



## Background | How can different approaches complement EPR schemes?

When introducing an Extended Producer Responsibility (EPR) system, practitioners in many countries will come across different alternative approaches for organising and financing waste management, as a basis for a circular economy. While some approaches complement the development of an EPR system, others may hinder it. Therefore, this factsheet gives an overview of a selection of different approaches for organising and financing waste management, including the following: Mandatory EPR, “cash for trash”, municipal waste fees, plastic credits, CO<sub>2</sub> taxes. The overarching aim is a functioning circular economy for the packaging waste stream, against which all approaches are evaluated. Since EPR is widely understood as the most encompassing and therefore preferred approach, compatibility of the other presented approaches with EPR schemes will furthermore be discussed.

In low- and middle-income countries, approaches to comprehensive waste management are generally limited. Municipal solid waste usually consists of mixed waste fractions and often ends up on landfills or waste dumps. Circular economy concepts and systems for packaging that focus on the use of secondary raw materials are rudimentary and only cover economically profitable materials. At the same time, the problem is increasingly being acknowledged and political decision-makers or private sector initiatives are trying to establish reliable waste collection and recycling systems by applying various approaches. The most encompassing and recognised strategy is the implementation of an Extended Producer Responsibility (EPR) scheme in the field of packaging.

The implementation of an EPR system for packaging is often very challenging. The complex structure of an EPR system requires, among other things, an extensive organisation based on an elaborated legal and institutional framework, and consistent control and enforcement > see [Factsheet 01 to 05](#). Since complex structures are needed for a well-functioning EPR system, decision-makers, companies, or other stakeholders sometimes look for **alternative (financing) solutions** to quickly address (at least partly) the waste problem in their country. **In this context, questions often arise regarding the strengths and limitations of these alternatives.** Stakeholders are also interested to know which approaches could be integrated into an EPR system, and which may hinder the development of such a system.

In the next section, the criteria that are particularly relevant for a reliable, well-functioning waste management system and circular economy are described. Afterwards, the following approaches for organising and financing waste management are presented, analysed, and evaluated with regard

to the fulfilment of these criteria: **Mandatory EPR**, “**cash for trash**”, **municipal waste fees**, **plastic credits**, **CO<sub>2</sub> taxes**. The considered approaches present a variety of strategies with different levels of complexity. Since EPR is widely understood as the most comprehensive approach, compatibility of the other presented approaches with EPR schemes will furthermore be discussed.

Please note that each presented approach as such is complex and may vary from country to country. This factsheet thus only provides a general overview and analysis that may not cover every detail. It must furthermore be noted that there are more approaches to waste management / circular economy that are not included in this factsheet.<sup>1</sup>

### Criteria for a functioning circular economy for packaging

Packaging presents a major share of waste that eventually ends up in the environment. Achieving circularity for packaging is possible given that the corresponding framework conditions are met and all stages – from packaging design to the after-use phase – are considered.

The aspects listed below are important **criteria for a well-functioning waste management** and for the basis of an operational circular economy for packaging waste.

Table 01: Criteria for a well-functioning waste management

	Criteria	Why/how these criteria contribute to a circular economy
Financing	a) Funding for infrastructure	To build an infrastructure, the facilities and other necessary measures must be financed. The financing must be dedicated, ongoing, sufficient, and efficient.
	b) Covering running costs	The <b>financing of all activities</b> (especially collection, sorting, recycling of packaging) must be guaranteed in the <b>long term</b> . To raise funds solely for a specific investment (e.g. for the construction of infrastructure) is insufficient. It must be guaranteed that a qualified use of the equipment and facilities is permanently ensured which involves OPEX and reinvestments. The financing must be dedicated, ongoing, sufficient, and efficient.
	c) Source of funding / polluter pays principle	According to the <b>polluter pays principle</b> , the waste producer or owner is the potential polluter and bears (financial) responsibility for any pollution it causes. The ‘polluter pays’ principle is designed to provide the necessary incentives for environmentally friendly conduct and to encourage the required investment in environmentally-friendly waste management.
Infrastructure and know-how	d) All-encompassing approach to waste management, including collection, sorting, recycling	<p>Packaging should be collected <b>separately</b> from residual waste. This means that a collection system separate from residual waste must be set up for packaging (if necessary, together with other defined recyclables) in order to avoid contamination and to recycle as much packaging as possible.</p> <p>In preparation for recycling, the packaging must be <b>sorted</b> to obtain accurate recyclable fractions and prevent contamination in recycling plants.</p> <p>As far as possible, a separate collection (and treatment) system should cover <b>all packaging</b> materials, whether its market value is positive (e.g. metal cans) or negative (mixed plastic).</p> <p>The target should be a <b>nationwide</b> collection (and treatment) of packaging, so that packaging is not only collected selectively or in single regions. This goal should be linked to concrete requirements.</p>

<sup>1</sup> More approaches are for instance presented here: <https://plasticsmartcities.org/collections/financial-instruments>

