stakeholders: This will enable collection of material data flow and identify linkages between waste flows and related material flows.

Financing model: The framework should incorporate the financial aspects of the material flow including the end-of- life cost (i.e. cost of collection, sorting, and treatment/recycling) of a product. The financing model could be a fee based where it could be a function of the product and weight based rather than fixed (e.g. unit based) fees and/or modulated fees or can be market based where the producers financial contribution in exchange for meeting its EPR obligation is market determined

Integration of the Informal Sector: The informal sector, through its network of aggregators, dismantlers, recyclers will play a key role in facilitating reverse logistics and help build an ecosystem which will be able to sustain multiple actors across different geographies in the country. Furthermore, participation from the



informal workers in both, the policy design as well as on-the-ground implementation is critical.

Development of a Reverse Logistics network: Developing an effective reverse logistics network is one of the most significant parts of implementation of the EPR responsibility. Third parties like the PROs can act on behalf of the Producers, Importers, Manufacturers & Brand-Owners (PIMBOs) by offering reverse logistics solutions, supporting them in implementation of their EPRs. Informal sector could also be integrated in the reverse logistics network. Reverse logistics enabled by the PROs can enable the circular flow of used/discarded products and packaging materials by connecting the generators of these products to those recovering value out of these used/discarded products. It focuses on the recovery of products when they are no longer desired (end-of-life electronic products such as computers or mobile phones) or can no longer be used (end-of-life products, i.e., tires and packaging) to obtain economic returns through reuse, or recycling in new production. Box 4 elaborates on the need for a reverse logistics network.

Box 4: *Why a reverse logistics network?*

A reverse logistics system is required in two key areas. Firstly, there is a need to develop wider and multi-optional take-back/reverse logistics infrastructure that enables collection of used/discarded products from the consumers for processing and waste management. This would also lead to co-creation of circular business models and logistics frameworks that can be a transformative intervention to accelerate CE. Second area is the closed loop system, where the reverse movement takes the product/material back in the manufacturers' supply chain leading to creation of secondary raw material for remanufacturing or for extending product life through repairs and refurbishing. In the closed loop system, reverse logistics is a type of supply chain management that moves goods from customers back to the sellers or manufacturers. Like in the first area, reverse logistics here starts from the consumers.

The key processes in reverse logistics involve collection, sorting, selection and control, recovery (which can be that of material or the product itself after repair, refurbishing), processing (that transforms waste into reusable products) and the re-distribution related to resale or reuse. Further, integrating reverse logistics into conventional supply chains can enable companies to retrieve end-of-life products efficiently. Technology plays a key role in reverse logistics by enabling tracking on returned items. Proposals like the one in the EU for a Digital Product Passport (Ecodesign for Sustainable Products Regulation) with scannable tags, unique identifiers, and data access requirements, could play an important role in improving reverse logistics.

7.6 Measuring impact/effectiveness and Reporting

Many of the G20 member have a robust and comprehensive policy framework surrounding EPR. These frameworks aim to reduce the environmental impacts of products not just at the end-of-life stage, but throughout their life cycle. The positive impacts of EPR on upstream, midstream, and downstream processes are depicted in Figure 8.



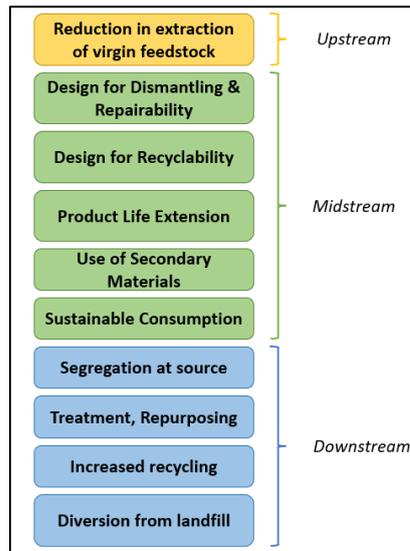


Figure 8: Positive Impacts of EPR across Product Life Cycle Stages

Monitoring flows and quantities of waste data is crucial for waste collection and recycling targets and to evaluate progress of the EPR implementation over time by segregating the waste data under different waste streams and bifurcating them to those with and without EPR coverage. Countries are responsible for this data collection process and often transparency becomes an issue due to lack of knowledge, awareness and capacity.

Metrics and indicators act as essential tools to measure the impact of EPR frameworks. However, this will rely on accurate data recorded at appropriate calculation points to ensure that progress toward performance targets, which are often set in legislation, can be tracked and measured appropriately.

It is also important for these metrics to maintain consistency across waste streams and lay equal emphasis on the different stages in the product life cycle. In 2014, a guidance document was developed for the effective functioning of EPR mechanisms in the European Union. Analysis on the existing frameworks around EPR found that there were minimal indicators to measure progress around eco-design (Bio by Deloitte 2014). Another review conducted on the performance monitoring practices for EPR in the Canadian province of British Columbia observed inconsistencies in the use of certain indicators, making comparison across programs difficult (Deloitte 2017). Yet another study focussing on the EPR program for steel can packaging in the Republic of Korea pointed out the need to re-evaluate the indicators measuring the recycling performance of the program (Park 2021).

7.7 Collection and Tracking of Data

To foster transparency in the implementation of EPR, there is a need for harmonization in reporting procedures across waste streams to get reliable and comparable data. Performance related data can be documented by the PROs or similar agencies which need to be reviewed by the regulators or designated third-party organizations, acting on behalf of government, to prevent overreporting/ double counting or misleading figures with regards to the amount of waste collected. This review should be complemented with stringent monitoring through frequent and random inspections and audits, thereby strengthening compliance and stricter enforcement of EPR norms.

Compliance and enforcement can be strengthened through tracking mechanisms such as records for each activity through online registration and periodic filing of annual returns. Robust mechanisms for data collection and tracking, transparent reporting, monitoring, and enforcement (in case of mandatory EPR)

help prevent the free-rider issue, evaluate the performance of the EPR and associated targets. This is particularly relevant when there are many producers and brands, and an online portal can facilitate check on compliance towards obligations. Data availability in the public domain through the online portal leads to transparency of waste and material flows. Free riding is a particular problem for distance-selling and requirements for online platforms could help in better compliance in this context. The online portal may be more successful in case of mandated EPR because of the fear of being caught. On the other hand, the voluntary schemes risk being undermined by players not participating on the portal, defaulting, or being dishonest about production levels, etc.

7.8 Policy instruments as enablers of effective EPR implementation- Regulatory, Informational, Institutional, Economic and Market-based

Realistic long-term policy objectives and targets supported by appropriate mix of policy instruments and monitoring and tracking mechanism for effective EPR implementation should be set. There are several policy instruments available to create a solid policy framework that encourages the effective and transparent implementation of EPR across the whole value chain. These instruments go beyond the conventional regulatory or 'command and control' approaches and include a much larger array of instrument types such as Economic or Market-based, Informational, Institutional and Administrative. Table 4 presents some of the key policy instruments that can be used for EPR implementation.

Table 4: Key instruments for EPR implementation

Policy instruments as enablers of effective EPR implementation	
Economic/market-based	<ul style="list-style-type: none"> - Recycling fee paired with recycling subsidy uses funds from the ARF or post-consumption recycling fee to subsidise the recycling process. Revenue earned might be utilised to subsidise the upstream producer's activity or the cost of waste management, including infrastructure costs. - Advanced Recycling Fees (ARF) levies a charge on the product's sale to fund the cost of recycling end-of-life products fees are imposed per unit of product and are either charged separately at the time of sale or applied upstream on producers and integrated into the retail price. - Deposit refund scheme refers to a product consumption tax (the deposit) with a rebate or reimbursement when an end-of-life product is returned for recycling or responsible disposal. The system has proven effective in increasing collection rates and reducing littering of products such as beverage containers. Placing a value on returning products helps operators to collect more and higher-quality materials for purposes of reuse, recycling or environmentally sound disposal (Laubinger et al. 2022). - Material taxes are specific charges placed on the use of potentially hazardous and difficult-to-recycle materials. This pushes the manufacturer to reduce the use of hazardous materials. - Upstream tax and subsidy refer to the tax paid by producers, which is subsequently used to subsidise waste disposal.
Regulatory	<ul style="list-style-type: none"> - Recycling and refurbishment targets - Recovery and reuse targets - Use of recycled content targets - Product take-back requirements
Informational	<ul style="list-style-type: none"> - Communication and information campaigns for the producers and the consumers about responsible waste disposal and the role they can play to promote the effectiveness of EPR - Introducing technical support schemes for eco-audits and training would enable EPR implementation. - Transparent and ethical reporting on EPR and effective communication of the results including impact metrics will increase the confidence amongst the citizens and add credibility to the process of EPR policy and its implementation.



	- An explicit labelling of circular products under EPR can be used for public identification. For e.g. EcoMark labels for circular products
Institutional	- Collection or take-back schemes. - Waste credit system can enable producers to achieve their obligation/targets (individually/collectively by PROs) through issuing recycling certificates by accredited re-processors/recyclers. - Centre of Excellence can enhance the synergy among the key stakeholders in implementation of EPR.

7.9 Impact metrics related to EPR implementation

A carefully thought-out, common set of impact metrics to measure EPR implementation may address the weaknesses and gaps that persist in the current EPR system of G20 members. The development of country wide metrics will aggregate granular level outputs, enabling comparison within and across G20 members. These metrics could be based on certain guiding principles along with assessment criteria to prioritize the metrics. The metrics can be adapted basis the context of the respective countries and the level of maturity achieved in EPR implementation. Guiding principles and assessment criteria are presented in Figure 9.

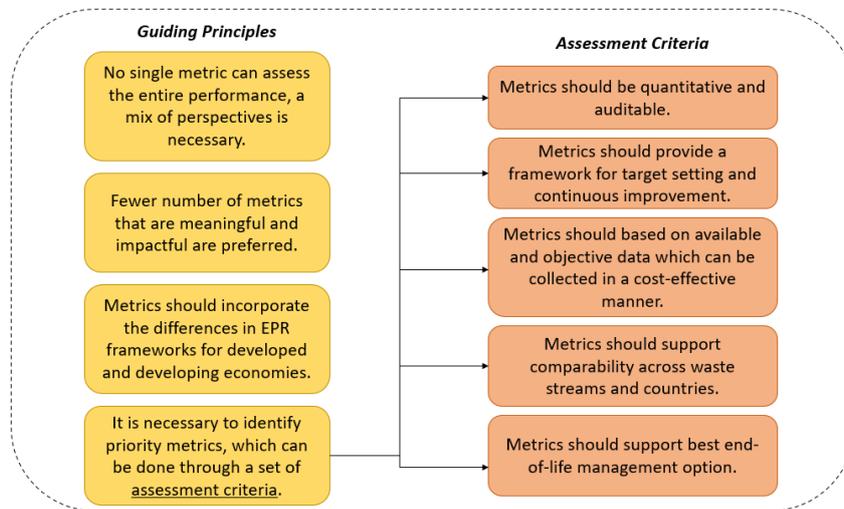


Figure 9: Guiding Principles and Assessment Criteria for Impact Metrics

Table 5 includes some metrics that can be considered under this thought process. Further, each country can define targets linked to these metrics as per the level of maturity achieved in EPR implementation.

Table 5: Proposed Set of Impact Metrics

<u>Impact Metric</u>	<u>Life-Cycle Stage</u>
Raw Materials, water and energy avoided to be mined (MT) (ML) (kWh)	Upstream
Recycled content in manufactured goods (%)	Midstream
Use of Secondary Raw Materials	Midstream
Recycling Rate (%) (Percentage of total waste recycled of the total waste generated)	Downstream
Recovery Rate (%) (Percentage recycled products as a proportion of the total recyclable waste generated)	Downstream
Collection Rate (%) (Percentage of material collected as a proportion of total material put on the market)	Downstream
Diversion from Landfill (sq. m.) (MT)	Downstream
Water saved by recycling/ refurbishing (million litres) ML	Downstream
Number of ecolabels/green marks (#)	Downstream
Imports and Exports of Waste (in USD) MT	Downstream
CO ₂ e Mitigated (MT)	Other: Environmental Impact

Energy Saved (kWh) Reduced emissions? Reduced health impacts?	Other: Environmental Impact
New Jobs Created (#) Value of jobs (\$)	Other: Social Impact
Engagement with the Informal Sector (# of contracts)	Other: Social Impact

Within the G20 space, concrete efforts are already underway in identifying existing indicators and fostering new ones under the Resource Efficiency Dialogue (RED). While the RED performs this exercise for defining indicators and targets broadly related to the Circular Economy, certain indicators, such as recycling rates, use of secondary raw materials in the production process, landfill tonnage, etc. are pertinent to EPR as well. Additionally, the proposed set of EPR-centric impact metrics can also be displayed on the platform. The existing and planned indicators to measure progress on Circular Economy and Resource Efficiency for various G20 members under the RED is explained in detail in Annexure 5.

8. Tapping Synergies between Corporate Social Responsibility (CSR) and EPR

As the regulations on both EPR and CSR are evolving differently across countries, the existing literature exploring synergies between EPR and CSR is limited. The inclusion of sustainable supply chain management practices as part of a company’s CSR strategy is very recent and, therefore, uncommon. Although some researchers assert that EPR is not considered as part of CSR but is considered a part of sustainable business practices (S.S. Rana & Co. 2019), and others have used CSR with environmental considerations interchangeably with the term EPR (Najmi, Kanapathy, and Aziz 2020).

Moreover, some researchers have stated that the end-of-life management practices are rarely reflected as part of an individual company’s CSR strategy (Hickle 2015). On one hand, some scholars have defined EPR as a “support tool to stimulate social responsibility” (Lozano R 2012) and on the other hand, some have argued that due to the increasingly global nature of supply chains, EPR regulations that are usually implemented in individual jurisdictions may hinder supply chains from becoming truly sustainable (Boons 2012).

While differences in defining EPR within the context of CSR persist, there is no cross-industry study that analyses the interlinkages between the two holistically (Hickle, 2015). Within specific industries as well, there is very limited literature and data on EPR alignment with CSR activities in companies. However, with the increasing awareness on the need for responsible waste management, waste management organizations like Eco Recycling Ltd (Ecoreco) in India have begun to provide large companies with the opportunity to divert their CSR funds to facilitate EPR implementation by sponsoring separate dustbins, training of unorganized waste workers, donating their e-waste and sponsoring collection centres³. It is expected that in the coming years, further research that explores interlinkages between CSR and EPR for businesses will pave the way for more informed understanding of the synergies between the two.

9. EPR and relevance with Lifestyle for Environment (LiFE)

Honourable Prime Minister of India Shri Narendra proposed Mission LiFE at COP 26 that is envisioned as an India-led global mass movement to nudge individual and collective action to protect and preserve the environment. Extended Producer Responsibility (EPR) will promote sustainable production and consumption of resources and is aligned with the objectives of Mission LiFE (Lifestyle for Environment). A key channel for this alignment is the impact of EPR on consumer behaviour. Brands and producers as part of their EPR can increase awareness amongst consumers through public awareness campaigns and provide incentives to encourage responsible disposal of waste and streamline the waste collection process

³ <https://ecoreco.com/aboutus-csr.aspx>



including through take back mechanism for the consumers and channelization of collected waste for recycling and reutilization.

