3 Plastic Credits and the relevance for EPR

The aim of the chapter is first to understand the mechanisms of PC, their strengths, and challenges in implementation. The second step is to identify the intersections with EPR and the risks as well as opportunities in using PC as a bridge concept. This is described on the basis of concrete challenges to the implementation of PC projects, as the interplay becomes particularly clear there.

3.1 PC general concept

The term PC is used for a transferable certificate representing the collection of specific amounts of plastic waste recovered and / or recycled that would have otherwise ended up in the natural environment (cf. King 2022; WWF n. d.: 2). Companies which are producing plastic waste thus voluntarily pay a specific amount of money to offset the company's plastic footprint. Additionally, they receive a certificate / claim like "plastic-neutral production" which can be used for reputation and marketing issues (cf. rePurpose n. d.; see Fig. 8:). The money raised by PC is used to finance the local collection and treatment of plastic waste done by local partners, i. e., governments or non-governmental organization (NGOs). Usually, one PC is representing a certain weight (e. g., 1kg / 1t) of plastic waste and is considered as a transferable, purchasable unit (cf. Prevent Waste Alliance 2022c:2; Nguyen 2022: 22–30). The price of one PC should cover at least the cost of collecting and treating the designated quantity of plastic waste. Treatment here describes recycling or energy recov-

ery or even landfilling on a sanitary landfill. Optimally, sufficient money will also be raised to help finance future waste management infrastructure in the country where the PC project takes place (cf. Prevent Waste Alliance 2022c: 5). Using quality standards regarding social and environmental requirements can lead to diverse benefits (e. g., via "(…) creating socio-economic co-benefits by improving income opportunities for waste workers." (Prevent Waste Alliance 2022c: 2). Following this basis idea PC therefore address the Polluter Pays Principle by shifting the cost towards producers and promotes the internalization of negative externalities like the EPR system do (e. g., waste management costs) (cf. OECD 2016: 21; see also chapter 2.3).

Fig. 8: PC cash and certification flow (own adapted illustration based on TonToTon 2022; icon source iconfinder & flaticon; credits to Freepik; Eucalyp Studio)

Worldwide, PCs are currently offered by more than 60 providers like rePurpose Global (cf. rePurpose n. d.; ValuCred 2021: 5). The range of products offered by the various PC providers varies substantially, which can be explained by the lack of uniform and binding quality standards (cf. Johnson 2022: 12–18). The following graphic illustrates an ideal typical process and the challenge of executing PC-funded waste management projects (see Fig. 9:).

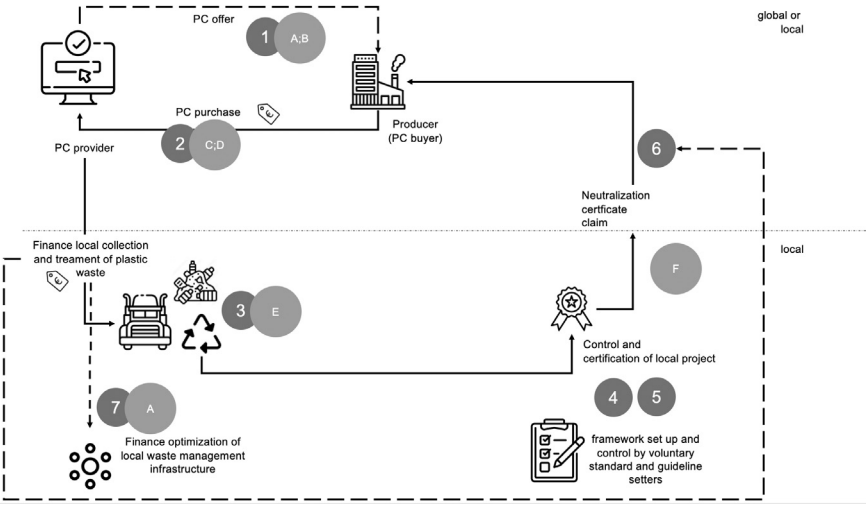

Fig. 9: Ideal typical process and challenge PC-funded projects
(own illustration; icon source iconfinder and flaticon; credits to Eucalyp Studio; Freepik; Gregor Cresnar; Chanut-is-Industries)