Criteria		Why/how these criteria contribute to a circular economy
	e) Tailor fit technologies	Infrastructure must be built for collection, sorting and recycling. This requires new technologies (especially plants) in countries where there is no sufficient collection and recycling infrastructure to date. A prerequisite for the commissioning of the system is an investor and an operator for each of the facilities.  <b>Adapted, individual solutions</b> are required in the different countries. This calls for a solid analysis and appropriate (technical) solutions ( <b>funding for R&amp;D</b> ).
	f) Technical capacities	Ensure <b>capacities and technical competence</b> in planning, management and operation of treatment and disposal facilities.
	g) Traceability of material flow	For comprehensive transparency, a <b>waste flow verification</b> must be maintained. This verification should list the quantities collected and all downstream facilities for sorting and recycling with respective quantities (incoming and outgoing), also in terms of financing. This will facilitate the monitoring of waste management results.
Up-stream effects	h) Design for recycling	The recyclability of packaging depends on the <b>design of the packaging</b> . Packaging must therefore be designed in such a way that it can be recycled, taking into due account the existing technical equipment of the facilities to which it is delivered. Another important aspect of the design is the <b>avoidance of toxic materials</b> .
	i) Avoid/prevent waste	Ideally, the generation of packaging <b>waste is avoided</b> in the first place. A waste system can support waste prevention through certain strategies (e.g. through monetary incentive effects).
	j) Use of recyclates	By using recycled materials for new packaging, <b>closed loop recycling</b> is achieved at a high beneficial level. To make <b>use of secondary material</b> , an authorised market must be established.
Complexity	k) Simple, practical structures with a low level of complexity for easy implementation	<b>Simple structures</b> are easier to build and faster to implement than structures with a high level of complexity. This applies to the revenue of financial resources, their administration, and the development of an infrastructure.
Country aspects	l) General framework conditions as basis for implementation	The successful implementation of a model depends mainly on the framework conditions, especially the <b>legal framework and its enforcement</b> . Level of development, administrative structures and readiness for change play an important role.
	m) Suitable models for each country	<b>Adapted, individual solutions</b> are required in the different countries. Depending on the established conditions (take-back systems, the state of development of EPR systems, and the existing infrastructure), models might be found suitable for a specific country context to a greater or lesser extent.
	n) Level playing field	Appropriate <b>checks and balances</b> should be in place, so that waste services are being delivered by either the public or private sector. Equal opportunities and transparency shall be ensured in bidding processes to allow a level playing field. The service should be carried out by the party able to provide the best service.
Social aspects	o) Community engagement	All residents and commercial waste producers must use the designated collection containers correctly to enable a successful recycling management. Consumers should also be sensitized to choose sustainable packaging over unsustainable ones. <b>Behavioural change</b> in this regard has to be guided by complementary measures.

Criteria	Why/how these criteria contribute to a circular economy
p) Inclusive approach	Ensure that municipal and private service providers (including the formal private, community or informal sectors) are <b>included in the planning and implementation</b> of solid waste management systems.

### Analysis of different approaches along criteria for waste management

For this analysis, only approaches that relate to the organisation and financing of waste management measures were selected. Measures that aim exclusively at the prevention of waste (such as bans or penalties) are therefore not considered in this paper. The selected approaches can be directly compared against the criteria outlined in the previous chapter. EPR, as the most acknowledged approached, is presented first, followed by a variety of others, starting with the most common ones:

1. Mandatory EPR
2. “Cash for trash“ / informal valorisation
3. Municipal waste fees
4. Plastic credits
5. CO<sub>2</sub> Taxes

As mentioned before, these approaches present only a selection of available approaches. The approaches’ nature may vary from country to country. The following chapters therefore solely provide a general overview.

#### 1. Mandatory EPR System – more than just a financing responsibility

EPR is an environmental policy approach based on obliging producers to assume full responsibility for their products, both during their life cycle (e.g. by complying with certain health and safety standards) and during the end-of-life phase once the products and packaging become waste. EPR systems can be applied to a number of waste streams, but are not suitable for all types of waste. **The most important aspects on „EPR for Packaging“ are listed in > see Factsheet 0-13.** In the following, the fulfilment of the criteria listed in the table above is analysed. **The analysis is based on a mandatory EPR system for packaging that has been introduced on the basis of legal regulation.**

##### 1.1 Financing

The financing of running costs is ensured by a constant financial contribution (EPR contribution) by the obliged companies. Depending on the specific regulation, the contributions of the companies also finance the necessary facilities, other infrastructures, education and awareness campaigns, as well as clean-up actions. A reliable cash flow guaranteeing the operation of an EPR system incentivises further (private) investment.

For the polluter pays principle, the EPR fees must be attributed directly to the packaging (respectively to the packed products). Those who put more packaged goods to the market pay more accordingly. However, cross-financing with other segments of companies is possible, but not desirable.



### 1.2 Infrastructure and know-how

Separate collection of packaging can be financed and organised within an EPR system. Nevertheless, other collection types are also possible. In a properly functioning EPR system, the requirements for sorting and recycling are specifically defined, implemented and monitored. Experiences from all functioning EPR systems have shown that new technologies are developed through funding security and the reliable collection of all packaging. For example, the world's most modern sorting and recycling plants for packaging have been built in European countries with functioning EPR systems (e. g. Netherlands, Germany, Belgium, France, Spain). There are indirect effects for companies to invest in research and development.

When an EPR system is introduced, only certain packaging can be included at first (e.g. PET bottles), followed by a gradual expansion. Since all companies that bring packaged goods onto the market must assume responsibility for their packaging, in the long term all packaging materials must be included in the EPR system, throughout the entire country. In a functioning EPR system, collection of packaging should be financed in all regions – those easy to reach (urban), as well as those more difficult to reach (rural), even if the collection in the latter will be more expensive.

### 1.3 Up-stream effects

EPR fees are usually based on the material and weight of the packaging. Within the framework of an EPR system, the EPR fees can be scaled in such a way that the fees are lower for packaging that can be recycled well (so-called eco-modulation). These modulated fees can be used to influence recyclability given that the difference in fees is significant. In Italy and France, different fee scales exist for different types of packaging based on their recyclability. In Italy, for example, the EPR fees of plastic packaging are more than twice as high, if the packaging is not recyclable (192,00 €/t if there is an existing sorting and recycling chain and 644,00 €/t if there are deficits in the sorting and recycling chain and the packaging is currently not recyclable<sup>2</sup>). The use of recycled content in the design of a package is another criterion according to which the EPR fees can be scaled. The EPR fees can be lowered if secondary raw materials have been used to produce the packaging. It is expected that this will lead to an increase in recycled content.