Responsible disposal of waste has proven to increase the recycling rate and its efficiency (if proper segregation of waste while disposal) and reduce the amount of waste ending up in landfills, generating many environmental benefits. Further, the upstream focus of EPR can create the supply of circular products (that include recycled content, use less toxic materials, are easy to recycle) which can help consumers engage in mindful and deliberate utilization of resources rather than mindless and destructive consumption.

One of the leading multi-national companies has started a mass innovative campaign, ‘Waste-free world’, in Indonesia that increases awareness among citizens and nudges them to refill the existing packaging instead of using virgin packaging. Refillable stations placed at the counter make it convenient for consumers to change their behaviour from mindless to mindful consumption and engage in reuse actions. In December 2021, the implementation of the above strategy in Indonesia led to a reduction in packaging used and customers could save 20% on retail costs. Such campaigns resonate well with the objectives of Mission LiFE.

To make EPR a ‘mass movement’, the implementation of the ‘Green Dot’ by the company Der Grüne Punkt – Duales System Deutschland GmbH (DSD) in Germany has been quite an influential example in nudging the citizens to adopt the principles like those engrained in Mission LiFE. The ‘Green Dot’ program indicates to consumers the contribution made by the producer towards the cost of managing the waste. This not only makes consumers conscious of their choice but also encourages producers to take a leap in contributing to the recycling infrastructure. The concept has been implemented across various countries in the EU and has been modified as per the national context.

10. Conclusion

In 2022, the disastrous impacts of unregulated plastic production led countries across the globe to consider adopting a legally binding agreement to manage the complete lifecycle of plastic, from production to disposal⁴. This highlights countries’ realization on issues regarding improper waste management. Though there is no internationally accepted legally binding legislation on EPR, national EPR legislation in most of the G20 members holds the promise for a sustainable and responsible future. EPR frameworks are present and are being solidified further to become more robust and effective at the ground level. Data has proven the benefits of establishing a strong EPR legislation in countries like Switzerland, Germany and Indonesia. In these countries, the EPR mandate has paved the way for responsible production by the producers and facilitating responsible consumption and disposal by the consumers, thereby embedding circularity in the complete value chain.

Taking forward, India’ G20 Presidency’s aims to share and exchange knowledge on design and implementation of EPR scheme. This Technical Document presents a guidance on domestic/national EPR Framework that includes suggestive principles that may be considered while embedding EPR policy in the country context recognizing the differing national priorities and circumstances in countries and need for local adaptation. The Framework is suggestive and can serve as a toolkit for countries across the world, essentially reflecting the distillation of the experience of G20 members and selected other countries on

⁴ In March 2022, Heads of State, Ministers of environment and other representatives from UN Member States endorsed a historic resolution at the UN Environment Assembly (UNEA-5) in Nairobi to End Plastic Pollution and forge an international legally binding agreement by 2024. The resolution addresses the full lifecycle of plastic, including its production, design and disposal; <https://www.unep.org/news-and-stories/press-release/historic-day-campaign-beat-plastic-pollution-nations-commit-develop>



EPR. The framework will represent an important outcome of knowledge sharing and will continue to evolve. Key elements of the framework for EPR design and implementation include identifying goals, key considerations, defining roles and responsibilities for all the stakeholders involved, different types of policy instruments that can be used and a robust methodology to measure the impact and effectiveness of EPR implementation. The impact metrics will help in tracking the progress made by the countries in terms of EPR implementation and achieving their national and regional waste management targets. The impact metrics can also be defined based on the country's willingness, capability and capacity to report, thereby providing flexibility based on the country's context.

As the G20 members have already shown commitment and undertaken initiatives to implement EPR and are at varying levels of maturity in EPR implementation, the proposed framework in this Technical Document will only further the countries' national agenda and targets on waste management. Moreover, access to critical information that the framework necessitates will also help in furthering academic and policy research as well as facilitating cross-country analysis, thereby providing space for knowledge exchange.



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Annexures

Annexure 1: Examples of selected businesses across the typology of roles that businesses can play in EPR implementation

Reducing EPR Obligations- <i>using fewer materials and designing products to last longer</i>	Fulfilling EPR Obligations through Producer Responsibility Organizations	Strengthening Reverse Logistics	Offering Reusable Solutions- Refillable Pouches and Refillable stations		Technology based platforms to facilitate take backs and channelize waste to recycler.	Setting up Reverse Vending Machines
Innerbottle in Republic of Korea, Danone, Patagonia in USA	Karo Sambhav, Kudoti, Recykal, Terrapro, Waste Ventures in India, Octopus and Waste4Change in Indonesia, Kudoti in South Africa and Terra Cycle in USA	MAC in Canada, Net-A-Porter in France; MAC, Net-A-Porter in Germany; Coca Cola, No Nasties, The Body Shop in India, Net-A-Porter in Italy, Neem London, Net-A-Porter in UK, and Kiehl's, MAC, Net-A-Porter, Regirlfriend in USA	OMO Laundry Liquid Etee in Brazil, Ouai in Canada, Raku Raku Eco Pack Refill in France, Cif in Japan, Ecorefill in UK and Kiehl's in USA	The Body Shop in Australia and Canada, Unilever in Australia, Bare Necessities in India, Rinso and Sunlight in Indonesia, Aromatica in Republic of Korea, Unilever in South Africa and UK and The Body Shop in USA	Uzed app by Recykal in India, RecycleNation in USA	TOMRA in Germany, ReAtmos In India Seven-Eleven, TOMRA in Japan and BioBox in Mexico



Annexure 2: Information Compilation Matrix of G20 Countries' EPR Design and Implementation Mechanism

Country	Evolution of Legislative and Regulatory Framework	Coverage (waste streams)	Whether any overall or generic EPR (Yes/No; If Yes, elaborate)	Implementation Model	Enablers	Engagement of the Informal Sector	Use of economic instruments	Use of administrative Instruments	Upstream Focus of EPR	Responsibility of producers including cost coverage	Reporting on EPR Performance (including mode and frequency)
Japan	<p>1997: Container and Packaging Recycling Law came into force (first compulsory law based on EPR)</p> <p>2001: Basic Act for Establishing a Sound Material-Cycle Society / Fundamental Law for Establishing a Sound Material-Cycle Society was enacted (new legal framework with EPR as one of its principles; enabled the development of multiple sector-specific EPR laws)</p> <p>2001: Home Appliance Recycling Act / Specified Home</p>	<p>1. PET, packaging, white goods and E-waste.</p> <p>2. Construction and Demolition waste, including concrete, wooden and asphalt materials</p> <p>3. Food waste / residue</p> <p>4. Automobiles</p> <p>5. Batteries</p>	<p>1991: Law for the Promotion of Effective Utilization of Resources</p>	<p>1. Collective EPR</p> <p>2. Japan's Container and Package Recycling Association acts as PRO</p> <p>3. Municipalities are responsible for collection and sorting of waste (participation is voluntary)</p>	<p>1. Collection Systems</p> <p>2. Digital Database of PROs</p> <p>3. system to certify "Food Waste Cycle"</p> <p>4. Labels/Green Marks for products</p> <p>5. Registration of PROS</p> <p>6. Licenses for recyclers</p>	No	<p>1. Recycling fee paid by producer to PRO and by contractors to authorized recyclers.</p> <p>2. Recycling fee paid by businesses in the food industry to recycling companies for production of feed/fertiliser</p> <p>3. Advanced disposal fee on home appliances and vehicles</p>	<p>1. Minimum yield for each recycling method, obligatory recycling amount for each individual producer, voluntary targets for collection/recycling (as rates)</p> <p>2. Material recycling targets set for Manufacturers/Wholesalers/Retailers for all specified sectors. (Manufacturers/Wholesalers/Retailers/Restaurants)</p>	<p>1. Adopting "Design for Environment" principles</p>	<p>1. Shared responsibility</p>	<p>1. Reporting by producers every year (fiscal/normal) through online portal</p>



<p>Appliances Recycling Act 2001: Food Recycling Law was enforced 2002: Construction Material Law was enforced 2003: Law for the Promotion of Effective Utilisation of Resources was amended to include WEEE items 2004: End-of-Life Vehicle Recycling Law 2012: Small Home Appliance Recycling Law 2019: Japan's Resource Circulation Strategy for Plastics</p>										
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<p>South Africa</p>	<p>1998: National Environment Management Act 1999: Waste Management Strategy 2000: White Paper on Integrated Pollution and Waste Management Policy 2001: Polokwane Waste Management Declaration 2003: National regulations for plastic bags (manufacturing and distribution) 2008: National Environment Management: Waste Act 2010: National Policy for the Provision of Basic Refuse Removal Services to the Ingredient Households 2011: National Waste Management Strategy</p>	<p>1. Paper and paper packaging material (including office paper), plastic packaging and straws and sheets. 2. Injection moulded products like cups, tubs, cutlery, etc. 3. Thermoformed products like trays, punnets, cups etc.</p>	<p>No</p>	<p>1. Collective and individual EPRs 2. The responsibilities of PRO clearly laid out.</p>	<p>1. An electronic portal for facilitating coordination between the PROs. 2. EPR fees by PROs are liable to be collected through the portal. 3. Takeback mechanism for white goods.</p>	<p>Yes</p>	<p>1. EPR fees established by PROs and individual producers for implementation of EPR.</p>	<p>1. Clear targets are set forth for product reuse, collection, and recycling for all applicable products 2. Energy recovery targets are also set for some products.</p>	<p>1. Targets for product recycling</p>	<p>1. Producers bear the entire cost of EPR implementation</p>	<p>1. Reporting requirements are laid out for producers as well as PROs on a portal.</p>
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<p>2014: National Environmental Management: Waste Amendment Act</p> <p>2016: National Pricing Strategy for Waste Management</p> <p>2017: National Environmental Management: Waste Act, 2008 (Act Number 59 of 2008) Section 28 Notice</p> <p>2019: Revised and Updated National Waste Management Strategy</p> <p>2020: Gazette 43882: National Environmental Management: Waste Act, 2008 (Act Number 59 of 2008): Regulations regarding Extended Producer Responsibility Scheme for Paper, Packaging, and some Single-Use Plastics</p>										
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	<p>2021: Gazette 44539: National Environmental Management: Waste Act, 2008 (Act Number 59 of 2008): Amendments to Regulations regarding Extended Producer Responsibility Scheme, 2020</p> <p>2021: Gazette 44078: National Environmental Management: Waste Act, 2008 (Act Number 59 of 2008)</p>										
Republic of Korea	<p>1986: Wastes control Act.</p> <p>1990s: Food waste recycling programmes</p> <p>1992: Act on Promotion of Saving and Recycling of Resources</p> <p>1993: Waste Charge System</p> <p>1994: Act on the Promotion of Saving and</p>	<p>1. Tires, 2. Batteries 3. Packaging: paper, plastic 4. Styrofoam packing 5. Used oil 6. WEEE</p>	No	<p>1. Individual and Collective EPR</p> <p>2. Korea Environment Corporation's (KECO) develops and implements the environment and promotion of resource recycling.</p> <p>3. Ministry of Environment</p>	<p>1. Registration of PROs and producers</p> <p>2. Certification of PROs and the producers</p> <p>3. Labelling of products which can be recycled</p> <p>4. Online portal for the registration of PROs and issuing certificates.</p>	No	<p>1. Deposit refund fees</p> <p>2. Modulation fees</p>	<p>1. MoE sets the recycling target for each item ranging between 55%–70% based on weight</p> <p>2. Return of deposits on proper collection and recycling of the e-waste, was managed by Korea Recycling Corporation (KORECO)</p>	<p>1. In case of Failure to comply with the targets, producers have to pay to commercial recyclers or PROs</p> <p>2. Pay certain fee on the oil sold, which</p>	<p>1. Producers to pay advance deposits to cover recycling costs based on the volume of items.</p>	<p>1. Annual reporting of the producers regarding the targets achieved</p>

	<p>Recycling of Resources</p> <p>1994: Act on the Control of Transboundary Movements of Hazardous Wastes and their Disposal</p> <p>1995: Volume-based Waste Fee System</p> <p>2003: EPR introduced which was earlier known as, Waste Deposit System</p> <p>2007: Act on Resource Circulation of Electric and Electronic Products and Vehicles</p> <p>2015 Promotion of Installation of Waste Disposal Facilities and Assistance</p> <p>2022: Promotion of Saving and Recycling of Resources</p>			<p>annually announces the item specific rates based on the recent recycling performance of the producers.</p>				<p>3. PROs are accredited by the KECO based on financial stability and potential contribution</p> <p>4. Producers are obliged to develop recycling technology</p> <p>5. EPR is mandatory for Producers and importers</p>	<p>is refunded to certified collectors</p> <p>3. Producers fulfil their obligations either by constructing their own recycling plant or out-sourcing it to commercial recycling units.</p>		
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<p>UK</p>	<p>2003: The Packaging (essential requirements) regulation 2007: Ship Recycling Strategy 2011: Responsibility deal between Govt. and waste resource management sector. 2012: Waste Collection Support Scheme 2013: Waste prevention programme 2013: Waste and Resource Evidence Plan 2015: The Single Use carrier Bags Charges order 2019: Extended producer responsibility for packaging 2020: Extended producer responsibility for waste electronic and electrical equipment</p>	<p>1. Packaging waste 2. End-of-life vehicle 3. Batteries and accumulators 4. Waste Electrical and Electronic Equipment (WEEE)</p>	<p>No</p>	<p>1. Individual and Collective EPR 2. Engagement of Local authority on the lines of the EU directive</p>	<p>1. Plastic waste recovery note 2. Labelling of recycled products 3. Certification of recyclers and PROs</p>	<p>No</p>	<p>1. Recycling fees 2. For every 1 tonne of waste recycled 1 Packaging Waste Recovery Note (PRN) is issued, this can be traded.</p>	<p>1. Packaging Waste Recovery Note (PRN) can be exchanged among re-processors, and obligated companies to comply. 2. Obligated companies can meet their recycling targets by themselves or through PROs</p>	<p>1. Modulating fees to incentivise producers to make more sustainable decisions when designing or purchasing packaging 2. The producer must handle the end-of-life management of the product.</p>	<p>1. The producer becomes the liable party for any environmental damage that the product causes during its life. 2. The producer covers the cost of end-of-life management, labelling and informing the public.</p>	<p>1. Producers will evidence that they have met their recycling obligations by acquiring packaging waste (export) recovery notes 2. Report on type of packaging used and its recyclability to be submitted to the authority.</p>
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<p>Brazil</p>	<p>1981: National Environmental Policy Act. 2010: National Solid Waste Policy</p>	<ol style="list-style-type: none"> 1. Pesticides and their residues and packaging 2. Cells and batteries 3. Tyres tires; 4. lubricating oils, their waste and packaging; 5. fluorescent lamps, sodium and mercury vapor and mixed light; 6. electronic products and their components 7. General Packaging 8. Glass 9. Steel Packaging 10. Automobile Batteries 11. Medicines 	<p>2010: National Solid Waste Policy</p>	<ol style="list-style-type: none"> 1. Collective EPR 2. Implementation is through a mixture of Sectoral agreements, Terms of commitment and State legislation 	<ol style="list-style-type: none"> 1. The Federal Technical Register of Potentially Polluting Activities 2. The National Council of the Environment (CONAMA) 	<p>Yes</p>	<ol style="list-style-type: none"> 1. Tax and subsidies implemented for various sectors based on reverse logistics. 	<ol style="list-style-type: none"> 1. Manufacturers are obligated to indicate their packaging or supplies materials in the value chain. 	<ol style="list-style-type: none"> 1. Encourage the use of materials that are less aggressive to the environment and more sustainable 2. Encouraging production and consumption of products derived from recycled and recyclable materials. 	<ol style="list-style-type: none"> 1. Businesses and distributors in the obligation for collecting and transporting waste discarded by the consumer. 	<ol style="list-style-type: none"> 1. Self-declaratory document issued by the producer valid in the national territory
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<p>Australia</p>	<p>1992: National Strategy for Ecologically Sustainable Development 2000, 2011: Product Stewardship act 2007: Waste Avoidance and Resource Recovery Act 2010: National framework for waste management and resource recovery -----: National Circular Economy Hub and Marketplace by 2021 2020: Recycling and waste reduction act</p>	<p>1. Televisions and Computers 2. Oil Tyre 3. Battery 4. Mercury containing lamp 5. Construction materials 6. Food and garden waste 7. Paints</p>	<p>2020: Recycling and waste reduction act</p>	<p>1. Collective and individual EPR 2.Co-regulatory arrangements to only contract with recycling providers that are certified to AS 5377 (The Australian Standard for the collection, storage, transport and treatment of end-of-life electrical and electronic equipment.)</p>	<p>1. Instructions on ways to recycle packaging. 2. Black and white recycling labelling for products (based on their recyclability) 3. Certification of recyclers</p>	<p>No</p>	<p>1. Fees for registration of PROs and recyclers.</p>	<p>1. Regulation of waste exports 2. Targets for reduction and recovery of materials. 3. Phasing out of unnecessary plastics by 2025. 4. Data collection and usage in the monitoring of waste recycling targets 5. Environment protection authority will monitor, evaluate and regulate the waste production and recovery. 6. Targets set for 80% recovery from all waste streams by 2030.</p>	<p>1. Certification for the recyclers 2. Training and research by the industry 3. Promotion of the use of recycled material</p>	<p>1. Shared responsibility</p>	<p>1. Yearly reporting through the online portal by the producer and recyclers</p>
<p>Argentina</p>	<p>2005: National Strategy for the Management of Urban Solid Waste -----: Management of Household Wastes Law -----: Industrial and Service Activities Waste</p>	<p>1. Phytosanitary containers 2. WEEE 3. Tyres</p>	<p>2021: National program to strengthen the Circular Economy (planning stage)</p>	<p>1. Collective EPR 2. Responsibilities shared between the producer and local authority</p>	<p>1.Take-back mechanism of used equipment</p>	<p>Yes, Waste pickers recognised in 2002</p>	<p>Does not exist</p>	<p>1. Government to oversee the implementation of EPR.</p>	<p>Does not exist</p>	<p>1. Shared responsibility with financial cost borne by the producers</p>	<p>Does not exist</p>