1) PC providers offer PC through digital platforms to get the attention of as many producers as possible **2)** Producers calculate their plastic footprint and buy the appropriate number of PC **3)** PC providers finance local collection and treatment of plastic waste (additionally take care about accompanying administrational tasks **4)** The control of the projects can take place through project participants or through external quality parties **5)** In the best case, certain guidelines and directives are also observed during implementation by standard and guideline setters **6)** After proving that plastic waste has been collected from nature and treated, a corresponding certificate is issued, which the producer, i. e. the buyer of the PC can use for his brand communication **7)** Ideally, PCs are already calculated in such a way that they also partly finance the optimization of the local waste management infrastructure. If the ideal type of PC is used, a wide range of positive impacts for various actors like recycling industry, producers, local communities and the informal waste pickers is achievable (cf. Lee 2020: 11; see Tab. 4:). Details on possible impact of PC in Lusaka are described in chapter 6.2).

Tab. 4: Exemplary impact of PC projects and benefits for selected actors (own illustration adapted Lee 2020:11; Nguyen 2022: 42–43)

Benefits for the recycling industry	**Benefits for the producer**	**Benefits for local communities**
Higher recyclability and better quality of plastics due to the revenue generated by PC, and the resulting development of infrastructure for recycling respectively CE	Increased interest in adopting recyclable material; reducing costs due to usage of recycled resources	Higher income per kg of recovered plastics due to better quality; stability in income
	Corporate endorsement for environmental and social impact in offsetting partial / total plastic footprint	Human rights-based employment and higher income for waste pickers; support local business
More stable and more reliable resource stream	Increased feasibility of sustainability goals for higher recycled material content	Cleaner local environment and tourism attractions; carbon reduction due to processes like Co-Processing
	Enhancement of company reputation	Optimization of waste management infrastructure (e. g., higher waste collection rates)

3.2 Strengths of PC and relevance for EPR

Considering the above-mentioned ideal typical process, the following main strengths of PC could be named.

3.2.1 Short term improvements and data collection

PC projects are compared to EPR more flexible to implement due to their independence from legal anchors and size. As a result, PC projects can bring about short-term improvements especially in developing countries (ValuCred 2021: 1–19). PC projects are flexibly applicable on different local conditions and can quickly achieve visible improvements, like

cleaner landscapes (see Tab. 4:). Thus, it was possible that one PC project established "(…) a local collection system in Mexico with 85 independent collectors (…) and recovered 169,535 tons of plastic from ending up in the ocean or landfill." (Prevent Waste Alliance 2022b). Besides that, the informal recovery sector has been connected with the global market demand and evaluated environmental impact (cf. Prevent Waste Alliance 2022b). Viewing PC as an intermediate stage to EPR, these projects provide evidence of the success of producer engagement and demonstrate the opportunities of cost-covering CE approaches.

All the information that can be collected about the waste value chain is also of great importance. It can be used for monitoring and thus for creating strongly needed transparency in PC projects themselves. In addition, PC projects also provide information about waste quantities, types and quality, which is essential for the construction of EPR systems. Also, any gaps in the wasteflow can be identified for consideration in the design and within the goalsetting of EPR systems (cf. Prevent Waste Alliance 2022b: 1). Thus, PC projects can provide the basis for the EPR design principle (EDP1), the clear definition of materials, stakeholders and responsibilities. It also provides an inventory of external factors relevant to EPR, such as country geography and demography (EF1) or the current value of secondary material on the national market (EF3). PC projects can also be seen as pilot phases for EPR introductions, in which relevant data are collected, ideas are tested, and short-term improvements for people and nature are achieved (see chapter 2.3). Details on the current situation of waste management and the associated challenges in Lusaka can be found in chapter 4.

3.2.2 Enhancing waste management infrastructure

In addition to successful short-term improvement, however, PCs also offer the opportunity for long-term improvements regarding the waste management in total. In the best-case scenario, PC projects also provide funding for necessary infrastructure improvements (e. g., collection systems and construction of waste sorting stations and treatment facilities). According to the consortium ValuCred it is possible to use PC as "(…) financing mechanism to fund the environmental services of collection,

transport, and treatment, and the set-up and operational costs of related infrastructure" (ValuCred 2021: 19). ValuCred intends to introduce a quality standard to improve plastic credits. This takes into account social as well as technical aspects. The aim is to develop a standard process that enables transparent calculation, verification and validation of plastic credits (cf. ValuCred 2021: 1–19).