**The main purpose of EPR is not to prevent the generation of waste, but to enable proper collection and recycling as much as possible. However, the generation of packaging waste can be prevented through an EPR system if the EPR fees are very high, thus creating incentives for obligated companies to use less packaging material.**

### 1.4 Complexity

EPR systems are very complex. This includes the establishment of a structure to identify and register all obligated companies, the collection of the EPR fees and the establishment of infrastructures for (separate) collection, sorting and recycling of packaging. The system needs a proper management during its ongoing operation. This concerns the work of operations (collection, sorting and recycling) as well as the monitoring and verification of recycling quotas and the documentation of volume flows. As a result, EPR takes a long time to be implemented, mostly due to the development of the legal framework.

### 1.5 Country aspects

The success of an EPR system depends largely on the framework conditions in a country. Particularly the conditions listed below are beneficial or detrimental to implementation:

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<sup>2</sup> <http://www.conai.org/en/businesses/environmental-contribution/contribution-diversification-for-plastic/>





- **General situation:** Stable political conditions, a sophisticated legal and regulatory framework, a high standard of education and living, and a good geographical location with easily accessible regions are the basis for proper enforcement of power and actions.
- **Waste management situation:** Existing collection systems, technical equipment, level of public awareness, available data and monitoring and the involvement of the informal sector.
- **EPR situation:** EPR regulations, industry and government initiatives and other decision-makers.

The conditions for a successful EPR system are correspondingly unfavourable if all these conditions are not met.

Private and municipal companies as well as the informal sector can become involved in collection, sorting and recycling services. Openness and transparency in tendering procedures to create a level playing field depend on the competence of the Producer Responsibility Organisations (PROs) and the framework conditions of the tenders. The extent to which this will happen depends on the EPR regulations and the general legal framework in the individual countries.

### 1.6 Social aspects

The necessary communication with citizens and producers is generally a task of PROs and is financed by EPR fees.

## 2. “Cash for trash” / informal valorisation

In many low- and middle-income countries, "cash for trash" has become established over the years and is the driving force in the recycling sector, leading to increasing recycling rates. The “cash for trash” approach offers citizens financial incentives for collecting certain types of waste. These are then sold on, often informally, to recycling companies or other buyers. Unlike in the case of plastic credits, EPR and municipal fees, collectors working in the cash-for-trash system are paid based on the material they collect rather than the environmental service they provide. For most informal collectors, the revenue from the collected packaging is often their only source of income.

### 2.1 Financing

Financing of facilities and other infrastructure is only possible for packaging that is permanently available and has a positive market value. Additionally, it is only viable for small scale solutions. Often, the funding is dependent on the financial support from additional donors. Financing of running costs (and cost of living) is also not guaranteed. Economic viability is determined by the recycler and by fluctuating market prices for recyclates. The commercialisation of recyclates must allow for the financing of the entire value chain. This only applies to packaging with a positive market value after its use phase, i.e. less valuable materials are excluded. Therefore, this is not in line with the polluter pays principle.

### 2.2 Infrastructure and know-how

For informal collectors, usually only marketable recyclables are relevant. For packaging, this only applies to certain types (e.g. PET bottles, metal cans, cardboard boxes and low-value plastics only in a few exceptional cases, provided there is a buyer for them). In addition, sorting only is done for packaging with market value. If certain packaging that can be recycled well is continuously available in reliable quantities, the infrastructure for recycling technologies will continue to develop.



Collection is limited to regions where (informal) collectors collect valuable packaging. **A nationwide collection system can therefore not be established. Structures cannot be applied to packaging waste with little or no value (may differ from region to region).** Such packaging mostly consists of films, bags and sachets, which are already prone to littering. There are no incentives for collectors and recyclers to collect those types of packaging, as there are no financial benefits.

Selling waste at the recycling plant at a very low price or without marketing revenues is not suitable for financing infrastructure. Economic dependency prevents these models from being extended to all packaging types and also to all regions. The costs and revenues for the collection and marketing of packaging vary considerably and also depend on local contextual factors. In rural areas, the collection of packaging is generally less profitable because the effort for collection and transport to the recycler is higher.

Capacities and technical competence in the planning, management and operation of treatment and disposal facilities are not improved by the “cash for trash” strategy.

### 2.3 Up-stream effects

**“Cash for trash” is not suitable to influence and control the design of packaging nor the use of recycled materials to produce new packaging.** Stakeholders involved in the „cash for trash“ business will not focus on waste prevention since this is not their main occupation. However, it can make people become aware that waste materials have value.

### 2.4 Complexity

The advantages of "cash for trash" include its simple implementation and little required political decisions or legal frameworks for a national system.

### 2.5 Country aspects

A prerequisite for "cash for trash" is that a market for the collected recyclables exists. In addition, the revenues generated by selling the recyclable materials must cover the costs of collection and transport. This is difficult to achieve in very remote regions or on islands that have no recycling facilities. Also, proper checks and balances are not promoted for waste services that affect both the public and private sectors.

### 2.6 Social aspects

Communication and education as well as research and development are also not within the competence of the informal sector and cannot be reliably supported by "cash for trash" strategies.