	<p>Management -----: National Environmental Policy -----: Filmus Bill 2021: Circular Economy Law</p>										
Canada	<p>1994: First EPR program 2009: Canada-Wide Action Plan for Extended Producer Responsibility</p>	<p>1. Packaging plastics, 2. batteries, 3.paper, 4.electronics</p>	<p>2009: Canada-Wide Action Plan for Extended Producer Responsibility</p>	<p>1. Collective EPR 2. The implementation of the plan carried under the jurisdictional authority of each provincial government.</p>	<p>1. Online portal for producers/business owners to register</p>	No	<p>1. Subsidies and fines for different provinces and different waste streams</p>	<p>1. Recycling targets set by the respective governments for various waste streams based on the provinces. 2. Compliance orders by the authority on recycling status In Quebec, recycling targets are established for specific materials (e.g., paper, cardboard, plastic, glass and metal). The recycling target for each of these materials is set at 70%.</p>	<p>1. Recycling targets customised according to the provinces and waste stream 2. Promotion of recycled material according to the provinces and different waste streams. 2. Education and outreach</p>	<p>1. Shared responsibility with financial cost borne by the producers</p>	<p>1. Producers should report on the status of achieving the recycling targets on regular basis</p>

Germany	<p>1991: Avoidance of Packaging Ordinance - 'Green dot'</p> <p>2002: Compulsory deposit refund system</p> <p>2005/2015/2022: EU WEEE Directive into German law</p> <p>2019: German Packaging Act - VerpackG</p> <p>2009/ 2021: Battery Act (BattG)</p>	<ol style="list-style-type: none"> 1. Packaging 2. WEEE 3. Batteries 4. Plastic 	No	<ol style="list-style-type: none"> 1. Individual and collective EPR 	<ol style="list-style-type: none"> 1. Certifications for recyclers, PROs 2. Registration of producers, PROs and recyclers. 3. Green Dot – Financing Label of recovery, sorting and recycling of sales packaging 4. German deposit system, a clearing system between retailers and fillers that allows consumers to return single use beverage packing to any retailer 	No	<ol style="list-style-type: none"> 1. Fines levied on the producers 2. Modulation fees 3. Deposit Refund System 	<ol style="list-style-type: none"> 1. Recycling targets and recycled content usage targets 2. A public register such that competitors can report unregistered traders 	<ol style="list-style-type: none"> 1. Directives for minimum recycled content 2. Usage of recycled content targets and recycling targets. 	<ol style="list-style-type: none"> 1. Complete responsibility by producers 	<ol style="list-style-type: none"> 1. Annual consolidation and monthly reporting by PROs on the platform
Turkey	<p>2019: By Law on Zero Waste</p> <p>2021: Packaging Waste Management Regulation</p>	<ol style="list-style-type: none"> 1. Packaging waste in terms of plastic, glass paper etc. 2. Batteries and Accumulator 	No	<ol style="list-style-type: none"> 1. Collective EPR 2. Shared responsibility between public and private 3. Individual Model (WMA) 	<ol style="list-style-type: none"> 1. Specific standards 2. Licenses issued for PROs and recyclers. 3. Coordination 	Yes	<ol style="list-style-type: none"> 1. No taxes 2. Fines for non-compliance by the producers 2. Recovery Contribution Shared paid by 	<ol style="list-style-type: none"> 1. Metropolitan municipalities are responsible for constructing and operating separation, recovery and disposal facilities 	<ol style="list-style-type: none"> 1. Directives for waste minimization at sources 2. Compliance 	<ol style="list-style-type: none"> 1. Financial responsibility by producers 	<ol style="list-style-type: none"> 1. Annual report to be submitted to the authority to operate for the next year.

<p>2004: Control Regulation of Waste Batteries and Accumulators</p> <p>2022: Regulation on the Management of Waste Electrical and Electronic Equipment</p> <p>2022: Regulation on the Restriction of the Use of Certain Harmful Substances in Electrical and Electronic Equipment</p> <p>2009: Regulation on the Control Of End Of Life Vehicles</p> <p>2009: Regulation on the Waste Oil Management</p> <p>2006: Regulation On Control Of End of Life Tires</p>	<p>s 3. waste oils 4. Vehicles 5. Electronic waste 6. Medical waste</p>		<p>4. Deposit Refund Model</p>	<p>and training at the national level in the field of waste management</p>		<p>producers/marketers</p>	<p>of municipal waste. 3. Auditing and monitoring of the recycling status of the industry done by the Ministry of Environment.</p>	<p>e with EPR and fines 3. Promoting recycled material</p>		
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Mexico	<p>1988: General Law on the Prevention and Comprehensive Management of Waste</p> <p>2003/2015: General law for the prevention and comprehensive management of Waste.</p> <p>2019: General Law for the Prevention and Integral Management of Waste (LPGIR)</p>	<p>1. E-Waste</p> <p>2. Plastic packaging waste and plastic waste including polystyrene.</p> <p>3. Used tyres, Hazardous waste</p> <p>4. Major classification are Urban solid waste , special waste and Hazardous waste</p>	No	1. Collective EPR	1. Registration to SEMARNT Law and Environment Assistance Platform (Digital) ("PROFEPA is the enforcement arm of SEMARNAT Semarnt")	Yes	1. EPR Fees	<p>1. Three levels of govt. Federal, state and central monitor resource efficiency.</p> <p>2. Individual states respond to their respective policies and programmes.</p>	<p>1. Improve and modernise recycling and reuse of municipal waste</p> <p>2. Introducing producer responsibility for selected waste streams and taking social factors into account</p>	1. Overall operational cost of the EPR implementation taken up by the producers.	1. Through the annual operation card (cédula de operación anual), which is submitted to SEMARNAT
Italy	<p>1992: Legislative Decree on Used mineral oils</p> <p>2003: Presidential Decree on Medical Waste</p> <p>2003: Legislative Decree on end-of-life Vehicles</p> <p>2008: Legislative Decree on Spent lead batteries and lead waste</p> <p>-----:Articles 217 to 226 on Packaging waste</p>	<p>1.WEEE</p> <p>2. Packaging</p> <p>3. Batteries</p> <p>4. Tobacco products</p>	No	1. Collective EPR	<p>1. Certifications of PROs and recyclers</p> <p>2. Registration of producers, recyclers, and PROs</p> <p>3. Labelling of recycled products</p>	No	1. EPR Fees	1. Recycling targets set based on the production	<p>1. Recycling targets set based on the production.</p> <p>2. Producers obligated to have 100% coverage</p> <p>3. Producers can form a coalition or outsource their</p>	1. Producers are financially responsible	1. Annual reporting by third party and the producers of the targets achieved and material produced.

	2014/2019: Legislative Decree on WEEE								obligation to third party (PROs)		
India	2001/2022: Battery Waste Management 2011, 2016, 2018, 2022: E-waste Management 2016: Solid waste Management. 2011, 2016, 2021, 2022: Plastic Waste Management Rule	1. WEEE including solar photo voltaic cells/module s/panels. 2. Rigid, flexible, Multilayer types of Plastic. 3. Tin 4. Corrugated boxes	No	1. Collective EPR	1. Digital EPR portal for registration of producers, Importers and Brand Owners (PIBO) along with other stakeholders, including monitoring and regulating EPR-related activities 2. Registration of PROs 3. Certificates issued by CPCB to recyclers, PROs	Yes	1. Deposit refund 2. EPR registration fees 3. Tradable EPR certificates	1. Compliance with CPCB guidelines and monitoring by the SPCB 2. Reporting of the materials used and recycled 3. Penalties are levied on non- compliance with the polluter pay principle.	1. Targets set based on the waste streams. 2. Encouraging the use of recycled materials.	1. Producers take the responsibility of end- of-life management of products.	1. Annual reporting by the producer, PROs on the digital EPR portal monitored by CPCB.

Russia	<p>1998, 2017: The Federal Law for production and consumption of waste management.</p> <p>2015: The Principle of Producer Responsibility was introduced in</p> <p>2019: Waste Reform</p>	<ol style="list-style-type: none"> Paper, Cardboard Oil products Tires Plastic articles WEEE 	No	<ol style="list-style-type: none"> Individual and collective EPR 	<ol style="list-style-type: none"> Online registration 	No	<ol style="list-style-type: none"> Regional and federal subsidies for producers to use recycled materials 'Green bonds' to attract investors 	<ol style="list-style-type: none"> Russian ministry of natural resources and environment is responsible for regulations and notifying the targets Environmental fees paid by producers for failing to comply with the targets 	<ol style="list-style-type: none"> Recycling targets set by the authority 	<ol style="list-style-type: none"> The producer is responsible for cost coverage. 	<ol style="list-style-type: none"> Keeping records with the regional operators and maintaining a monitoring mechanism
China	<p>1995: Law of the People's Republic of China on the prevention and control of solid waste pollution,</p> <p>2002: In MII jointly organised a commission under SEPA (State Env. Protection Agency) and State Economic Trade committee to formulate regulation of ' E-waste Management in China based on EPR'.</p> <p>2002: Cleaner production promotion law of</p>	<ol style="list-style-type: none"> White goods WEEE Vehicles Plastic 	No	<ol style="list-style-type: none"> Individual and collective EPR Combination of collective and individual responsibilities 	<ol style="list-style-type: none"> Registration of producers, PROs, and Recyclers on the digital platform Digital platform for registration of Producers, PROs and other stakeholders, including monitoring and regulating EPR related activities 	Yes	<ol style="list-style-type: none"> Subsidy for the formal sector Tax credits to the producer implementing EPR Special purpose funds are available for local authorities to invest in EPR infrastructure Tipping fees paid by the producers, recyclers. 	<ol style="list-style-type: none"> Regulatory and supervisory of the EPR taken up by the government Recycling targets set 	<ol style="list-style-type: none"> Recycling targets set by the government based on waste streams Material recovery targets set by the government for a particular waste stream 	<ol style="list-style-type: none"> Producer responsible for the cost coverage of the collection and transport of the waste. Producer subsidised by the government 	<ol style="list-style-type: none"> Records to be maintained by the producers at the central level documents submitted to the central government.

<p>the People's Republic of China. 2003: State Development planning commission took responsibility to establish overall system of E-waste management. 2003: SEPA promulgated 'strengthening Management of electrical & electronic equipment within framework of Env. Laws as promotion of clean production and prevention of and control of Env. Pollution by solid waste. 2004: Law of the People's Republic of China on the prevention and control of solid waste pollution. . 2005: Compiled a draft regulatory Approaches on the pollution control in Electronic &</p>										
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<p>information products. 2006/ 2016: China RoHS 2008:Regulation on the recovery and disposal of waste electrical and electronic products (EPR was introduced). 2008: End of Life Vehicles (ELVs) 2009: Law on circular economy promotion. 2011: China WEEE regulation 2015 Integrated Reform Plan for Promoting Ecological Progress (EPR was initiated) 2015, 2020: Solid Waste Pollution Preventing and Control Law .</p>										
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<p>Saudi Arabia</p>	<p>2013: Waste Management law 2021: Waste Management law 2021: E-waste legislation,(Draft)</p>	<p>1. Organic material 2. WEEE 3. Metal/minerals 4. Leather 5. Rubber/tyres</p>	<p>No</p>	<p>1. Collective EPR</p>	<p>1. Online registration of manufacturers and waste management agencies 2. Digital platform for registration.</p>	<p>Yes</p>	<p>Does not exist</p>	<p>1. Penalty for non-compliance 2. Recycling targets set for the producers</p>	<p>1. Recycling targets and material recovery targets set by the government.</p>	<p>Producers/Manufacturers takes the responsibility</p>	<p>1. Waste management service provider to keep the information related to handling.</p>
<p>USA</p>	<p>1976: Resource Conservation and Recovery Act (RCRA) 1991: The California Oil Recycling Enhancement Act 2003: Electronic Waste Recycling Act 2019: National Framework for Advancing the U.S. Recycling System 2020: National Recycling Strategy ---: Over 30 laws on EPR implemented by states various states (Maine, LD 1541 (2021); Illinois,SB 345</p>	<p>1. Packaging and Paper 2. Carpet 3. Mattresses 4. Textiles 5. WEEE 6. Used oil 7. Paint</p>	<p>2020: National Recycling Strategy</p>	<p>1. Collective EPR 2. PPP practices to manage waste</p>	<p>1. Registration of recyclers, PROs, 2. Digital portals for registration. 3. Certified collection centres</p>	<p>No</p>	<p>1. Modulation fees 2. Penalties for improper treatment of the waste by recyclers 3. Incentives to authorised collectors and re-processors</p>	<p>1. Recycling targets 2. Penalties on mismanagement by PROs 3. Discount on fees for products with high recyclability or including recycled content.</p>	<p>1. Promotion of use of recycled material and increase the material recovery rate. 2. Operating and designing standards</p>	<p>1. Producers/Manufacturers takes the responsibility 2. In certain cases cost passed on to the consumer</p>	<p>1. Annual reporting on a digital portal</p>