Thus, PC can provide a reliable, contextualized sustainable revenue stream (EDP5), providing the foundation for the required infrastructure to enable the implementation of EPR systems and target circularity (EDP2). However, in addition to funding, this also includes co-operating (EDP4) with relevant stakeholders and their willingness to improve the situation in short- and long-term (EF4). Context-specific implementation (EDP7) and transparency (EDP6) are of great importance here and also include consideration of the informal sector (EDP3).

3.2.3 Plastic pollution awareness and its relevance for the market

Another major strength is the possibility of generating attention through PC projects. The very existence of PC and the structures associated with it create awareness of plastic pollution and the assumption of responsibility by producers in general. In addition, producer awareness of PC can also help strengthen the market for secondary material. For example, active participation in a recycled plastic market can increase its liquidity (EF3). In addition, lobbying for an enabling local environment to support additional funding, such as through microfinance, could be facilitated. Taking responsibility for one's own products and calculating the actual environmental costs can also lead to a rethinking by producers of their production processes, also referred to as "upstream" in EPR systems (cf. OECD 2016: 21–58; WWF Akademie n. d. a.). However, attention generation applies not only to producers but also to residents. Through visible projects and their impact, a new view and evaluation of plastic waste can be created, which can ultimately also contribute to waste prevention.

The intersections of PC with EPR principles and the relevance for external factors to EPR implementation are manifold. With an ideal-typi-

cal PC implementation adapted to the local characteristics, including the financing the optimization of the waste management structure, meaningful cornerstones for the long-term expansion of EPR systems and therefore also CE could be established (cf. Ocean Conservancy 2021: 10; OECD 2016: 21–58).

But the implementation of PC also faces many challenges that can ultimately have backlash effects on EPR systems. These are discussed in more detail below.

3.3 PC challenges and dependencies with EPR

The ideal-typical process shown (see Fig. 9:) is based on the assumption that all processes between all participants run smoothly and in a controlled environment. Of course, implementation in reality poses various challenges (A–F) which are described below. Each challenge is also highlighted in terms of potential dependencies towards EPR.

3.3.1 PC provider offers PC and finance local infrastructure (1)

Challenge A – Cost-covering PC price: As already mentioned, the costs of a PC should consist of the money required for the collection and treatment of the respective amount of plastic waste as well as money for the development of further waste infrastructure (cf. Prevent Waste Alliance 2022c: 5). In addition, the work of the PC provider and its margin must be taken into account. PC are offered globally and the PC projects take place locally in cooperation with local governments, non-governmental organization (NGOs) and other stakeholders. As established waste management systems are rarely available in developing countries, pricing may vary. Depending on the country and the available infrastructure, this can result in widely differing price ranges for PC (cf. WWF n. d.d.). The challenge, however, lies more in determining the price rather than the wide variance of prices. An approximation calculation of a PC price based on the current SWM in Lusaka is provided in chapter 6.

EPR & PC – Dependencies: Implementing EPR and PC and its costs based on the local context (EDP7, EF1), such as the waste management infrastructure or possible revenues from secondary material (EF3). PC projects are able to provide a senseful step towards transparency of infrastructures and required costs and revenues (cf. Johnson 2022: 12–45; Prevent Waste Alliance 2022a). A valid cost determination is a cornerstone for PC projects as well as for EPR systems. By striving for cost coverage and the highest possible sales of PCs, a high level of cost transparency (EDP 6) is desirable. In addition, PCs can also influence the market for secondary materials, which can ultimately also generate relevance for EPR.

Challenge B – Find Buyers: Since the purchase of PC is on a voluntary basis, it is necessary to find ways to ensure sales. After all, without sufficient buyers, PC's intended goals cannot be achieved (cf. Nguyen et al. 2022:13–20). In recent years, a market for PCs has emerged in which various suppliers compete with each other. Producers can therefore choose the supplier with the best cost/benefit offer. This often leads to low-cost providers being chosen regardless of their quality standards (cf. Circular Action Hub 2020: 1–10).