### “Cash for trash” & EPR

The introduction of separate waste collection (based on municipal or EPR fees) and the implementation of EPR may be more difficult after the introduction of cash payment for waste, as people are used to receiving money for waste and the revenue is a significant source of income for them. They focus on recyclables such as PET and other valuable plastics, metal, and paper, which are usually covered by an EPR system. Hence, **“cash for trash” can compete with EPR, and there is a risk that informal activities will deprive the EPR of recyclables in significant quantities, with an impact on the economics of EPR.**

On the other hand, in most developing countries, **informal collectors are the driving force for separate collection of recyclables and under certain constellations can be relevant for the EPR system.** Especially in the early stages of EPR, when formal collection is not yet well established,



informal collectors can be important actors in separate collection. If clearly defined legal frameworks and cooperation provisions between EPR operators and informal collectors are in place, **“cash for trash” can contribute to the functioning of the EPR scheme. This requires their thoughtful, socially responsible, and legally secured consideration during the planning phase of EPR systems.**

### 3. Municipal waste fees

Municipal waste fees are payments by citizens for a specific waste management service. Municipal ordinances specify the amount of the fee per waste producer and service. The fees are usually paid by households, homeowners, and businesses.

We assume that municipal regulations can indeed be fulfilled by the municipality under the national regulation / the level of autonomy of the municipality. It should always be noted that in the individual states the competences of the municipalities (e.g. the right to introduce fees, etc.) are regulated differently.

#### 3.1 Financing

Securing funding for facilities and other infrastructure is only possible if the municipality can generate enough money from all obliged parties to cover not only running costs but also further investments.

Financing running costs in low- and middle-income countries is possible if there are clear guidelines, and they are monitored. Often, there is just enough money for the collection and dumping of mixed waste, but not for separate collection of individual waste streams such as different packaging. The reasons for this include a low fee collection rate because residents are not willing or able to pay, unclear costs, an improper charging system and a lack of an accounting system. Waste management is often subsidized from other municipal funds. Municipal fees tend to be rather unpopular, but acceptancy in the population increases with income level and awareness of the problem. Moreover, if the informal sector collects most of the waste that has value and can be marketed, the municipality is left with only the waste that does not bring any benefit to the municipality.

For the polluter pays principle, it must be possible to directly assign a waste quantity to a specific waste producer. In the case of packaging, this is the household and direct identification is possible in general. However, placing (additional) communal bins in public spaces could hinder the direct identification of the waste producer.

#### 3.2 Infrastructure and know-how

In low- and middle-income countries, it is not common for municipalities to systematically collect packaging separately. The sorting of packaging is also usually not covered by municipal fees, which hardly cover the costs of collection and transport to landfills or dumps. As municipal fees cannot be set higher in low- and middle-income countries, the development and maintenance of infrastructures/technologies beyond mixed collection is often not possible. However, in theory, a municipality could arrange a separate collection of all packaging materials. Private and municipal companies could become involved and capacity building could be carried out and stipulated by the municipality. This service could theoretically also be financed through fees.

**By its origin, a municipality is always limited to its geographic area and could at best act as a pilot for other areas. Therefore, a nationwide collection and sorting system cannot be built by waste fees from only one municipality.**

Research and development (e.g. of new technologies) are usually not part of the competence of a municipality. Therefore, such measures cannot be financed through municipal fees.





A municipality may require that a mass-flow-analysis has to be performed by the waste management companies that accept the packaging for sorting and recovery and that this record will then be made available to the municipality for verification.

### 3.3 Up-stream effects

It is not possible for the municipality to influence and control the design of packaging waste. Specifications for the use of recycled packaging (upstream effects, e.g. for recycled content in new packaging) are also not possible within the framework of municipal charges.

In developed countries, a municipality could use its fee system to incentivise the separate collection of certain materials for recycling, e.g. by charging a volume-/ amount-based fee for residual waste, from which the target materials such as paper, plastic, glass or metal are excluded. However, this requires a separate collection already being in place or possibilities for separate collection and a system for the quantification of residual waste fees.

As such requirements often lack in developing countries, municipalities can use waste fees to support waste prevention through its citizens and companies, by implementing pilot projects or waste consultations.

### 3.4 Complexity

**Municipal waste fees bear the advantage that the municipality, as the responsible authority of the waste management at the local level, can best decide how to manage any collected funds and invest them according to an integrated municipal waste management plan/strategy.** It is simpler to develop a municipal solid waste management and local circular economy strategy if citizens and commercial waste producers are already identified and registered in a municipality. The approach is relatively simple, if only one waste stream (residual waste) is collected and treated. The more advanced a system gets, with separate collection and treatment of different waste streams, such as residual waste, packaging, or organic waste, the more complex it gets.

### 3.5 Country aspects

Effectiveness of municipal fees strongly depend on framework conditions, for instance administrative structure, country policies etc. However, since municipalities are local authorities, they have a certain degree of power to influence these. In principle, municipal fees can be levied in all countries. Mostly, they are only used to finance the collection of mixed waste and then to send it to landfills. However, in many countries not even this is guaranteed. Only when these services can be financed, the additional financing of a separate collection of packaging by a municipality is useful. If suitable administrative structures are lacking in these municipalities, these issues must first be solved with the initial aim of ensuring that all waste is collected in all areas of the municipality.

Equal opportunities and transparency in tendering procedures to create a level playing field depend on the competencies and interests of the municipalities and the framework conditions of the tenders.

### 3.6 Social aspects

Communication and awareness-raising can usually be carried out by waste advice services of the municipalities.



### *Municipal waste fees & EPR*

**Municipal waste fees and EPR schemes can be well combined.** An EPR scheme may, for example, cover all kinds of packaging, while municipal fees may cover all other waste streams, such as mixed household waste or organic waste.

In this context, the fee system can be designed in such a way that it supports the separate collection of recyclables and thus the implementation of EPR. For example, in Germany, fees are charged only for the collection and disposal of residual waste, while for materials subject to EPR, the costs of collection and management are covered by EPR fees. Citizens can save fees by using smaller residual waste bins. In some municipalities in Germany, fees for residual waste are also calculated by weight, meaning that the collected waste is weighed, which creates an even greater incentive for separate collection.