	(2021); California, AB 2398 (2010))										
Indonesia	<p>2008: Act regarding waste management</p> <p>2009: Law on Hazardous Wastes</p> <p>2012: Management Of Household Waste And Waste Like Waste</p> <p>2017: Policy and National Strategy of MSW</p> <p>2019: Road Map Of Waste Reduction By Producer</p>	<ol style="list-style-type: none"> 1. Packaging plastics 2. Food waste 3. Metals 4. Textile 5. Glass 6. Paper, cardboard 7. WEEE 	<p>2019: Roadmap of waste reduction by producer</p>	<ol style="list-style-type: none"> 1. Collective EPR (Indonesia Packaging Recovery Organization) 	<ol style="list-style-type: none"> 1. Digital platform for monitoring EPR-related activities 2. Registration of recyclers, Producers and PROs. 	Yes	<ol style="list-style-type: none"> 1. Modulation fees 2. Deposit refund system 	<ol style="list-style-type: none"> 1. Recycling targets 2. Promotion of recycled content 3. Use of CSR to finance the recycling infrastructure 4. Waste handling budget per capita 	<ol style="list-style-type: none"> 1. Legal mandate to increase the use of recycled material in new products 	<ol style="list-style-type: none"> 1. Financing the waste management system will be transferred from the municipalities and taxpayers to the producers 	<ol style="list-style-type: none"> 1. PROs submitting roadmap with measures to implement EPR submitted for approval to the Ministry of Environment and Forestry (KLHK)

France	<p>1992: EPR or collection of packaging waste of household packaging waste ---:Recycling Management Act 2005: Decret on WEEE 2019: Single-Use Plastic directive 2022: Anti-Waste Law for a Circular Economy (AGEC Law)</p>	<ol style="list-style-type: none"> 1. Tyres 2. Packaging Waste 3. Textiles 4. Building Materials 5. Chemical products and Pharmaceutic als 6. Furniture including upholstery 7. Paper 	<p>No</p>	<ol style="list-style-type: none"> 1. Collective EPR 	<ol style="list-style-type: none"> 1. Labelling triman Logo (on all recyclable products) 2. Registration of PROs on digital portal. 3. Retailers enabled to take back waste from the customers 	<p>No</p>	<ol style="list-style-type: none"> 1. Repair funds 2. Modulation fees 3. Subsidies given to companies using recyclable material 	<ol style="list-style-type: none"> 1. Recycling targets along with Material recovery targets in use 2. Structural support (physical infrastructure) is given to recyclers and retailers rather than strict measures of taxes and fines to adopt EPR 	<ol style="list-style-type: none"> 1. Promotion of usage of recycled materials 2. Recycling targets set by the government. 	<ol style="list-style-type: none"> 1. Producers obliged to meet the recovery target. 2. Support given to recyclers based on the funds established. 	<ol style="list-style-type: none"> 1. producers to present their five year waste prevention plan, emphasizing on the eco-design of the products.
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Annexure 3: Case Study of Switzerland, Germany, and Indonesia

Switzerland

Switzerland has long been recognized as one of the most advanced countries in the areas of waste management and recycling policies, due to a strong policy framework established in the 1980-90s. Although limited to a few waste streams, Switzerland has well developed and high-functioning EPR schemes in place (Circular Economy Switzerland 2021). EPR frameworks for three waste streams: batteries, e-waste and packaging waste are discussed at length below.

Battery Waste

The first explicit EPR scheme was targeted towards managing battery waste. Take-back obligations for waste batteries in Switzerland were first introduced in 1986 and are regulated by the Substances Ordinance. Under the current Ordinance on “the reduction of risks associated with the handling with certain particularly dangerous substances preparations and articles” (ChemRRV), all producers of batteries as well as producers of vehicles and/or appliances containing batteries (that are not already charged with a fee) must finance the net costs arising from the collection, treatment and recycling of the batteries as well as the administrative costs work done by the Federal Office for the Environment (BAFU) and the costs for communication and awareness raising (BAFU 2021).

According to the ChemRRV, all batteries, irrespective of weight, are subject to the obligation to register and pay fees. In the case of industrial and automotive batteries, the obligation of paying Advanced Recycling Fee (ARF) may be waived in case the industries or companies can provide evidence of environmentally sound disposal that fully covers the end-of-life costs of battery disposal. The BAFU commissions a suitable private organisation to coordinate collection, administration, and use of the ARF for a contractual period of 5 years (Ahlers et al. 2021).

Consumers are required to hand over waste batteries for disposal at designated battery collection points. Battery collection points include the locations of all first-time distributors (e.g., physical sites of distributors/importers and manufacturers) of batteries in Switzerland, municipal collection points as well as private collection points of authorised companies. In addition, shops, companies, gas-station, etc. may also set up voluntary collection points. In the aggregate, the collection network for waste batteries in Switzerland is well developed and encompasses over 11,000 individual collection points. The transporters are contacted directly by the respective collection points, whenever collection of waste batteries is required (INOBAT. 2021).

To verify the quantity of batteries collected, all parties are required to fill a waste consignment note for the collection of waste batteries whenever they are collected and delivered for recycling. Each consignment note has a unique identification number and is provided by the responsible transport company upon collection. Amongst others, these notes contain information on the respective collection point, a description and amount of collected batteries, details on the responsible transport company as well as information on the recycling plant to which the batteries are delivered (BAFU 2021).

The ChemRRV has yielded positive results in terms of implementation. As of 2019, the collection rate of batteries was 63.68% and the collection per capita stood at 1.75 kg. The recycling and treatment rate stood at an impressive 83%. A challenge currently seems to be the low return rates of li-ion batteries. Furthermore, battery sales are increasing rapidly, and collection rates continue to remain constant leading to declining collection rates over time (Ahlers et al. 2021).

E-Waste

Switzerland was the first country in the world to have a formal legislative system built on EPR principles to manage e-waste (Sinha-Khetriwal, Kraeuchi, and Schwaninger 2005). In 1998, the BAFU introduced the Ordinance on ‘The Return, the Taking Back and the Disposal of Electrical and Electronic Equipment’ (ORDEE) (Fishbein 2002; Nnorom and Osibanjo 2008). Under this ordinance, retailers, manufacturers, and importers are obligated to take back electrical appliances free of charge. Consumers, for their part, are obliged to return end-of-life appliances and are not allowed to dispose of them via household waste or bulky item collections. The ordinance covers all sorts of electrical/electronic devices, including IT and telecommunications equipment (Global Information Society Watch 2010). A huge reason behind the success of the Ordinance is that it clearly demarcates roles and responsibilities for all stakeholders. These are described in Table below.



Responsibilities of various stakeholders in the e-waste management system of Switzerland

Actor	Responsibility
Government	<ul style="list-style-type: none"> Overseeing body and licensing authority for recyclers Passing amendments to legislation Overall monitoring of progress
Manufacturers/Importers PROs	<ul style="list-style-type: none"> Importers carry the economic and physical responsibility of their products.
Distributors/Retailers	<ul style="list-style-type: none"> Bear part of the physical and informational responsibility of products Obligated to take back all the products that they have on sale
Consumers	<ul style="list-style-type: none"> Responsible and obligated by law to return discarded appliances to retailers or designated collection points
Recyclers	<ul style="list-style-type: none"> Adhere to minimum standards on emissions and take adequate safety measures concerning employee health

(Source: Sinha-Khetriwal, Kraeuchi, & Widmer, 2009)

Producer Responsibility Organisations (PROs) share all the operational responsibilities on behalf of the producers. The largest share of Switzerland's e-waste in terms of weight and volume is handled by two PROs: **SWICO** (Swiss Economic Association for the Suppliers of Information, Communication and Organizational Technology) and **SENS** (Swiss Foundation for the Disposal of Wastes). The close interaction between the BAFU and the PROs at early stages and during the legislative process resulted in greatly reducing the burden of federal authorities in establishing an e-waste management system using a top-down approach. The industry welcomed the legislation, as it helped provide a legal framework to the respective actors involved in collection and recycling activities, and create a level playing field (Tojo 2003).

The finance for collection and recycling is secured by an ARF which is borne by consumers on the purchase of all new appliances, thereby bearing the financial responsibility of WEEE. The ARF is set by PROs and varies according to appliance type and weight. The recycling fee is set as intergenerational contracts between the appliances purchased in the past and those that will be purchased in the future. Since the purchase price of all appliances includes a disposal charge, they can be returned free of charge (Sinha-Khetriwal, D., and Widmer 2009).

Consumers must deposit EEE at the end of its life at "Collection Points" which are specifically designated locations having coverage throughout Switzerland. These Collection Points are set up and managed by the PROs. Retailers are also required to take back the waste from the consumers free of charge, irrespective of the brand and manufacturing year of the products (Sinha-Khetriwal, Kraeuchi, and Schwaninger 2005). The most important feature of the system is the presence of multiple levels of independent controls, which prevents free riding and helps to maintain quality and environmental standards by the recyclers. The controls also prevent illegal import and export of e-waste. ORDEA lays down rules for the exporters, which require them to provide documentary evidence that the final disposal will be done in an environment friendly manner and has acquired prior consent from the importing countries (Gupt and Sahay 2015).

Packaging

Switzerland has committed to harmonise its legislation with the EU rules so as not to obstruct the exchange of goods with EU Member States. To that extent, there is no general legislation on packaging but a series of specific prescriptions for each packaging type. These prescriptions exist in the Beverage Containers Ordinance of 2000 (Swiss Government Portal 2022).

Under the Ordinance, dealers, manufacturers, and importers (henceforth referred to as "producers") shall supply packaging only in containers which, when they are collected, treated, or recycled by existing organisations, do not give rise to significant additional costs or significant technical difficulties.





Furthermore, producers that supply beverages in refillable containers to consumers must charge a deposit. They must take back refillable containers of all the products they stock and refund the deposit amount from their own expense. The same applies to non-refillable PVC containers. The Ordinance also clearly lays out the labelling requirements for beverage containers. The label must mark refillable and non-refillable containers separately and indicate the amount of deposit charged (Swiss Government Portal 2022).

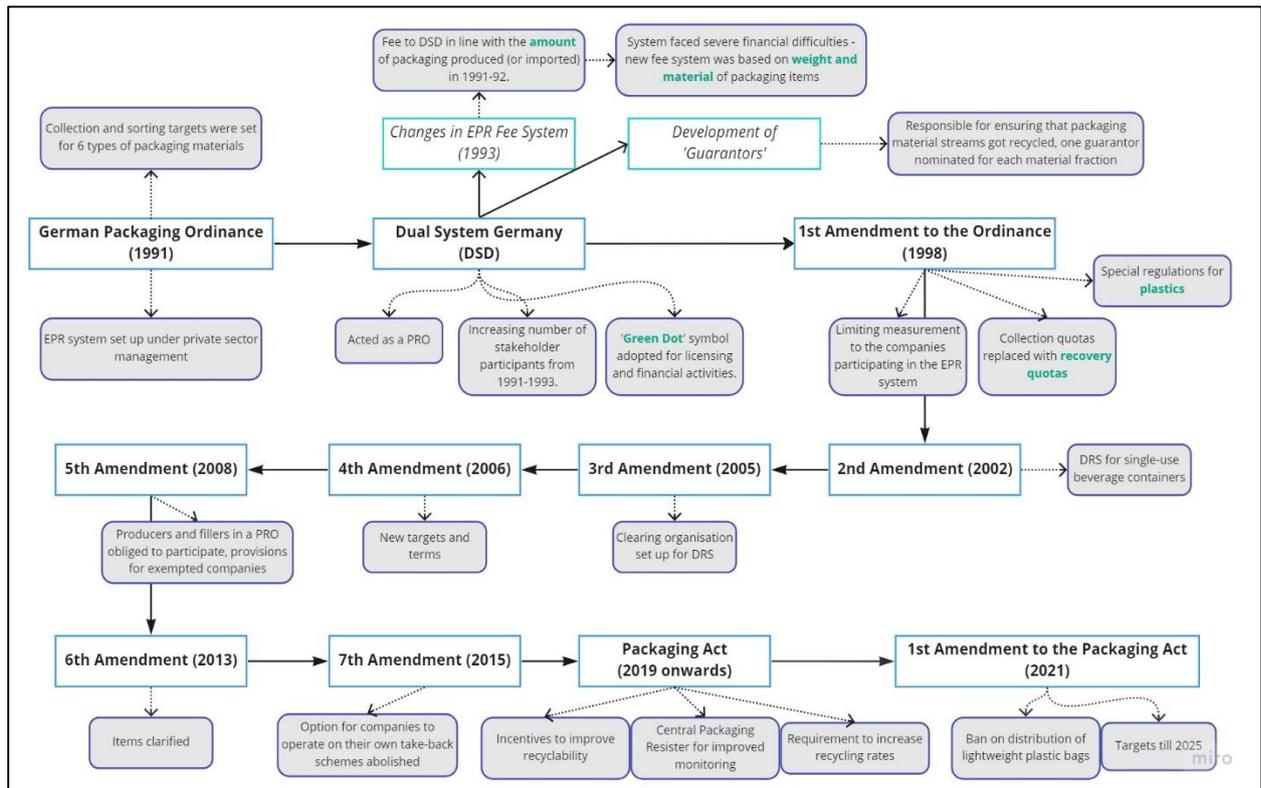
The Ordinance also makes a provision for prepaid disposal fee for glass beverage containers. Manufacturers who supply empty glass beverage containers for use within Switzerland and importers who import such containers must pay a disposal fee to an organisation appointed by the Federal Office for the Environment. The obligation to pay a fee also applies to importers who import filled glass beverage containers. The Fee Organisation must use the fee for the collection and transport of used glass, the cleaning and sorting of intact glass containers, the cleaning and preparation of cullet for the manufacture of containers and other products, information, particularly to promote the reuse and the recycling of glass beverage containers, refunding the fee and for its own operations (Swiss Government Portal 2022).

The recycling rate for beverage containers made from glass, PET and aluminium has been set to a minimum of 75% for each material. The recycling rate of any packaging material is the percentage proportion of the containers recycled during a calendar year compared with the total weight of non-refillable containers of the material supplied for use in Switzerland (Tojo and Lindhqvist 2001).

Germany

Germany is often used as a model for implementing EPR policy and programs. EPR policy has existed in Germany since the early 1990s. Over time, EPR was used a tool for managing multiple waste streams. Germany's EPR currently covers a comprehensive set of waste streams, namely packaging, WEEE, and batteries. The **German Packaging Ordinance** was the first large-scale EPR initiative. It was approved by the government in June 1991 and came into force in 1993 (OECD, 2014). With the implementation of this ordinance, Germany became the first country in the world to set requirements for collection and recycling of sales packaging. The Ordinance was subsequently amended several times (Quinn, 2011). Recently, it was replaced by the **German Packaging Act** which became law on January 1, 2019 (Deutsche Recycling, 2022). The following mind map encapsulates the developments in Germany's EPR landscape for packaging.