In order to master this challenge, it is advisable both to establish quality standards for PC providers (see challenge F) to achieve comparability of the offerings, as well as to create clear added value for the potential buyers. These aspects subsequently need to be translated into clear brand communication, e. g., in the form of marketing (see also chapter 5). A further approach to solving this challenge would be to establish PC as mandatory element. This could clearly determine buyers and the PC quantities to be purchased. At the same time, however, care should be taken not to lose the flexibility of the PCs.

EPR & PC–Dependencies: Finding buyers is a challenge only for PCs because EPR systems are mandatory. Nevertheless, interactions between PC and EPR can arise here as well. If the approach of making PC mandatory is applied, the legal interaction between EPR and PC must be defined in particular. How this interaction

might work, is described in chapter 5. The marketing carried out by the PC supplier can help to raise awareness among producers and consumers. Raising awareness among producers and consumers can lead to a change in mindset and thus a growing understanding of the need to take responsibility (EF4). Cost-covering PC projects and the prospect of a profitable recycling market can also increase the entrepreneurial interest of producers and their own initiative. In addition, this can foster collaboration and coordination among stakeholders and actors (EDP4).

3.3.2 Producers purchase PC (2)

Challenge C – Legal Binding: Purchasing PC is voluntary thus it is left open to producers to use them without any legal enforcement (cf. Prevent Waste Alliance 2022c). The lack of legal obligation yet is both an advantage and a disadvantage. On the one hand, PC projects are detached from complex regulations and can also be implemented at short-term (cf. Prevent Waste Alliance 2022a: 133–160). On the other hand, regulations can help to convince numerous producers to buy PCs and thus to take over the costs originally caused by them. This taking of responsibility as well as internalization of costs is a central point for both PC and EPR.

EPR & PC–Dependencies: The voluntary acquisition of PCs, i. e., the lack of a legal obligation, may also lead to problems with regard to EPR introductions in the medium term. Due to the voluntary decision to purchase a self-selected amount of PC, the producer can determine its own costs. Whereas implemented EPR systems set a higher cost frame corresponding to the product quantities (cf. Prevent Waste Alliance 2022a: 153). This can lead to resistance to the introduction of EPR systems as PC can save producers costs for CE-oriented conversion of production, which might be part within EPR implementations (cf. Prevent waste Alliance 2022c: 7). This problem should already be taken into account when setting the price of PCs. In addition, PC could be integrated into EPR schemes from the beginning (EF5) in order to exclude cannibali-

zation and to enact sensible regulations and requirements in this regard (cf. Prevent Waste Alliance 2022c: 6). How this interaction exemplarily might work out is described in chapter 5.

Challenge D – Amount / Impact: The producers decide for themselves whether and also how many PCs they want to purchase. This can result in small quantities, which only benefit the producer's brand communication, but hardly lead to any significant impact in the countries affected (cf. Johnson 2022: 12–18). Since PC providers offer different projects and therefore also different types of plastic, producers can also do cherry-picking on the most valuable waste but ignoring less valuable waste e. g., light plastic bags (cf. Prevent Waste Alliance 2022a: 133–153). Different types of plastic require different treatments and also have different values. Producers are able to choose PC projects regardless of the country or plastic type. Consequently, producers can currently produce one specific type of plastic, but offset another easier recyclable one which distorts the idea of the offset certificate (cf. Prevent Waste Alliance 2022c). It is also important to consider the aspect of additionality which should "ensure that a project's positive environmental impacts are additional compared to the impact in the absence of the project" (CircularActionHub2020: 3). That means, that waste reducing activity for which the credit is given would not have occurred in the absence of the crediting mechanism but instead clearly occurred in response to (and after the development) of a crediting mechanism (cf. WWF n. d.d.). This additionality is intended to ensure that real added value and improvements are achieved. These challenges might be partly tackled through defined quality standards and accompanying transparency within the PC framework (see challenge F). A clear definition with regard to a material binding would also be conceivable. However, this is currently not part of the standard in PC projects (EDP1).

EPR & PC–Dependencies: In order to generate the most relevant impact possible, the aim must be to achieve not only a valid price but also the most efficient and sustainable implementation on site. This challenge might be partly tackled through defined quality standards and transparency (EDP6) of the PC projects (see chal-

lenge A and F). In particular, monitoring processes and results can lead to high impacts here. In the long term, these results can define benchmarks and minimum requirements for EPR systems. This includes looking at the market for secondary material (EF3) which has a strong impact on the success of EPR systems and PC projects.