Clear agreements between the private producers and importers obligated under the EPR scheme, as well as the municipality are necessary. This concerns for example the collection system, public awareness raising and other responsibilities.

## **4. Plastic Credits**

The idea of “plastic credits” comes from the field of climate change mitigation – companies can offset their greenhouse gas emissions by buying carbon credits based on implemented certified measures that reduce CO<sub>2</sub> emissions, for example through industrial emission reduction projects or reforestation. **Similarly, companies or individuals aim to off-set the amounts of plastic they put on a specific market by paying for plastic credits associated with the collection/recovery of plastic from the environment.** Plastic credit schemes have gained significant attention over the last years with various companies exploring whether such an approach could be an element worth implementing in their corporate responsibility strategy, especially in countries without established EPR systems. Nevertheless, this market is still being introduced and therefore still missing any clear definitions and standards. As such, it can be criticised for risking greenwashing or undermining the implementation of ambitious EPR schemes.<sup>3</sup>

### *4.1 Financing*

**Plastic credit systems can contribute to financing the collecting and recycling of waste as indicated, especially in countries without EPR systems already in place.** In most of these countries, environmental authorities do not have the financial resources needed to prevent plastic packaging waste from entering and polluting the environment. In such cases, plastic credit schemes can be an opportunity to obtain money from private companies which aim to reduce the environmental impacts of their products that may be generated after the use phase. Under this perspective, plastic credits can be seen as a direct implementation of the polluter-pays-principle: Those companies who put plastic products/packaging on the market are the ones that would finance collection and disposal.

Companies and organisations which provide such plastic credit certificates get paid by those who put plastic products or plastic packaging on the market. The credit organisations then finance the collection and recovery of plastic waste from the environment, mainly in close cooperation with the informal sector. Payments for plastic credits can be used for long-term investments but neither companies nor plastic credit providers are obligated to do so. **There is a risk that actions are publicity-driven for one-off purposes and lack standardised quality criteria,** such as those established by the Ellen MacArthur Foundation for “dedicated, ongoing, and sufficient funding”<sup>4</sup>.

<sup>3</sup> See e.g. [https://prevent-waste.net/wp-content/uploads/2021/11/PREVENT\\_Discussion-Paper\\_Plastic-credit-schemes-and-EPR.pdf](https://prevent-waste.net/wp-content/uploads/2021/11/PREVENT_Discussion-Paper_Plastic-credit-schemes-and-EPR.pdf) or <https://prevent-waste.net/wp-content/uploads/2021/09/Plastic-Credits-%E2%80%93-Friend-or-Foe.pdf>

<sup>4</sup> <https://plastics.ellenmacarthurfoundation.org/epr>



Another key challenge is the lack of transparency: Prices for plastic credits from different schemes differ significantly in most cases. Also, clear indications what is covered by these payments and where the revenues end up are missing. Depending on the provider, credits bought in one country might be based on waste collected on a completely different continent. A governance framework as in the realm of the carbon market is absent so far but could address this challenge.

#### 4.2 Infrastructure and know-how

In order to efficiently collect plastic waste from the environment and subsequently issue plastic credits, various plastic credits schemes invest in the establishment of basic infrastructures, such as collection points from which waste can be transported to treatment facilities. In most cases, such infrastructures are the very first step towards a sustainable waste management system. By contrast, without such schemes, waste would be disposed of or dumped in a completely uncoordinated manner.

On the other hand, it should be noted that the short-term contracts of plastic credit schemes with companies paying them for the collection and recovery of plastic waste often do not allow investments into high quality waste infrastructures with longer pay-back periods, e.g. sanitary landfills. Based on the voluntary nature of these activities, in most cases no quality requirements for the establishment of waste management infrastructures exist. Only a few plastic credit schemes explicitly address the way how they treat waste. In some cases, credits were issued for the collection alone, while there were also reports of open burning of waste.

Most credit schemes focus only on plastics; just a few schemes offer “circular credits” that cover also other materials. It should also be taken into account that **plastic credit schemes mainly operate in specific regions, not on a nation-wide level**. See also below for possible implications for the implementation of EPR systems.

#### 4.3 Up-stream effects

**Certainly, payments for plastic credits could be seen as an economic incentive for companies to reduce the amount of plastic waste, similarly to EPR. On the other hand, especially such incentives for waste prevention have been questioned critically.**<sup>5</sup> It is rather questionable if limited payments for collection and recovery of plastic waste in specific regions really provide sufficient incentives for big companies to consider the revision of product design or packaging solutions. It seems plausible that payments for plastic credits are not considered in such strategic considerations, especially when product design and packaging choices are determined for international markets.

Contrarily, there is a risk that intensive plastic waste production and consumption patterns will normalise, especially in countries where plastic waste generation is increasing anyway. Companies could use plastic credits and claims like “plastic neutrality” as an alibi to continuously put products on the market that are clearly non-recyclable. Against this background, plastic credit systems should always be designed in a way that they do not undermine incentives for waste avoidance and do not delay the necessary "change" regarding plastics.

Specific challenges arise from the way most plastic credits are calculated and issued: Credits are normally based on weight and do not consider specific environmental impacts from different types of plastics or different applications in products. In this context, tailor-made incentives for upstream innovation are unlikely. Nevertheless, they often do raise awareness for the responsibility of companies and could initiate discussions what an actual Extended Producer Responsibility scheme could achieve. This could be strengthened, for example, by requiring companies to publish data on which share of their plastic production/use is actually covered by plastic credits and what efforts have been made to minimise waste generation and associated impacts.