Landscape of Germany's EPR System for Packaging

The Packaging Ordinance of 1991 tasked the private industry to set up an EPR system. Binding targets for collection and sorting rates were set and these targets had to be met for the first time in 1993. Collection, sorting, and recycling targets were set for 6 packaging material streams, namely **glass; tinplate; aluminium; paper, cartons, and cardboard; plastics; composite materials** (Neumayer, 2000).

In response to the Packaging Ordinance, an association called Duales System Deutschland (DSD) gained popularity. DSD was set up in the 1990s by industry representatives, and its membership increased greatly from 1990 (95 stakeholders) to 1993 (562 stakeholders) (Bünemann, Brinkmann, Löhle, & Bartnik, 2020).

- DSD thus started functioning as a PRO in charge of collections. It invited tenders for collection services and concluded contracts with companies and municipalities.
- The '**Green Dot**' symbol was adopted for DSD's licensing and financial activities. Manufacturers were to place a green dot on the packaging in order to indicate that that package should be collected and recycled by DSD.
- From 1991-92 onwards, participation in the system and the entitlement to use the Green Dot logo was based on a fee linked to the amount of packaging used (AINIA Packaging Technical Guide).

In 1993, it ended up in severe financial difficulty which led to the introduction of a **new fee system** based on the weight of each item and the materials used to make it (Kraemer, 1999). DSD only covered collection and sorting of sales packaging. However, the Ordinance called for the eventual recycling of the material streams as well. This meant the companies and organisations handling the packaging had to find a market for the individual packaging material flows. This led to the designation of '**guarantors**' under the scheme, which were organisations made up of raw material suppliers, packaging material manufacturers or converters, ensuring that packaging materials got recycled. The table below shows the guarantors nominated for each material stream (BellandVision, 2021).

Guarantors for Packaging Material Streams

Material Stream	Guarantor
Plastic packaging	German Society for the Circular Economy and Raw Materials



Beverage cartons	Recarton-Gesellschaft für Wertstoffgewinnung GmbH (ReCarton GmbH)
Aluminium based packaging	Deutsche Aluminium Verpackung Recycling GmbH
Tinplate packaging	Germany's major steel manufacturers
Glass packaging	Association of the German Glass Industry

It was difficult to determine whether the legally mandated separate collection quotas had been achieved, as the precise quantities of packaging introduced to the market always had to be calculated retrospectively, with the help of a private consultant. In response to this issue, the **1st Amendment to the Packaging Ordinance** in 1998 was passed.

- The law was changed so that the reference quantity of the denominator of the quota would be measured in relation to the quantity of packaging introduced to the German market by the companies participating in the EPR system, rather than on the basis of the amount of packaging being introduced to the German market in total.
- The collection quota was replaced by a recovery quota for each type of material.

A mandatory deposit-refund system for single-use beverage packaging was introduced in 2003, in response to a decline in the quantity of reusable beverage packaging.

In 2005 the central organisation Deutsches Pfandsystem GmbH (German Deposit System, known by the acronym DPG), set up a clearing system between retailers and fillers that allowed consumers to return containers to any participating retailer, and not just to the original point of sale.

- The Ordinance was amended several times after that.
- In 2003, other PROs started coming up. The current EPR system in Germany is that of a **multi-PRO** one. Each PRO enters into contracts with certain obliged companies within the system. Once the waste has been collected, each PRO takes responsibility for an amount of waste corresponding to the amount licensed and paid by the obliged companies for which it is the contracted PRO.
 - Competing different PROs led to a reduction in collection and recycling costs. However, it also made the system more complex and opaque.
 - It became impossible to verify whether any given company had actually paid its EPR fees to any of the PROs. The overall quantity of packaging licensed under the system fell significantly, as many obliged companies exploited the situation and failed to license all of their packaging with a PRO.
 - These difficulties led to the passing of the German Packaging Act (Bundesministerium der Justiz, 2017).

The Packaging Act replaced the Packaging Ordinance on 1 January 2019. It introduced several new requirements and set up new institutions. Additional features include:

- A new Central Agency Packaging Register (Central Agency): This Central Agency was created to increase transparency and manage free riding. It is responsible for registering manufacturers and importers, receiving, and verifying data reported by manufacturer and importers (obliged companies) and PROs and, by extension, for monitoring and enforcing how obliged companies are participating in the system, and monitoring compliance with the principles of EPR.
- Increased recycling targets
- Provision to take recyclability of packaging into account when setting EPR fees by setting minimum criteria for recyclability (Kumar, 2020).

The Packaging Act was amended in 2021. In February 2021, Germany's Federal Cabinet approved a new Draft Law transposing the Single Use Plastics Directive (EU-Plastics Directive 2019) and the Waste Framework Directive into the Packaging Act. This was intended to bring the Packaging Act into line with the current EU directives and to improve its enforcement.

- The amendment came into force in July 2021. **New Producer's obligations for packaging** were introduced, including record-keeping and self-monitoring mechanisms, self-regulatory mechanisms, and dialogue with end consumers about return possibilities.



- In January 2022, **deposit was made mandatory for all one-way beverage bottles and drink cans** (exemption for one-way beverage bottles filled with dairy products [which will end in 2024, and exemption for specific medical dietary drinks]). Furthermore, **obligations for final distributors and small companies** were set. Final distributors were to offer and indicate alternative and not “more expensive” reusable packaging in addition to single-use plastic food packaging and single-use beverage cups. Small companies were to advise consumers to fill products in reusable containers as an alternative to single-use packaging.
- In July 2022, it was **made mandatory for all packaging producers to be registered with the Central Agency**.
- Targets were set for 2025 and 2030. From 2025, a sales ban on PET bottles containing less than 25% **recycled plastics** would be effective. The recycled content amount would be increased to 30% in 2030.

Impact

One of the most significant changes to EPR in Germany has been its transformation from a system based on a single, non-profit PRO to one that incorporates several for-profit PROs, operating in competition with each other. The system for charging fees has also changed over time, moving progressively towards a model based on the types and weights of material in the system.

Through EPR mechanisms, Germany also witnessed increasing stringency in the targets set for recycling/recovery. Table below sheds light on the same. The values highlighted in green indicate that does targets were met successfully.

Recycling Targets

Source: Official documents released for the Ordinance amendments

Packaging Material	Recycling Rate				
	1993-1995	1998	2018	2019	2022
Glass	42%	75%	75%	80%	90%
Tinplate	26%	70%	-	-	-
Aluminium	18%	60%	60%	80%	90%
Paper, cartons, and cardboard	18%	70%	70%	85%	90%
Plastics	9%	60%	60%	90%	90%
Mechanical recycling (plastics)	-	-	36%	58.5%	63%
Beverage cartons	-	-	60%	75%	80%
Ferrous metals	-	-	70%	80%	90%
Other composites	6%	-	60%	55%	70%

The following table presents some statistics shedding light on the success of packaging EPR in Germany.

Statistics on the success of Packaging EPR in Germany

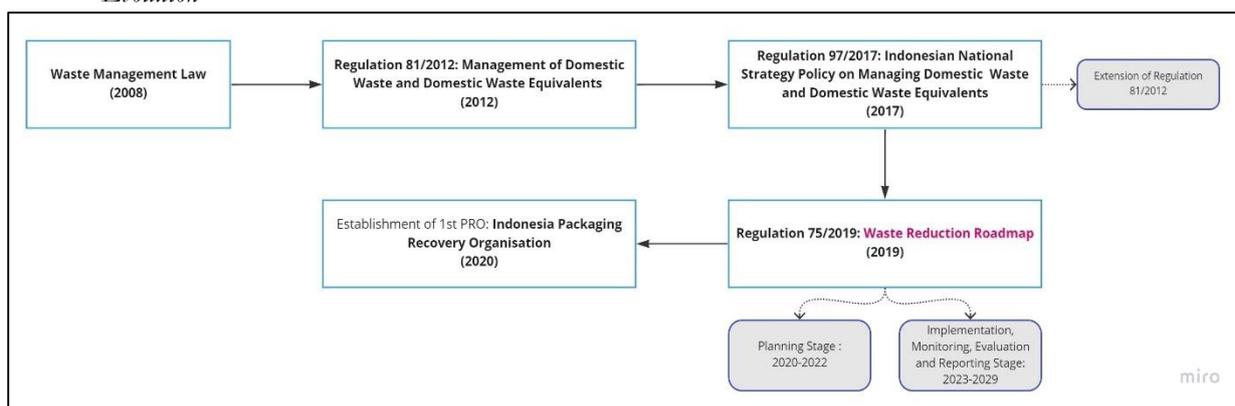
Rate of Recovery of Packaging Materials	<ul style="list-style-type: none"> • Between 1991 and 2017, the rate of increase in recovery/recycling for packaging materials was recorded to be significantly higher than the rate of increase in packaging production. • The amount of packaging rose from 15.6 million tonnes in 1991 to 18.7 million tonnes in 2017. The recovery rate of packaging materials (material recycling and energetic recovery) rose from 37.3% to 94.3% at the same time (Umwelt Bundesamt, 2020).
Collection Rates	<ul style="list-style-type: none"> • As of 2017, approximately 2.5 million tonnes of lightweight packaging and about 2 million tonnes of glass waste packaging are collected by the PROs every year. • Paper, cartons, and cardboard packaging are collected directly from households (as are newspapers, magazines, etc.). In 2014 this amounted to about 5.8 million t/year.



	<ul style="list-style-type: none"> The collection, sorting and recovery of packaging by the PROs generates total revenues of over €1 billion per year.
Sorting Activity	<ul style="list-style-type: none"> Lightweight packaging is sorted in about 45 sorting facilities across Germany (Bunderkartellamt , 2019).
Quantum of waste going through the recycling path	<ul style="list-style-type: none"> The amount of waste going through each recycling path must be officially reported on an annual basis. The figures for 2017 were: <ul style="list-style-type: none"> - Glass: 1.87 million tonnes - Paper, carton, cardboard boxes (for packaging): 1.2 million tonnes - Aluminium: 0.07 million tonnes - Tinplate: 0.27 million tonnes - Beverage cartons: 0.14 million tonnes - At total of 1.2 million tonnes of plastics were recovered. Of those, 0.46 million tonnes were mechanically recycled (Schüler, 2017). In 2017, Germany recovered 1.2 million tonnes of plastics out of which one-third was due to mechanical recycling (Volk, et al., 2021).
Reduction in waste generation	<ul style="list-style-type: none"> Germany achieved a 3% annual reduction in 1990s in packaging, compared to a 2%-4% yearly growth before to the EPR implementation (Simoens, Leipold, & Sina, 2021)
Registration in the Central Agency Packaging Register	<ul style="list-style-type: none"> As of February 2023, 683,000 producers have registered with the Central Authority and entered into contracts to participate in recycling systems (Lizenzero, 2023).

Indonesia

Evolution



Development of the EPR landscape in Indonesia

- Efforts to integrate EPR into Indonesia's waste management framework began in 2008, with the **Waste Management Law** (REPUBLIK OF INDONESIA , 2008). Article 15 of the law states that producers are responsible for the disposal of packaging and products that cannot be composted or are difficult to compost. However, the law provided no clear directions on how companies should comply with the same. As a result, the law failed to create the necessary impact.
- Further developments were made in 2012 with **Regulation 81/2012** (UNEP LEAP, 2012). The title of the regulation roughly translates to Management of Domestic Waste and Domestic Waste

Equivalents. In essence, the regulation asked the industry to use recyclable materials and to take care of the packaging recycling.

- In 2017, an extension of Regulation 81/2012 was passed: **Regulation 97/2017** (UNEP LEAP, 2020) (Indonesian National Strategy Policy on Managing Domestic Waste and Domestic Waste Equivalents). The aim of the regulation was to create a national strategy on domestic waste and equivalents.
 - Concrete targets for waste reduction were set and a range of measures to achieve these targets were identified.
 - Accordingly, a target of reducing household waste by 30% was set. The remaining 70% was to go through an effective treatment process.
 - Municipal governments were requested to develop concrete waste reduction and treatment plans to contribute to the overall targets.
 - In order to strengthen the industry's efforts, it was specified, among other things, that concrete savings targets should be set and that company-specific savings plans would have to be developed.
- The legal situation changed in 2019 with a landmark regulation by the Minister of the Environment titled **Waste Reduction Roadmap**, or **Regulation 75/2019** (Indonesian Waste Platform, 2020).
 - In a nutshell, the regulation would require producers to create a roadmap to reduce waste by 30 percent from 2020 to 2029. The nature of waste focussed on is mainly packaging waste.
 - The roadmap lays out the implementation of the municipal waste management plans brought forth in Regulation 97/2017 for three industries/sectors, namely the consumer goods industry, retail sector and the hotel and restaurant industry. The table below depicts the sectors and sub-sectors that the roadmap targets

Sectors and Sub-Sectors targeted by the Waste Reduction Roadmap, 2019

Sectors	Sub-Sectors
Manufacturing	<ol style="list-style-type: none"> 1. Food and beverage industry 2. Consumer goods industry 3. Cosmetics and personal care industry
Food and beverage services	<ol style="list-style-type: none"> 1. Diners 2. Cafes 3. Restaurants 4. Catering services 5. Hotels
Retail	<ol style="list-style-type: none"> 1. Shopping centers 2. Modern stores 3. Traditional markets

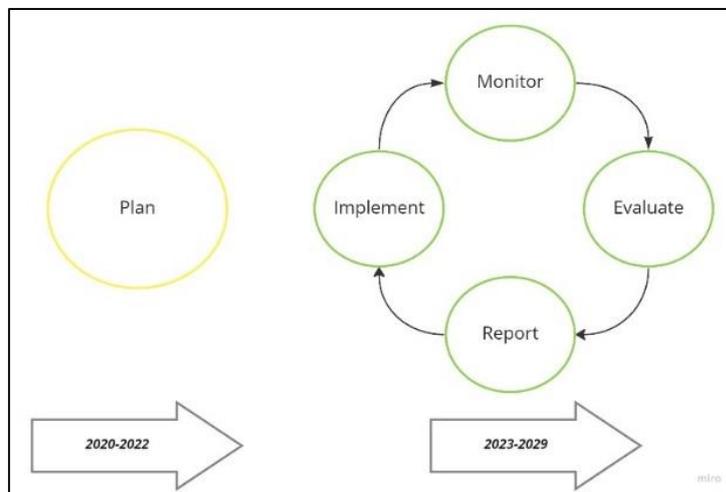
- Actions were clearly defined for each sector. They are presented in the table below.

Sector/Industry	Target/Action
Consumer goods industry	Reduction of waste generated due to their own products by 30% by 2029
Retail sector	Ban on single-use plastics
Hospitality industry	Setting of savings and recycling targets

- The Ministerial Regulation also mandates the private sector to take on a number of responsibilities in reducing waste, including they must provide waste storage facilities (Article 7), waste monitoring (Article 13) and fund waste-reduction programs (Article 26) (Independent Observer, 2022).
- The regulation also specifically addresses packaging made of plastic, aluminium (cans), glass and paper and sets targets for the same. It calls for the use of 100% recyclable materials and 50% recycled content for packaging by 2029 (SystemIQ, 2021).



- The progress of the roadmap has been divided into different stages, which are to be completed by pre-decided timeframes. The figure below illustrates the same.