3.3.3 PC providers finance local collection and treatment of plastic waste (3)

Challenge E–Local conditions: When considering waste collection and treatment, challenges are found due to local conditions in current waste management infrastructures, geography and country demographics (EDP7, EF1). Depending on structures, different requirements and possibilities may occur towards the implementation of PC projects (e. g., missing waste sorting infrastructure leads to a gap in the required value chain and might cause higher costs). At this point, reference should also be made to the administrative effort and the necessary structures. This applies both to the implementation of the projects and their control. The basic idea of PC is based on the assumption that with producers pay for previously externalized costs. For this purpose, it is necessary to consider the local as well as the material and organizational context to avoid shifting problems and reducing positive impacts (cf. WWF n. d.).

EPR & PC–Dependencies: PC projects can be used to quickly research local conditions. These can be the waste flow (EF2, EF6), relevant stakeholders (EF1, EF4), aspects of the market for secondary material (EF3) or legal aspects (EF5). All these aspects are highly relevant for both PC projects and EPR systems as local conditions define future EPR schemes and their chances of success (cf. Prevent Waste Alliance 2022a: 211). For this reason, documentation of PC projects is highly recommended, as these can already provide essential insight into EPR systems. The structures needed for implementation and also control (Challenge F) can also be taken over in the long term, if necessary, by the EPR structures such as PRO (see chapter 2). Thus, not only data and basics are collected

in PC projects, but also already administrative structures for EPR systems are tested and optimized. Details about local conditions and their possible influences in Lusaka are described in chapter 4.

3.3.4 PC project control based on guidelines, issuing certificate (4,5,6)

Challenge F–Greenwashing: In addition to the local conditions, the control and quality assurance of the PC projects is a challenging task. Without verifiable standards and controls, slipping into greenwashing represents a potential risk. Greenwashing describes a feigned sustainable action by companies or organizations, which is usually based on marketing or individual actions (cf. Prevent Waste Alliance 2022c: 3). This risk permeates the basic idea of PC, since as described in challenge D, even with marginal investment, the benefits (usage of claims) for the producers remain unaffected. As a result, the claims like plastic-neutral might mislead the consumer, as it is rather a plastic-free products nor a sufficient financial compensation (cf. WWF, n. d.). As there is no uniform regulation the possibility of fraud is very high (cf. Johnson 2020; ValuCred 2021: 5). The certificates are not yet forgery-proof and the processes are not completely transparent and controllable. Thus, there are providers who just burn the waste, do not dispose any of it at all, sell the same quantities several times for different certificates or only send a certificate without carrying out any activity. A possible documentation of the collection is currently done via photo documentation. In order to be as forgery-proof as possible, some providers already use blockchain technology that documents the various collections or even further treatment (cf. Liu et al. 2021: 42–51). To meet this challenge, the introduction of overarching, global guidelines and quality standards as well as adequate tools are necessary. This includes uniform claims as well as inclusion of environmental and social criteria within PC projects (cf. ValuCred 2022: 19; Johnson 2020: 12–19).

EPR & PC – Dependencies: The introduction of standards and the control of their implementation is essential for successful PC (EDP5, EDP2). In order to benefit from this also in the long term in EPR

systems, an alignment with EPR principles is senseful (cf. Prevent Waste Alliance 2022c: 2–7). Failure to do so creates the potential risk of mutually exclusive standards or even loopholes that enable greenwashing.

3.4 Interim conclusion

The aim of the chapter was to understand the mechanisms of PC, their strengths, and challenges in implementation. It also refers to risks and opportunities while using PC as a bridge concept towards EPR. In summary, many challenges and opportunities can be identified for PCs and their interaction with EPR systems. The challenges can be met by a wide variety of solutions and approaches that should be taken into account when designing PC projects. Due to the high flexibility of PC, they could serve the needs of fragmented waste management systems in developing countries and can be a useful bridge to EPR systems (cf. Prevent Waste Alliance 2022c: 2–7). The next chapter looks at the specific local challenges in Lusaka's waste management. In chapter 5, these results are combined with the risks and opportunities identified here to formulate concrete recommendations for the implementation of PC projects in Lusaka.