<sup>5</sup> PREVENT Waste Alliance Discussion Paper [https://prevent-waste.net/wp-content/uploads/2021/11/PREVENT\\_Discussion-Paper\\_Plastic-credit-schemes-and-EPR.pdf](https://prevent-waste.net/wp-content/uploads/2021/11/PREVENT_Discussion-Paper_Plastic-credit-schemes-and-EPR.pdf)



#### 4.4 Complexity

The main strength of such systems lies in their **overall simplicity** and the often very short timeframe within which such systems can be set up. Compared to standard EPR systems, (at least voluntary) plastic credit schemes require significantly less time to become operational. However, **the schemes might be less well integrated and embedded in more comprehensive local and national waste management and circular economy strategies – and might even be contrary to these plans**, e.g. with regard to coordinated investments in collection infrastructure.

The simplicity of the scheme also stems from weak or sometimes even lacking regulations e.g. with regard to long-term financial accountability or aspects of transparency. In most cases, it stays unclear how exactly plastic credit schemes guarantee the added value of their activities or the final fate of the collected waste. Only few organisations have published quality standards on this.

This causes the risk of fraud and profiteering: How exactly can it be ensured that certificates are not simply duplicated? Standards and norms preventing such simple types of fraud are currently under development. In the long run, also the interoperability between different types of plastic credit schemes would require more administrative background.

#### 4.5 Country aspects

The specific requirements of integrating credit and EPR systems will depend on the status of establishing such systems. As indicated above, plastic credit schemes hold advantages especially in countries that currently suffer from environmental as well as economic impacts caused by plastic waste pollutions due to not yet existing EPR systems - at **low investment costs in a voluntary environment**. Many of these countries lack financial resources to set up at least basic collection infrastructures. Here, plastic credits could offer faster solutions by engaging large companies which put these materials on the market and demonstrate to governments that producers are willing to take actions. In countries where EPR systems are currently being set up, plastic credits should contribute to the collection and monitoring of relevant data e.g. on waste generation and shares of collected waste amounts. **Plastic credit schemes will be of limited use in countries where these companies already pay licensing fees as part of mandatory EPR systems**. Here they could be used to explore new grounds, e.g. solutions for plastics (multi-layer) or stakeholders (informal sector) that are not yet included in EPR. In any case, they should be fed back into the EPR system and operate under same conditions.

#### 4.6 Social aspects

As described above, **plastic credits should never be allowed as a cheap way out for companies or as an excuse to reduce their efforts to minimize plastic pollution**, for instance with regard to research and development investments on plastic prevention. A transparent use of plastic credits can, on the other hand, also raise awareness amongst companies for the general issue of mismanaged plastic waste or marine littering.

There is also an intense debate on the impacts of plastic credits on informal waste pickers: On the one hand, plastic credit schemes can offer opportunities for job creation. On the other hand, the requirement of additionality also bears the risk to shut out those workers who already try to make a living from collecting plastic waste e.g. from landfills.

#### *Plastic credits & EPR*

**Plastic credits can have significant side effects, especially along the implementation of EPR systems. Depending on the nature of the system, it can have both supporting as well as hindering effects:**



On the one hand, due to plastic credit schemes in place, the collection of plastic waste can easily lead to “cherry picking”, especially if the schemes operate rather disconnected from public administrations: The schemes would focus on plastic packaging materials with the highest market value in order to receive an additional revenue not only from selling the credit certifications but also from selling the collected material. This raises challenges for the establishment of obligatory EPR schemes that would have to cover also non valuable fractions that currently don't get collected: The operators remain with the low-quality materials and thus have to set higher licensing fees than necessary – driving more and more companies to the cheaper plastic credit systems. Also, regarding the actual amounts of waste for which collection and treatment capacities should be provided, an unregulated market for plastic credit schemes can cause difficulties, lowering average prices for the collected materials and complicating processes such as planning for required treatment capacities.

On the other hand, **plastic credit schemes could also be a first step towards binding EPR systems.** The systems could establish a collection infrastructure, engage with the formal sector and automatically gather necessary data e.g. with regard to amounts of plastic waste put on the market. Specific emphasis should be put on the possibilities of integrating these structures into EPR schemes so that they do not create any barriers for future circular opportunities. However, the above mentioned supporting and hindering effects are rather of a theoretical nature without any experiences from a country to date.

## 5. CO<sub>2</sub> Taxes

Compared to more local and direct funding mechanisms, **CO<sub>2</sub> taxes offer a completely different opportunity to finance the transition towards a more sustainable waste management and circular economy.** In this chapter, carbon taxes will be briefly addressed to give a more comprehensive picture of different approaches on different spatial levels. CO<sub>2</sub> taxes have been implemented in various forms, e.g. on specific activities like waste management and on specific materials or products. Against this background, the following brief analysis does not go into the details of taxing CO<sub>2</sub> emissions but rather focuses on the comparison to EPR, municipal waste fees or plastic credits.

### 5.1 Financing and 5.2 Infrastructure and know-how

Compared to the limited income flows of municipal waste fees or especially local plastic credit schemes, **CO<sub>2</sub> taxes offer the opportunity to gather financial resources for large-scale investments e.g. into new technologies or collection systems.** Here, the pooling of resources on the national level can help to initiate actual systemic change compared to often incremental progress on the local level.

However, it should be noted that **taxes are by definition fed into the overall public budget and spending depends on specific decisions by policy makers,** such as the parliament. It is not at all necessary that CO<sub>2</sub> levies, even for certain waste management measures, flow inevitably into the improvement of waste infrastructures. They are clearly not a dedicated form of financing for a circular economy. Thus, CO<sub>2</sub> levies or taxes can be seen as a comprehensive and efficient approach to organise funding for public expenditures like waste collection and recycling. The initiation, organisation and implementation of such activities is rather separated from this. Depending on the definition of the tax base, CO<sub>2</sub> taxes can nevertheless be an efficient way of applying the polluter-pays-principle.