Stages of the Waste Reduction Roadmap

- The planning stage has been set for the time period 2020-2022. In this stage companies in the aforementioned sectors need to submit their strategies to the government authorities. To ease the process of submitting the documents, the government agencies are creating applications.
- After the planning phase, the government agencies and the producers will be in contact on a bi-annual basis. In 2021, producers were expected to develop packaging take-back concepts and to strengthen/establish cooperation with waste banks and other collection points. For 2022, the implementation of pilot projects and baseline studies has been foreseen. From 2023 onwards, the implementation of the developed concepts shall begin in order to achieve the government's minimum targets by 2029. Throughout this timeframe producers need to report their achievements ministry.
- Regulation 75/2019 is not explicit about whether producers should use the formal or informal system for their recycling and take-back obligations. However, given the focus on recycling in the regulation, the informal system seems to be preferred (Defitri, 2022).
- The Indonesian EPR framework recognises the pros of a collective EPR system and deems it to be more effective than individual EPR. As a result, the first PRO in Indonesia was set up in 2020. The **Indonesia Packaging Recovery Organization (IPRO)** (IPRO, 2022) has been set up by private sector operators. However, the current legal framework does not require a collective approach.

Impact

1. Consumer Goods Industry

With the passing of regulation 75/2019, many initiatives in the sector have been undertaken to comply with the new requirements. The table below showcases some initiatives taken by large FMCG corporations operating in Indonesia as an effort to integrate EPR in their operations.

Efforts taken by the consumer goods industry

Company	Initiative/Efforts taken
Unilever	<ul style="list-style-type: none"> • Public statement was made stating their commitment to implement EPR standards. • Refill station were created in Bintaro for shampoos, laundry detergents, etc. • Commitments towards halving use of plastics, designing products to be recyclable, reusable, or decomposable and collecting and processing packaging waste sold were made. These goals were claimed to be achieved by 2025.
Le Minerale	<ul style="list-style-type: none"> • Recycling points were set up throughout Java. • It works closely with IPRO, the Indonesian Scavenger Association and Waste4Change.



Garnier	<ul style="list-style-type: none"> An application was launched jointly with eRecycle that can weigh sorted plastic waste.
Danone	<ul style="list-style-type: none"> A pilot programme for a reverse vending machine for plastic waste was launched. The initiative had a strong digital infrastructure, allowing consumers to recycle their PET bottles. By recycling consumers can earn points to be converted into electronic money.
Coca-Cola	<ul style="list-style-type: none"> Coca-Cola re-established their Plastic Reborn 3.0 initiative. The project is aimed at increasing the capacity of workers, by increasing the usage of technology and educating the workforce about recycling activities. It put a special emphasis on the inclusion of the informal sector. 436 scavengers were trained in using technology and in recycling. Within the program, the Ancora Foundation, with the Plastic Bank Indonesia and MallSampah collected more than 14 million PET plastic bottles in the regions of Lombok and Makassar.

2. Retail Sector

In Indonesia, the retail sector is characterized by a high degree of economic development. According to data from Bank Indonesia, the retail sector experienced an increase in sales performance on a monthly and annual basis. As of December 2021, there was growth of up to 7.6% (mtm) from 2.8% (mtm) in the previous month and indicated an annual growth of 13.8% (yoy) from 10.8% (yoy) in the previous year (Bank Indonesia, 2021). The table below shows efforts taken by the retail sector to comply with the Roadmap.

Efforts taken by the retail sector

Companies/Collaborations	Initiative/Efforts Taken
Aflamart, Danone and PlasticPay (in collaboration)	<ul style="list-style-type: none"> Reverse Vending Machine program was launched to improve the collection of recyclable plastic residues (Evandio, 2022). Consumers can exchange their empty plastic bottles into electronic money (OVO, LinkAja, Dana, etc.) with the help of these machines. To begin with, the machines are planned to be placed in five Alfamart stores located in Jakarta and Tangerang.
Farmers Market, PT Unilever Indonesia, PT Supra Bogi Lestari (in collaboration)	<ul style="list-style-type: none"> A plastic exchange program called the Smart Drop Box Facility was launched (PT Unilever Indonesia, Tbk., 2022). It allows consumers to earn shopping points in the MyTrust Farmers Market app after disposing trash into the Smart Drop Box.
H&M Indonesia and Danone-AQUA	<ul style="list-style-type: none"> A new collection of sustainable children's clothing was launched as part of the Bottle2Fashion program (Kompas, 2022). The clothes are produced with plastic bottles as the base material. For the latest edition, Bottle2Fashion has collected and recycled more than 7.5 million PET bottles, and has produced several modern forms of hoodies, trousers, t-shirts, and long-sleeved tops, also socks for 9 to 14-year kids.
Super Indo	<ul style="list-style-type: none"> As an alternative to plastic rolls that are used by consumers to shop for fresh fruits, vegetables, eggs, etc., Super Indo launched the Kantong Segar 365 (Kontan, 2022). The product is made of cloth and is more environmentally friendly.
Super Indo, Tetra Pax, and Green Movement Indonesia (in collaboration)	<ul style="list-style-type: none"> Packaged Waste Drop Boxes were set up in 6 Super Indo outlets in the Solo area (EPR Indonesia, 2022). The collected waste will be distributed to a waste bank and then recycled.

3. Hotel and Restaurant Sector

With the obligations that have been determined by the government, the hotel and restaurant industry has begun to act in managing its waste. Some initiatives taken by the sector are defined in the table below.

Efforts taken by the hotel and restaurant sector

Companies/Collaborations	Initiative/Efforts Taken
PT Trinseo Materials Indonesia	<ul style="list-style-type: none"> In February 2022, the "Yok Yok Ayok Daur Ulang" movement was launched in the form of an educational programme (Pratono, 2022).



	<ul style="list-style-type: none"> • Education and awareness building was conducted through a webinar on effective management of tourism-related waste in Bali. • This program will proceed with an alliance that combines various parties, including hotels, restaurants, producers, consumers, recycling associations, and other stakeholders involved and the polystyrene (PS) recycling process.
KFC and Divers Clean Indonesia	<ul style="list-style-type: none"> • The “No Straw Movement” campaign was launched (PressRelease.id, 2019). • The fast-food chain had stopped using plastic straws in 2017. • McDonald’s Indonesia (McDonalds , 2018) and Starbucks (Riani, 2020) have also launched similar programs.
Famous Hotels in Indonesia	<ul style="list-style-type: none"> • IBIS Manado Hotel has reduced the use of drinking water in plastic bottles by 100% and replaced it with glass water kettles (Sindomanado, 2019). • Borobudur Hotel uses paper straws and provides dispensers in a number of rooms so employees must bring their own tumblers (Indriani, 2019). <p>ON Priority Simatupang Hotel collaborates with the Muda Rasa Empati Community in environmental care activities at Tanjung Burung. The program includes various activities such as processing waste into fertilizer and plastic recycling, as well as cleaning up garbage in the Tanjung Burung Island Trash area (Amanda, 2021).</p>

India- Case of EPR for Plastic Waste

In India, EPR policy for plastic packaging waste management is relatively new. It was introduced as a mandate with notification of Plastic Waste Management Rules, 2016. Following that, amendments have come in the form of rules and the guidelines for the EPR implementation. The implementation involves key stakeholders such as:

- Producer, Importer, Brand Owner (PIBO)
- CPCB, SPCB/PCC
- Plastic Waste Processor

In addition, various entities have obligation under the rule which are described in the table below:

Different obligations applied to entities

Entity	Obligations
Producer	EPR Target, Obligation for recycling, End of life disposal and Obligation for use of recycled content
Importer	EPR Target, Obligation for recycling, End of life disposal and Obligation for use of recycled content
Brand Owner	EPR Target, Obligation for reuse, Obligation for recycling, End of life disposal and Obligation for use of recycled content

EPR is applicable on both pre and post-consumer plastic packaging waste which are further categorised into four categories as shown below:

Categorization of plastic in India

Plastic category	Plastic Type
Category I	Rigid Plastic packaging
Category II	Flexible Plastic packaging
Category III	Multi-layered Plastic packaging
Category IV	Compostable plastic packaging & carry bags

Separate registration under specified categories has to be issued if one entity falls under more than one category. A Centralized online EPR portal for the registration, which is mandate to all the EPR obligators has been creates. Once the registration process is complete, a certificate is issued through the portal.

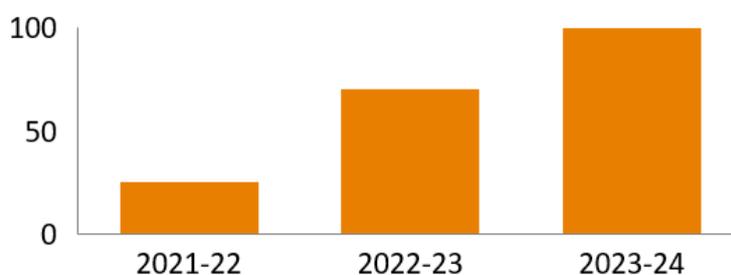


EPR targets are based on category wise and geographically neutral to better tackle the waste management and increase recycling rate. Some of the recent targets are as follows:

EPR targets for plastic

Year	EPR Targets
2021-22	25%
2022-2023	70%
2023-24 and onwards	100%

Percentage of EPR Target

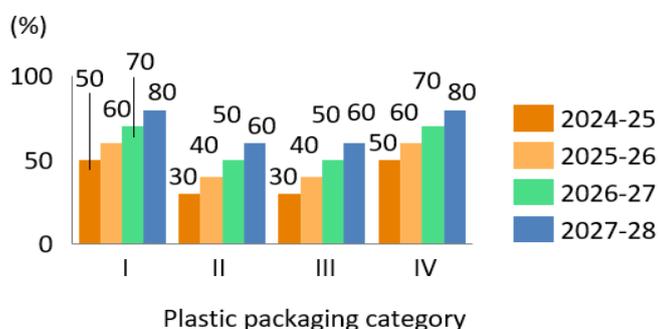


EPR target on Plastic Packaging

In addition, there exists minimum level of recycling (excluding end of life disposal) of plastic packaging waste collected under EPR targets. The table below shows the percentage of plastic waste to be collected under EPR targets shown in the table below:

Percentage of recycling of plastic waste collected under EPR targets

Plastic packaging category	2024-25	2025-26	2026-27	2027-28 and onwards
Category I	50	60	70	80
Category II	30	40	50	60
Category III	30	40	50	60
Category IV	50	60	70	80



Category I: Rigid packaging, **Category II:** Flexible packaging, **Category III:** Multilayered packaging, **Category IV:** Compostable plastic



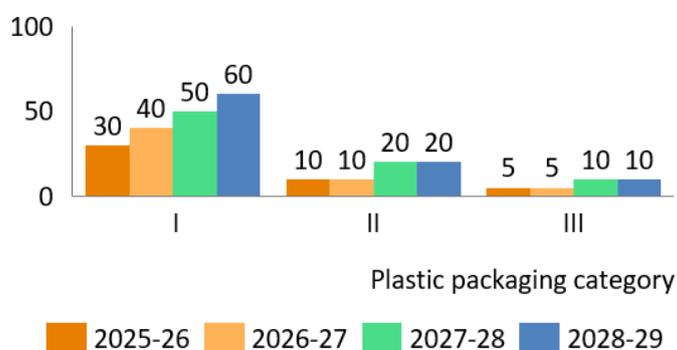
Minimum level of Recycling of Plastic Packaging Waste collected under EPR Target

India has also charted out mandatory use of recycled plastic in plastic packaging. The table below shows the percentage of recycled content used in plastic packaging.

Percentage of recycled content used in packaging

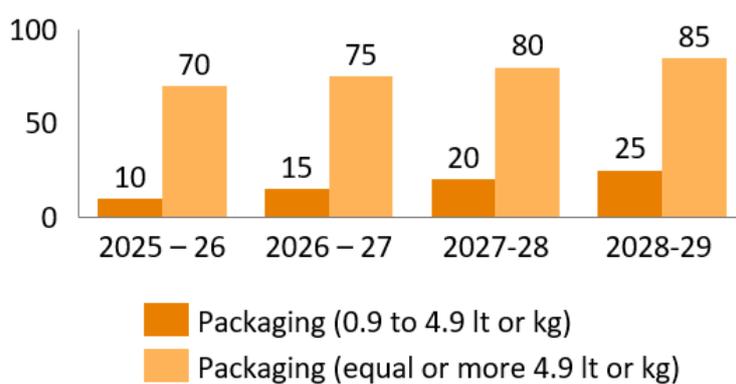
Plastic packaging category	2025-26	2026-27	2027-28	2028-29 and onwards
Category I	30	40	50	60
Category II	10	10	20	20
Category III	5	5	10	10

Percentage of EPR Target



Percentage of recycled plastic in plastic packaging

Percentage of packaging in product sold annually



Minimum obligation of Re-use Category I (Rigid Plastics)

EPR Obligations can be met by the mechanism of exchange of EPR credits wherein surplus certificates are purchased by a PIBOs under the same category. Such transaction shall be recorded and submitted during the filing of Annual Returns under EPR framework.

End of life	Offset
Reuse	Reuse, Recycling and End of life
Recycling	Recycling, End of life



End of life	End of life
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Entities carrying out activities without registration and providing false information under the PWM Rules are subjected to imposition of Environmental compensation. Furthermore, non-fulfilment of the EPR targets and the obligations set by the CPCB are subjected to fines or environmental compensation. This helps implement EPR implying the principles of accountability.

Annexure 4: Engagement of informal sector in G20 members in context of the EPR implementation.

Country	Does the EPR framework engage the informal sector?	How is the informal sector being involved?
Japan	No	-
South Africa	Yes	<ul style="list-style-type: none"> Regulation 5A of the 2021 gazetted regulations places legal obligations on EPR schemes to “integrate informal waste collectors, reclaimers and pickers into the post-consumer collection value chain, compensate waste collectors, reclaimers or pickers, who register with the National Registration Database, implement transformation within those entities with whom they contract with a special focus on women, youth and persons living with disabilities, and prioritize the promotion of small businesses and entrepreneurs with a special focus on women, youth and persons living with disabilities.” (Department of Environment 2021). PROs, that are frontrunners to the success of EPR in South Africa also enable involvement through various schemes. <ul style="list-style-type: none"> Waste separation at source business of Polyco (PRO handling polyolefin plastic-packaging) involves informal waste workers and pays them a fair wage (Packa-Ching® 2021). PETCO (PRO handling PET packaging) conducts training programs for the informal community for safe and proper collection and separation mechanisms (petco 2021).
Republic of Korea	No	-
UK	No	-
Brazil	Yes	<ul style="list-style-type: none"> There are several cooperatives for waste workers in Brazil. These cooperatives are divided by the kind of labour done in the waste value chain (collectors, separators, operational workers, office associates) (Flávio de Miranda Ribeiro 2016). In 2010, Brazil adopted its National Solid Waste Policy that identified the inclusion of waste pickers into the waste management systems as one of its key pillars. In 2015, a coalition of packaging companies signed a packaging sectoral agreement with the national government to reduce packaging waste disposal in landfills. The agreement also included support for informal waste pickers through various actions like implementation of needs assessments, provision of equipment and infrastructure, capacity building, communications campaigns, and the purchase of materials processed for recycling (Dias 2021).
Australia	No	-
Argentina	Yes	<ul style="list-style-type: none"> Cities within Argentina have taken efforts to integrate the informal sector through legal measures.