### 5.3 Up-stream effects

**The key strength of a CO<sub>2</sub> taxation is, of course, the direct effect on the design of production processes:** Companies have a very clear incentive to use materials and technologies that cause





lower CO<sub>2</sub> emissions. This has a specific impact on decisions whether to use primary or secondary materials: For most materials, recycled raw materials have a significantly lower carbon footprint. Thus, higher prices for recycled materials could be compensated by lowering the taxation for companies.

Looking at **further up-stream effects, companies could consider implementing more circular business models in which they keep control over the materials to ensure closed material loops and high quality of secondary resources**. This might also be linked to incentives for more durable product design or easier repairability.<sup>6</sup>

#### 5.4 Complexity

Against the background of the described potential side-effects, it is clear that **the introduction of CO<sub>2</sub> taxes is extremely challenging, requires careful considerations**, for instance with regard to which companies are actually addressed and how CO<sub>2</sub> emissions can be measured consistently. Even compared to EPR regulations, the introduction of CO<sub>2</sub> taxes is an enormous endeavour and requires strong political support. Although most studies highlight the potential net benefits of such environmental taxes, they undoubtedly cause winners and losers – making it extremely difficult to be introduced in democratic systems. All those referring to CO<sub>2</sub> taxes as an answer e.g. for circular plastic solutions should be aware of the timeframe necessary to implement them.

#### 5.5 Country aspects

Obviously, CO<sub>2</sub> taxes will lead to very different outcomes in different countries, depending, for example, on the structure of the domestic industry: Countries with a high share of domestic industrial production like Germany would have to deal with another level of impacts compared to countries that depend much more on imports of semi-finished or final products. Another important effect might be carbon leakage: High levels of CO<sub>2</sub> taxation in Germany and/or Europe could set incentives to shift carbon intensive production processes abroad to countries with no or lower CO<sub>2</sub> taxation. Such “carbon leakage” effects could be addressed by carbon border adjustment mechanisms (CBAMs), for instance, that basically put a tax on specific imported products.

Also, the challenging aspect of introducing such taxation systems clearly depends on the political culture and participation processes: For instance, China recently launched the world’s largest emission trading scheme<sup>7</sup>. This process clearly encountered different resistance compared to the discussions in Germany or the US. The introduction of any type of taxes always requires an effective public administration that ultimately is able to enforce the payments and to prevent tax evasion. This capacity is often limited, especially in developing economies. On the other hand, carbon taxes could be implemented irrespective of the state of the waste management. Thus, they could represent a complementary but not main source for financing.

#### 5.6 Social aspects

Considering the massive market intervention that CO<sub>2</sub> taxation represents at relevant price levels per ton of CO<sub>2</sub>, **different side effects occur**. For instance, from a socio-economic perspective the distributive aspects of CO<sub>2</sub> taxation need to be considered as well. Price increases for products because of CO<sub>2</sub> taxes could especially affect lower income groups, and thus have a regressive distributional effect.<sup>8</sup> For example with regard to mobility behaviour, particularly those living in rural areas who cannot easily switch to other means of transport (e.g. to public transport) could be affected. Also, massive price increases for single use plastic products could especially hurt low-

<sup>6</sup> acatech, Circular Economy Initiative Deutschland, SYSTEMIQ Business Models Report: <https://en.acatech.de/publication/circular-business-models-overcoming-barriers-unleashing-potentials/>

<sup>7</sup> <https://www.nature.com/articles/d41586-021-01989-7>

<sup>8</sup> <https://wegowp.uni-graz.at/shift/wp-content/uploads/sites/4/2019/02/SHIFT-Arbeitspapier-Steuerreform-1.pdf>



income groups. Against this background, lump-sum repayment mechanisms (with fixed, income-independent per capita payments for all) like in Switzerland should be considered.

#### *CO<sub>2</sub> taxes & EPR*

CO<sub>2</sub> taxes have a clear incentive for companies to produce in a more resource-efficient way. These upstream incentives are often criticised as insufficient in EPR systems. At the same time, CO<sub>2</sub> taxes generate additional funds that are suitable to the extent of financing larger infrastructure measures as well as research and development. In contrast to this, EPR schemes are not only a way to provide financing, but rather an approach to organise the management of packaging waste and create the necessary institutional structures. Thus, **both approaches can complement each other.**

However, both EPR schemes and CO<sub>2</sub> taxes require sophisticated and progressive legal and administrative frameworks to be implemented properly and effectively. The development of both systems would overburden most developing countries. Moreover, the introduction of CO<sub>2</sub> taxes only makes sense if there are mechanisms in place to prevent carbon leakage, such as taxing specific imports. These mechanisms may in turn have an impact on international trade. Under these circumstances, complementarity of both systems is a rather theoretical possibility, at least for the foreseeable future.

#### **Summary from previous chapter**

The following table is a summary of which objectives and criteria can be achieved with which approaches, if all approaches are carried out with the greatest possible accuracy. This table lists the most important key points for the respective set of topics.