		<ul style="list-style-type: none"> - The city council of Buenos Aires passed the “Basua Cero” law (zero waste) and initiated the gradual integration of informal waste workers, so-called Cartoneros, into a formalized employment relationship. - In 2017, a total of 12 cooperatives with 5,500 employees collected the recyclable waste (WWF 2019).
Canada	No	-
Germany	No	-
Turkey	Yes	<ul style="list-style-type: none"> • In Turkey, producer responsibility systems set up in conformity of EU waste directly capture a mere 10% of materials, and the rest is being captured by the informal sector (OECD 2015). • Turkey faced a clash in capabilities in 2005 when packaging producers became legally responsible for the capture, safe management, and recycling of all packaging. Due to its heavy dependence on the informal sector for end-of-life management, there was a mismatch between knowledge and activities (which resided with the informal waste workers) and investment funds (which were accumulated at the formal side). • In response, the EXPRA Street Collector Initiative was designed to study these issues and learn more about the informal sector (demographics, infrastructure needs, preferences, and best practices) and then to develop win-win solutions especially in terms of social integration (fair wages, housing, social rights, legality, and stability) (Scheinberg A et al. 2016). • Within the scope of the By Law on Zero Waste a memorandum was published in order to regulate the working conditions of waste collectors and integrate them into the waste collection system of the municipality.
Mexico	No	<ul style="list-style-type: none"> • Mexico’s waste value chain is largely dependent on contributions from the informal sector. • Literature suggests that waste workers belonging to the informal sector face a lot of discrimination in Mexico. They lack basic sanitation facilities at dumping sites and are unable to avail childcare services (Sánchez and Muller 2022). • The country is currently lacking the legislative backing that will pave way the formalisation of the sector or engage them in the waste management process by providing them with a fair wage (MONTALVO and OLIVARES 2020).
Italy	No	-
India	Yes	<ul style="list-style-type: none"> • The amended versions of the Solid Waste Management Rules 2016, the Plastic Waste Management Rules 2016, and the E-Waste Management Rules 2016 emphasize on EPR and also acknowledge the role of waste pickers and other informal collectors for the first time. • The Uniform Framework for EPR under Plastic Waste Management Rules mentions the need to promote the inclusion of waste pickers in a manner which improves their working conditions and incomes. • The Government has mandated the integration of informal waste workers into the city’s solid and plastic waste management systems and recommended that the urban local bodies issue occupational identity cards to waste pickers (Talbot et al. 2022).
Russia	No	-
China	Yes	<ul style="list-style-type: none"> • As of 2016, there were about 6 million waste pickers and dealers in China, which is the largest waste informal recycling sector in the world (Medina 2008).



		<ul style="list-style-type: none"> Recyclable wastes usually flow at source from the residents or cleaners to waste dealers, or from waste pickers to waste dealers, and a very small portion of these actors participate in the formal collection and transportation system established by the government in some cities (World Bank Group 2019). The existing legislative framework does not consider the coexistence of informal recycling for all waste streams. Efforts of inclusion were made for the e-waste stream. Since sufficient incentives are required as a stimulus for informal collectors to channelise e-waste to the formal recyclers, China introduced a new regulation based on the EPR principle in 2011- 'Regulation on the Administration of the Recovery and Disposal of WEEE'. The regulation has set up a special fund for subsidising formal e-waste collection and treatment (Gupt and Sahay 2015).
Saudi Arabia	No	<ul style="list-style-type: none"> No literature was found on the integration of the informal sector for waste management in Saudi Arabia.
USA	No	-
Indonesia	Yes	<ul style="list-style-type: none"> In Indonesia, informal collectors collect an estimated 20% of the plastic waste that is collected – much less than the formal system. In 2019, the Minister of the Environment passed a landmark regulation titled Roadmap on Reducing Plastic Pollution by Producers, or Regulation 75/2019. It sets ambitious targets for recyclability and recycled content for all plastic material types, including those with currently very low recycling rates. The informal system is preferred by producers for fulfilling recycling and takeback obligations. In August of 2020, the six companies founded the Indonesia Packaging Recovery Organisation (IPRO) as a voluntary vehicle to jointly implement their producer responsibility IPRO funds collection, recycling and social inclusion activities in East Java and Bali (SystemIQ 2021; The German-Indonesian Chamber of Industry and Commerce (EKONID) 2021).
France	No	-

Annexure 5: Country-Specific Indicators for Circular Economy (CE) And Resource Efficiency (RE) under the G20 RED

Country	Domains				
	<i>Resource Input and Resource Use</i>	<i>Resource Circulation/Disposal</i>	<i>Environmental Impact in the Context of CE / RE</i>	<i>Social Impact in the Context of CE / RE</i>	<i>Economic Impact in the Context of CE / RE</i>
	Indicators				
Status (E: Existing, P: Planning, N: No Indicators)					
Australia	E 1. The National Waste Report provides material flow analyses for ash, glass, metals, paper and cardboard, plastics, and tyres	E 1. The Australian Plastics Flows and Fates Report provides a comprehensive time-series picture of plastic flows across all polymer types and applications. Key indicators include consumption, plastics reaching end of life, recovery rate, recycling rate, reprocessing, and reprocessing capacity. 2. The National Waste Report provides material flow analyses for ash, glass, metals, paper and cardboard, plastics, and tyres.	E 1. Tonnage of waste being diverted from landfill by projects funded under the Recycling Modernisation Fund (RMF) 2. Measures and activities to reduce the impact of plastic pollution on threatened species in Australia	E 1. Number of jobs being created by projects funded under the RMF - Number of ongoing jobs being created in regional and remote Australia	E 1. Total RMF funding being injected into the resource recovery industry - Total investment made into recycling infrastructure in regional and remote Australia. 2. The Australian Plastics Flows and Fates Report provides a comprehensive time-series picture of plastic flows across all polymer types and applications. Key indicators include consumption, plastics reaching end of life, recovery rate, recycling rate, reprocessing, and reprocessing capacity.
European Union	<i>Resource Input and Resource Use</i>	<i>Resource Circulation/Disposal</i>	<i>Environmental Impact in the Context of CE / RE</i>	<i>Social Impact in the Context of CE / RE</i>	<i>Economic Impact in the Context of CE / RE</i>
	E 1. Circular material use rate 2. End-of-life recycling input rates	E 1. Waste generation excluding major mineral waste, per GDP and per DMC	E 1. Material footprint (raw material consumption)	E 1. Jobs related to circular economy sectors	E 1. Private investments related to circular economy sectors

	<ol style="list-style-type: none"> 3. Domestic Material Consumption (DMC) 4. Resource productivity (decoupling) 5. Material imports dependency 6. EU self-sufficiency for raw materials 	<ol style="list-style-type: none"> 2. Waste generation excluding major mineral waste per capita 3. Municipal waste generation 4. Recycling rates for municipal waste and for all waste 5. Recycling/recovery for specific waste streams (overall packaging waste, plastic packaging waste, wooden packaging, electrical and electronic waste, biowaste per capita, recovery rate of construction and demolition waste). 6. Trade in recyclable raw materials 7. Food waste (planned) 8. Generation of packaging waste 9. Recycling of textiles (planning) 	<ol style="list-style-type: none"> 2. Consumption footprint 		<ol style="list-style-type: none"> 2. Value added related to circular economy sectors 3. Green Public Procurement (planned)
*Other indicators include Patents related to recycling and secondary raw materials, Eco-innovation index, and GHG emissions from DMC and saved from secondary raw materials (planned)					
France	Resource Input and Resource Use	Resource Circulation/Disposal	Environmental Impact in the Context of CE / RE	Social Impact in the Context of CE / RE	Economic Impact in the Context of CE / RE
	E <ol style="list-style-type: none"> 1. DMC / capita 2. Resource productivity 3. Material Footprint 4. Household spending on product maintenance and repair 5. % of French people who repair or have repaired their broken products 	E <ol style="list-style-type: none"> 1. Landfill tonnage 2. Use of secondary raw materials in production processes 3. Food waste 	E <ol style="list-style-type: none"> 1. CO2 emissions avoided thanks to recycling 	N	E <ol style="list-style-type: none"> 1. Jobs in the repair of goods and recycling of materials 2. Number of industrial symbiosis initiatives

Germany	<i>Resource Input and Resource Use</i>	<i>Resource Circulation/Disposal</i>	<i>Environmental Impact in the Context of CE / RE</i>	<i>Social Impact in the Context of CE / RE</i>	<i>Economic Impact in the Context of CE / RE</i>
	<p>E</p> <ol style="list-style-type: none"> 1. Direct Material Input 2. Raw Material Input 3. Raw Material Consumption (RMC) per capita 	<p>E</p> <ol style="list-style-type: none"> 1. Direct Effect of Recovery (DERec) and Direct and Indirect Effects of Recovery (DIERec) 2. Decoupling waste generation from economic output (the Waste Prevention Program puts an explicit focus on the reduction of overall waste flows, food waste, and packaging materials (e.g., through reuse)). Additional indicators exist for specific material/waste streams, also, e.g., under EU legislations (e.g., for waste electrical and electronic equipment (WEEE)). 3. Recycling and recovery rates for different waste streams 	<p>E</p> <ol style="list-style-type: none"> 1. Global environmental impact by private household consumption (i.e., domestic, and foreign energy consumption, emissions of carbon dioxide (CO₂) and the use of raw materials) (footprint perspective) 	<p>N</p>	<p>E</p> <ol style="list-style-type: none"> 1. Total raw material productivity = (GDP+imports)/RMI, with GDP: gross domestic product and RMI: raw material input).
*Other indicators include Anthropogenic material stock					
Indonesia	<i>Resource Input and Resource Use</i>	<i>Resource Circulation/Disposal</i>	<i>Environmental Impact in the Context of CE / RE</i>	<i>Social Impact in the Context of CE / RE</i>	<i>Economic Impact in the Context of CE / RE</i>
	<p>P</p> <p>Resource Input:</p> <ol style="list-style-type: none"> 1. Using materials 100% recyclable 2. Using materials 50% recycled content <p>Resource Use:</p> <ol style="list-style-type: none"> 1. Producers' side <ul style="list-style-type: none"> - Using materials 100% recyclable 	<p>E, P</p> <ol style="list-style-type: none"> 1. Composted 2. Recycled product 3. Implemented take back system 4. Recycling waste through waste bank facility 	<p>E, P</p> <ol style="list-style-type: none"> 1. Waste reduction achievement 2. Reducing the amount of waste generated from products and/or packaging at the TPA/landfill 3. Environmental sustainability 	<p>E</p> <ol style="list-style-type: none"> 1. Community recognition for producer who implemented the regulation 2. Awarding from government to producer who implemented the 	<p>E</p> <ol style="list-style-type: none"> 1. Promote green industry/business 2. Sustainability production 3. Economic Value added by waste

	<ul style="list-style-type: none"> - Using materials 50% recycled content - Close loop (recycled to be same product); and/or - Open loop (recycled becomes raw /downstream). - Use recyclable non-plastic bags <p>2. Community side</p> <ul style="list-style-type: none"> - Composting - Reuse - Recycle waste 			<p>waste reduction of their product</p> <p>3. Increase community awareness of better environment</p> <p>4. waste collection provided</p>	
Italy	Resource Input and Resource Use	Resource Circulation/Disposal	Environmental Impact in the Context of CE / RE	Social Impact in the Context of CE / RE	Economic Impact in the Context of CE / RE
	<p>E</p> <p>Resource Input</p> <ol style="list-style-type: none"> 1. Direct material input 2. Raw material input <p>Resource Use</p> <ol style="list-style-type: none"> 1. Domestic material consumption 2. Raw material consumption 	<p>E</p> <ol style="list-style-type: none"> 1. Circular material use rate 2. Industrial and municipal waste generation 3. Recycling rates for municipal waste, and construction and demolition waste 4. Recovery and landfilling of industrial waste 5. Imports and exports of waste 	<p>E</p> <ol style="list-style-type: none"> 1. Total GHG emissions from the national economy, by industry and from households 2. Total GHG emissions from the national territory by SNAP sector 3. Carbon footprint 4. Environmental footprint (as policy instrument) 5. State of terrestrial protected areas designated under the EU Habitats Directive 	<p>P</p> <ol style="list-style-type: none"> 1. Jobs related to the circular economy sector 	<p>P</p> <ol style="list-style-type: none"> 1. Economic indicators related to the circular economy sector
Japan	Resource Input and Resource Use	Resource Circulation/Disposal	Environmental Impact in the Context of CE / RE	Social Impact in the Context of CE / RE	Economic Impact in the Context of CE / RE
	<p>E</p> <p>Resource Input</p>	<p>E</p> <ol style="list-style-type: none"> 1. Cyclical use rate at outlet 	<p>E</p>	<p>N</p>	<p>E</p>

	<ol style="list-style-type: none"> 1. Resource productivity 2. Cyclical use rate at inlet 3. Ratio of domestically produced biomass resources to total natural resources input 4. Per-capita consumption of natural resources in terms of primary <p>Resource Use</p> <ol style="list-style-type: none"> 1. Market size of reuse 2. Market size of sharing (car sharing, etc.) 3. Development of guidelines for product assessment (design for environment) by industries 4. Establishment rate of life extension plans for individual facilities (individual facility plan) 5. Implementation rate of specific 3R actions 	<ol style="list-style-type: none"> 2. Final disposal amount 3. Per-capita waste generation per day 4. Per-capita household waste generation per day 5. Business waste generation 6. Implementation rate of recycling of cyclical food resources 7. Generation of household food loss 8. Generation of commercial food loss 9. Amount of illegal dumping 10. Amount of waste treated improperly 11. Number of illegal dumping cases 12. Number of improper waste treatment cases 13. Diffusion rate of electronic manifests 14. Number of remaining sustainable years of municipal waste final disposal sites 15. Number of remaining sustainable years of industrial waste final disposal sites 	<ol style="list-style-type: none"> 1. Emission of greenhouse gas from the waste sector 2. Reduction of greenhouse gas emissions from other sectors through the utilization of waste as raw material and fuel as well as a source of power generation 3. Average power generation efficiency of garbage incineration facilities constructed or improved during the specified period 4. Area of forests for which specific forest management plans are formulated 		<ol style="list-style-type: none"> 1. Resource productivity by industry (in terms of primary resources converted) 2. Market size of business related to sound material-cycle society business
Netherlands	Resource Input and Resource Use	Resource Circulation/Disposal	Environmental Impact in the Context of CE / RE	Social Impact in the Context of CE / RE	Economic Impact in the Context of CE / RE
	<p>E, P</p> <p>Resource Input</p> <ol style="list-style-type: none"> 1. Material resources for domestic use, DMC 2. Resource efficiency (GDP in EUR/kilo DMC) 	<p>E</p> <ol style="list-style-type: none"> 1. Dutch waste (Mt) 2. Share recycled waste in processed waste (recycled waste/waste, in %) 	<p>E, P</p> <ol style="list-style-type: none"> 1. Greenhouse gas emission footprint of consumption (MtCO₂ eq) 	<p>P</p> <ol style="list-style-type: none"> 1. Circular employment (no. of circular jobs in FTEs) (*1,000) 	<p>E, P</p> <ol style="list-style-type: none"> 1. Added value of circular activities (EUR billion) 2. Share circular activities (added value circular / GDP in %)