Table 02: Summary from previous chapter

Criteria / Goals	1. Mandatory EPR	2. “Cash for trash”	3. Municipal waste fees	4. Plastic Credits	5. CO <sub>2</sub> Taxes
<b>Financing</b> a) Funding for infrastructure b) Covering running costs c) Source of funding / polluter pays principle	(Full) financing of running costs and the required facilities as well as other infrastructure must be done by the obligated companies.  Polluter pays principle applies.	Funding for facilities and other infrastructure is only possible for packaging that is permanently supplied and has a positive market value.  Polluter pays principle is not fulfilled.	Financing of all necessary measures or partial financing (e.g. for collection) is possible if all households and waste producers contribute, and guidelines and monitoring exist.  Makes citizens responsible according to the polluter pay principle.	Plastic credit schemes can contribute to financing the collection and recycling of waste. However, it is a voluntary measure taken by only some companies, there are no standards yet, and lacking transparency could be a challenge.	CO <sub>2</sub> taxes can be used to finance investments in waste management. But they can also be used (completely) for other national expenditures, so that funding is not secured. Depending on the definition of the tax base, they can be an efficient way of applying the polluter-pays-principle.
<b>Infrastructure and know-how</b> d) All-encompassing approach to waste management, including collection, sorting, recycling e) Tailor fit technologies f) Technical capacities g) Traceability of material flow	Since the whole infrastructure required for collection, sorting, recycling, and transportation in a well-functioning EPR system is paid for via EPR fees, the required infrastructure can be built and operated nationwide for all packaging and in all regions.  Transparency can be achieved through mass-flow-analyses.	Collection, sorting and recycling are limited to regions where recyclers collect valuable packaging on a relevant scale and to materials that have value.  The development of new technologies rarely takes place and is limited to these materials.  Transparency of material flow and control of waste management results are not achieved.	Municipalities can arrange for the separate collection of all packaging in their area, but not nationwide.  Difficult to collect and market all packaging, especially those with a negative market value.  Research and development are normally not financed by municipal waste fees.  Mass-flow-analysis can be requested.	Participation in plastic credits is voluntary and often temporary, leading to little effects for the development of infrastructure and is often limited to the establishment of collection points. Limitation to plastics collection & recycling and no coverage of all packaging.  A mass-flow-analysis can be requested from the paying companies for this partial flow.	CO <sub>2</sub> taxes can support the infrastructure development but cannot guarantee reliable financing of running costs.



Criteria / Goals	1. Mandatory EPR	2. “Cash for trash”	3. Municipal waste fees	4. Plastic Credits	5. CO <sub>2</sub> Taxes
<b>Up-stream effects</b> h) Design for recycling i) Avoid/prevent waste j) Use of recyclates	<p>Increase of design for recycling and recycled content can be affected by modulated fees.</p> <p>Waste prevention and communication can be financed by EPR fees.</p>	<p>The model has no influence on design or recycled content.</p>	<p>No side-effects on design for recycling and recycled content of packaging.</p> <p>Avoidance of waste and communication can be supported by a municipality.</p>	<p>Plastic credits normally are weight-based and no side-effects on design for recycling and recycled content of packaging are expected. There is a risk that plastic usage will become more prevalent. Nevertheless, awareness for the responsibility of companies can be created.</p>	<p>Companies have a clear incentive to use or innovate primary or secondary materials and technologies that cause lower CO<sub>2</sub> emissions.</p>
<b>Complexity</b> k) Simple, practical structures with a low level of complexity for easy implementation	<p>EPR systems are very complex, and the system needs a proper management of the ongoing operation as well as monitoring and verification of recycling quotas and documentation of volume flows.</p>	<p>Structures are easy to implement, and no political decisions are required for legal frameworks for a national system.</p>	<p>If citizens and commercial waste producers can be identified and registered, the development of systems become simpler. The more advanced the system gets, the more complex it gets.</p>	<p>Such systems are quite easy to implement. However, they are also susceptible to fraud unless a control system is in place. This makes the process more complex.</p>	<p>Against the background of the potential side-effects, the introduction of CO<sub>2</sub> taxes is extremely challenging and requires careful considerations and time.</p>
<b>Country aspects</b> l) General framework conditions as basis for implementation m) Suitable models for each country n) Level playing field	<p>The state of development of EPR systems varies greatly between countries. In countries where there is no concept for EPR, it will take several years to build a system. EPR systems essentially depend on the framework conditions and EPR regulations.</p>	<p>The prerequisite is that a market for the collected recyclables exists or can be established.</p>	<p>Countries with good and effective administrative structures are more suitable to organise and finance separate collection of recyclables via municipal fees.</p>	<p>Advantages especially in countries that suffer from environmental as well as economic consequences caused by plastic waste pollutions due to an absence of EPR systems.</p>	<p>Depending on the structure of domestic industry, CO<sub>2</sub> taxes will lead to very different results; this also applies to administrative capacities to actually enforce taxation. More direct impacts are expected in countries with a high share of domestic industrial production.</p>



Criteria / Goals	1. Mandatory EPR	2. “Cash for trash”	3. Municipal waste fees	4. Plastic Credits	5. CO <sub>2</sub> Taxes
<b>Social aspects</b> o) Community engagement p) Inclusive approach	<p>Indirect effects for companies to invest in research and development.</p> <p>Necessary communication with citizens and producers is generally a task of PROs and financed by EPR fees.</p>	<p>No corresponding side effects can be expected.</p>	<p>Communication and education can be carried out by the municipalities.</p>	<p>Plastic credits can have side-effects especially at the interface with EPR system development; depending on the specificities of the system, both supporting as well as hindering effects.</p>	<p>CO<sub>2</sub> taxation means market intervention. The side effects are essentially influenced by the criteria according to which the CO<sub>2</sub> taxes are calculated.</p>





## Final Remarks

**Combining a mandatory EPR system for packaging with municipal fees** for all materials that cannot be covered by the EPR system provides the most solid and reliable funding basis for organizing and financing a sustainable circular economy. CO<sub>2</sub> taxes based on ecological criteria regarding resource savings and usage of raw materials can offer additional financing.

Plastic credits and “cash for trash”-schemes become less relevant with the setup of an EPR scheme. However, these approaches are valuable as transition finance, as long as there is no EPR system established. They can be set up as voluntary initiatives, which eventually can be integrated in a later, mandatory EPR scheme.

**EPR schemes may take a long time to be set up, especially due to the comprehensive legal framework required. The (legal) framework in an EPR system enables, among other things, fair (working) conditions, planning security for investments and a level playing field.**

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