	<ul style="list-style-type: none"> 3. Material resources for the economy, DMI 4. Share bio-based resources, kilo/DMI 5. Material resource footprint of the economy, RMI4 (Mt) 6. Total sustainable renewable material resources (kilo/DMI) (Planning) 7. Material resource footprint domestic use, RMC2 (Mt) (planning) <p>Resource Use</p> <ul style="list-style-type: none"> 1. Share secondary materials, CMUR (kilo secondary/DMI, in %) 2. Life span of products (planning) 3. Value retention (planning) 	<ul style="list-style-type: none"> 3. Waste recycled in the Netherlands (Mt) 4. Incinerated waste in the Netherlands (Mt) 5. Landfilled waste in the Netherlands (Mt) 	<ul style="list-style-type: none"> 2. Greenhouse gas emission footprint of production (MtCO₂ eq) 3. Emissions to air, water and soil, such as nitrogen and particulate matter (planning) 4. Land-use footprint of consumption (million ha) 5. Land-use footprint of production (million ha) 6. Water abstraction (planning) 7. Water footprint consumption (km³) 8. Biodiversity footprint of consumption (million MSA loss ha/year) (planning) 9. Biodiversity footprint of production (million MSA loss ha/year) (planning) 10. Toxicity (planning) 		<ul style="list-style-type: none"> 3. Share circular employment (no. of jobs/total no. of jobs in %) 4. Supply risks (planning)
South Africa	No concrete indicators have been developed yet; all are in the planning stage.				
Spain	Resource Input and Resource Use	Resource Circulation/Disposal	Environmental Impact in the Context of CE / RE	Social Impact in the Context of CE / RE	Economic Impact in the Context of CE / RE
	<p>E</p> <p>Resource Input</p> <ul style="list-style-type: none"> 1. Resource productivity indicator. 2. N° of ISO 14001 certifications. 3. N° of EMAS certifications (only in priority sectors: construction, farming, fishing, and forestry; 	<p>E</p> <ul style="list-style-type: none"> 1. Valorization rate 2. Circularity rate 3. Percentage of sewage used 	<p>E</p> <ul style="list-style-type: none"> 1. N° Spanish products and services with Ecolabel. 2. N° companies in the Pact on CE 	<p>E</p> <ul style="list-style-type: none"> 1. N° workers trained in CE in the companies. 2. N° workers in CE 	<p>E</p> <ul style="list-style-type: none"> 1. Trade balance of recycled raw materials. 2. Total expenditure of companies on waste management (industrial sector).

	<p>industry; Consumer goods; Tourism; Textile and Garment).</p> <ol style="list-style-type: none"> 4. Domestic material consumption (energy carriers). 5. Domestic material consumption (non-energy carriers). 6. Biological cycle domestic material consumption (non-energy carriers)/ Technical cycle domestic material consumption (non-energy carriers). 7. Percentage of recycled material in certain plastic bags (average percentage of recycled material in HDPE and PEBD bags with a thickness greater than or equal to 50 microns). <p>Resource Use</p> <ol style="list-style-type: none"> 1. Average household expenditure on certain product repair and maintenance 2. Tyre's rate (Number of retreaded and used tyres placed on the market with respect to new tyres for the categories of motorcycle, scooter and motorbike/ tourism, van, 4x4, off-road and SUV/ agricultural/ public and industrial work/ Quad, Kart, gardening and others/ truck and bus). 3. Residual water treated for reuse. 4. Destination of reused water. 		<ol style="list-style-type: none"> 3. N° CE best practices published in the catalogues. 4. N° Life Program projects related to CE. 5. Final expenditure of Life Program projects related to CE 	<ol style="list-style-type: none"> 3. N° professional qualifications in CE in Spain 	<ol style="list-style-type: none"> 3. Total expenditure on residual water treatment (companies). 4. GDP/ waste generation 5. Gross value added of circular economy sectors. 6. N° enterprises in CE activities.
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Turkey	<i>Resource Input and Resource Use</i>	<i>Resource Circulation/Disposal</i>	<i>Environmental Impact in the Context of CE / RE</i>	<i>Social Impact in the Context of CE / RE</i>	<i>Economic Impact in the Context of CE / RE</i>
	<p>P</p> <p>Recycled materials use in new production for packaging. Mandatory deposit-refund system to be implemented.</p>	<p>E</p> <ol style="list-style-type: none"> 1. Recycling rates for municipal waste will be increased by 2023. 2. National collection and recycling/recovery targets for specific waste streams. 3. Ratio of reused treated wastewater 	<p>"Circular of Cleaner Production Practices in Textile Industry" dated 30.12.2022 and numbered 2022/20 was published in order to develop green transformation and circular economy in the industry. It is aimed to minimize the negative effects of the activities of the textile sector, which is among the sectors with the highest water consumption, to prevent air and water pollution, and to apply clean production technologies to reduce water and energy consumption.</p>	<p>E</p> <p>Jobs related to circular economy and zero waste approach</p>	<p>N</p>
USA	<i>Resource Input and Resource Use</i>	<i>Resource Circulation/Disposal</i>	<i>Environmental Impact in the Context of CE / RE</i>	<i>Social Impact in the Context of CE / RE</i>	<i>Economic Impact in the Context of CE / RE</i>
	<p>E, P</p> <p>Resource Use</p> <ol style="list-style-type: none"> 1. US personal consumption expenditure (goods) per capita in millions USD (US measure for SDG 12.2.2) 2. EPA currently uses the following to evaluate products and services in the U.S. economy in its SMM Prioritization Tools, and is exploring using these indicators for evaluating resource use: 	<p>E, P</p> <ol style="list-style-type: none"> 1. EPA currently uses the following to evaluate products and services in the U.S. economy in its SMM Prioritization Tools, and is exploring using these indicators for evaluating resource use: <ul style="list-style-type: none"> - Commercial municipal solid waste generation 	<p>E, P</p> <ol style="list-style-type: none"> 1. EPA currently uses the following to evaluate products and services in the U.S. economy in its SMM Prioritization Tools, and is exploring using these indicators for evaluating the circular economy: 	<p>E, P</p> <ol style="list-style-type: none"> 1. EPA currently uses the following to evaluate products and services in the U.S. economy in its SMM Prioritization Tools, and is exploring using 	<p>E, P</p> <ol style="list-style-type: none"> 1. EPA currently uses the following to evaluate products and services in the U.S. economy in its SMM Prioritization Tools, and is exploring using these indicators for evaluating the circular economy: <ul style="list-style-type: none"> - Jobs supported

	<ul style="list-style-type: none"> - Energy use - Non-renewable Energy use - Renewable Energy use - Land use - Minerals and metals use - Freshwater withdrawals 	<ul style="list-style-type: none"> - Commercial construction and demolition debris generation - Commercial RCRA hazardous waste generation <p>2. EPA is also working with stakeholders to develop and implement additional national recycling definitions, measures, targets and performance indicators under the National Recycling Strategy. These definitions, measures, targets and performance indicators will help advance the understanding of how the recycling system is performing. This effort will improve data availability and granularity for a range of recyclables and support tracking and measuring progress nationally. EPA will continue to collaborate with interested stakeholders to develop standardized definitions, measurement methodologies, baselines and targets for future metrics and the National Recycling Goal. This work will include work by other entities, including consensus standards bodies, to identify and develop additional metrics.”</p>	<ul style="list-style-type: none"> - Acidification potential - Freshwater ecotoxicity potential - Eutrophication potential - Greenhouse gas emissions - Human health respiratory effects - Human health toxicity - Human Health cancer - Human Health non-cancer - Ozone depletion - Smog formation potential - Hazardous Air Pollutants - Pesticides 	<p>these indicators for evaluating the circular economy:</p> <ul style="list-style-type: none"> - Jobs supported 	<ul style="list-style-type: none"> - Value added to economy
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United Kingdom	<i>Resource Input and Resource Use</i>	<i>Resource Circulation/Disposal</i>	<i>Environmental Impact in the Context of CE / RE</i>	<i>Social Impact in the Context of CE / RE</i>	<i>Economic Impact in the Context of CE / RE</i>
	<p>E</p> <p>Resource Input</p> <p>England:</p> <ol style="list-style-type: none"> 1. Raw material consumption (sometimes referred to as ‘material footprint’) by material type (excluding fossil fuels) 2001-2018 (tonnes) 2. Fibre composition of textiles sold by UK SCAP signatories (percentage of total) 3. Resource productivity, gross value added (chained volume measure, 2018 money value (per tonne raw material consumption, excluding fossil fuels)) <p>Wales:</p> <ol style="list-style-type: none"> 1. Prioritise use of sustainable and low carbon materials in construction funded through WG Housing Capital 2. Work to use more low carbon materials in the refurbishment of the social housing stock 3. Work to use more low carbon materials in the construction of new schools <p>Resource Use</p> <p>England:</p> <ol style="list-style-type: none"> 1. Resource productivity 2. Total waste arisings by sector and on a per capita basis 	<p>E</p> <p>UK:</p> <ol style="list-style-type: none"> 1. Food and drink waste 2. Food and drink waste produced at the retail and consumer level 3. Total food and drink waste produced (kg per capita) <p>England:</p> <ol style="list-style-type: none"> 1. Total waste generation, split by source (million tonnes) and by material type (% of total) 2. Waste intensity, waste produced (tonnes) per unit gross value added (chained volume measure, 2018 money value) 3. Municipal waste recycling (or Local Authority Collected Waste recycling) 4. Total hazardous waste arisings, (including by sector and per unit of GVA) 5. Composition of ‘Waste from Households’ 6. Capture rates for ‘Waste from Households’ (% recycled by material) 7. Avoidable residual waste from household sources (Proportion of residual waste) 8. Final treatment of waste (percentage of tonnage by method) 	<p>E</p> <p>England:</p> <ol style="list-style-type: none"> 1. Territorial greenhouse gas (GHG) emissions from the waste management sector (million tonnes CO2 equivalent) 2. Carbon footprint on a consumption basis (million tonnes CO2 equivalent) 3. Carbon footprint associated with household consumption (split by product group) 4. Intensity of greenhouse gas emissions on a consumption basis (kilogrammes CO2 equivalent per £ unit gross value added (chained volume measure, 2018 pounds)) 5. Water footprint per tonne of garments sold by UK Sustainable Clothing Action Plan signatories (the UK’s voluntary agreement on reducing the impact of clothing and 	<p>E</p> <p>England:</p> <ol style="list-style-type: none"> 1. Percentage of places at or above an acceptable standard for litter 2. Percentage of people perceiving litter as a problem in their area <p>Scotland:</p> <ol style="list-style-type: none"> 1. Percentage of households in fuel poverty 	<p>E</p> <p>England</p> <ol style="list-style-type: none"> 2. Costs to local authorities of street cleaning per household Wales: 3. Procurement – percentage of public sector spend that is spent in Wales 4. Welsh Government Collections Blueprint 5. Sustainable businesses - increase the number of businesses adopting sustainable policies

		<p>9. 'Waste from Households' recycled, composted or prepared for reuse (tonnes)</p> <p>10. 'Waste from Households' recycled, composted or prepared for reuse (percentage of total arisings)</p> <p>11. Local Authority Collected Waste recycled or composted (tonnes)</p> <p>12. Local Authority Collected Waste recycled or composted (percentage of total arisings)</p> <p>13. Non-hazardous construction and demolition waste recovered and placed on market (tonnes and percentage of total placed on market)</p> <p>14. Packaging waste recycled (tonnes and percentage of total placed on market)</p> <p>15. Waste landfilled or incinerated (excluding mineral wastes) (tonnes)</p> <p>16. Biodegradable municipal waste landfilled (tonnes)</p> <p>17. Exports of Refuse Derived Fuel and Solid Recovered Fuel (tonnes, and tonnes by country of destination)</p> <p>18. Waste fly tipped (Incidents, total, by region and by size of the tip)</p> <p>Wales:</p> <p>1. Household waste per capita Municipal waste sent to landfill (As a proportion of</p>	<p>textiles) (cubic metres per tonne)</p> <p>Wales:</p> <ol style="list-style-type: none"> 1. Net zero carbon public sector 2. Carbon saving per capita from recycling – Carbon Index 3. Modernising the waste fleet with ultra-low emissions vehicles (ULEV's): 4. Percentage of RRV (single-pass resource recovery vehicles) 5. Percentage of RCV (conventional refuse collection vehicles) 6. Percentage of light commercial vehicles <p>Scotland:</p> <ol style="list-style-type: none"> 1. The Monitoring Framework for the Climate Change Plan for sectors is structured on three levels: <ul style="list-style-type: none"> - greenhouse gas emissions statistics provide the highest-level measure of progress at an economywide and sectoral level - a suite of policy outcome indicators measures the 		
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		<p>total municipal waste collected by local authorities)</p> <ol style="list-style-type: none"> 2. Municipal waste that is recycled (As a proportion of total municipal waste collected by local authorities) 3. Plastic sent outside Wales – percentage of collected plastic waste that is not processed in Wales 4. Food waste reduction <p>Scotland:</p> <ol style="list-style-type: none"> 1. Total amount of landfilled waste, (tonnes) 2. Total amount of biodegradable landfilled waste, (tonnes) 3. Total amount of biodegradable landfilled waste, (tonnes) 4. Household and non-household food waste reduced, (tonnes) 5. Total waste generated (tonnes) <p>Northern Ireland:</p> <ol style="list-style-type: none"> 1. Percentage of household waste sent for recycling (including composting and preparing for reuse) 2. Percentage of household waste sent to landfill 3. Percentage of waste sent for recycling (including composting and preparing for reuse) 	<p>success of policies in achieving the changes that are needed</p> <ul style="list-style-type: none"> - a policy tracker monitoring implementation of specific policies and proposals 		
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		<ul style="list-style-type: none"> 4. Percentage of waste landfilled 5. Reported biodegradable waste sent to landfill 6. Annual household waste collected per household 7. Waste arisings 8. Capture rates by primary waste category 9. Waste arisings growth rate 10. Annual household waste collected per capita 			
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Presidency Outcome Document on Extended Producer Responsibility (EPR) for Circular Economy

Background:

Extended Producer Responsibility (EPR) is widely used for promoting sustainable consumption and production, resource efficiency and circular economy and meeting sustainable development goals. Many G20 members have made commitments or have undertaken various initiatives to promote and implement domestic EPR schemes, and several have noted positive impacts such as sustainable product design, resource conservation, pollution prevention and employment generation.

Experiences on EPR

Currently, there are more than 400 schemes⁵ on EPR design and implementation across the world. Many countries have introduced EPR within existing frameworks like waste management rules, often, to achieve greater circularity, improve materials security, and introduce market mechanisms. Experiences on promoting, designing and implementing EPR schemes, including learnings on various mechanisms across the EPR design and implementation cycle, case studies, success stories and best practices may help improve EPR schemes and generate social, environmental and economic benefits, and support circular economy and resource efficiency.

It is important for EPR schemes to recognize the differing priorities and circumstances in countries and the need of local adaptation. Collaborative engagement between different stakeholders will play an important role.

Knowledge Exchange Opportunities

The G20 Presidency of India has prepared the Technical Document for Knowledge Exchange on EPR for Circular Economy, that reflects a distillation and compilation of experiences, and may help designing, developing, and implementing EPR across the world.

⁵OECD 2016. "Extended Producer Responsibility: Updated Guidance for Efficient Waste Management."





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