7 Summarizing review and outlook

The master thesis aimed to discuss the opportunities and challenges for the implementation of plastic offsetting certificates (plastic credits = PC) in Lusaka, Zambia with the use of a field study. This paper addresses the question to what extent PC can be used as a bridge concept towards EPR System in Lusaka.

The importance of this question lies in the high relevance of waste management in the context of CE. A functioning waste management system is part of CE, which aims to keep materials in circulation as long as possible. EPR systems are frameworks that pay into CE, but are mainly long-term solutions. However, as a short-term solution for dealing with plastic waste has to be created, especially in developing countries, PCs can be of great importance. Due to their flexibility and short-term implementation period, PCs in developing countries can fill gaps in waste management until or during the implementation of EPR systems (see chapter 1).

In order to identify the mode of action of EPR and also its possible gaps, the second chapter (see chapter 2) focuses on the interaction of CE and EPR systems in terms of waste management. In the best case of CE only necessary materials are used (including packaging materials) and kept within the circulation as long as possible, e. g., via recycling. The implementation of this CE is associated with costs that must be covered by municipalities in the area of waste management, especially in developing countries. Due to the rudimentary infrastructure (e. g., lack of sorting facilities), optimizations in the infrastructure often have to be made as a first step. In doing so, it is necessary to ensure constant cash flows so that waste management can be built up in the long term. One possible system

is EPR, which forces producers of plastic waste to internalize the actual costs of their products, including their disposal. The implementation of these EPR systems is usually a lengthy process that requires, among other things, adjustments to legislation. In countries such as Germany, EPR has been in place for 32 years and is still being developed. EPR systems and their design are based on local conditions and yet follow all the basic principles: social inclusion, circular economy, co-operation and co-ordination, financial sustainability, transparency, monitoring and enforcement, context-specific implementation, clear definitions of the materials covered, the companies obliged and the responsibility of the producers. In Lusaka, the first EPR laws are in place, but they mainly relate to a ban on plastic bags. In addition, there is a set of measures for waste management in Lusaka, the SWIMP, which is also based on CE and has overlaps with the EPR principles (e. g., SG8: increase recycling rate).

Chapter 3 (see chapter 3) deals with the systematics of PCs and their strengths and challenges. PCs are a compensation certificate for plastic waste that can be purchased voluntarily by producers. This money is used to finance the collection of plastic waste from the natural environment and its proper disposal. PC is a voluntary system that, like EPR, complies with the Polluter Pays Principle and can thus contribute to financial relief for municipalities. Unlike EPR schemes, PC projects are more flexible as they are not tied to lengthy legislative developments. However, their voluntary nature can lead to low impact and greenwashing. PC and its relevance to EPR is found in both flexibility and short-term implementation. In particular, the strengths of short-term improvement through on-site waste collection, parallel data collection on waste streams, and improvement of waste management infrastructure using collected funds and revenues from recycling can be closely linked to EPR systems. Thus, PC projects can be understood as pilot projects that are equivalent to a fundamental analysis for future EPR systems. However, this only makes sense if the EPR principles are followed from the beginning, but without adopting their long-term processes. This flexibility allows PCs to take effect in local contexts and serve actual local needs. Risks such as a lack of quality assurance and transparency of PC projects, or the lack of sales of voluntary PCs and thus a missing sustainable financial flow,

can be reduced by appropriate actions such as campaigns or monitoring tools. However, it remains important that PCs are understood as one step towards EPR in order not to threaten future EPR schemes. This might happen if i. e., producers boycott EPR schemes because of cheaper PC solutions. Since the design of EPR systems and PCs are based on local conditions, chapter 4 (see chapter 4) focuses on local challenges in Lusaka. During a field study in October 2022 in Lusaka, sub-areas of waste management were examined. Lusaka has a very fragmented waste management system legally as well as operational. Legally several ministries, e. g., MoH and local authorities like the LCC are involved. It is not always clear though who is entrusted with which tasks and responsibilities. From the operational side franchise waste collectors and community-based companies are responsible for waste collection. Temporary storage or sorting stations for waste are not available as standard. The waste that is collected at the houses is mostly driven directly to landfills, where it is sorted and sold by socially unprotected waste pickers. The recycling of materials does take place, but a valid database could not be determined. In general, there is a great deficit in the validation of data, so that the basic functioning of waste management could be traced, but actual verifiable figures are not available in the long term. Waste collection is insufficient, so that so far only about 50 % of the waste arrives at legal landfills. This not only poses a threat to the environment and human health, but also wastes valuable recyclable material. The volume of waste is expected to further increase and with it the problems of handling the waste, but also a reliable flow of recyclable material. Lack of controls, lack of waste sorting, and a poor funding model are just some of the current challenges. Poor equipment and overcrowded areas also prevent waste collection and encourage illegal disposal. PC projects can help identify gaps in collection infrastructure through the use of digital solutions, introduce small-scale value chains, and raise awareness of waste as a recyclable material. In addition, the informal sector can be supported by providing it with better social security. Be it through a higher income or by being able to work in newly planned waste disposal stations, for example. In addition to recycling, the incineration of materials in cement plants can also be an important temporary building block for managing waste volumes. There is already a

high amount of low-value waste that would be excessively costly to recycle. This waste could still be uses as an essential part of the co-processing process. The field study identified some gaps in waste management that can be closed with the help of PC or EPR. Basically, it is important to hold producers accountable for their products and use this money to optimize waste management. PC projects can create great added value in Lusaka by collecting and documenting data on waste flow, quantities and types. This data is both relevant for future infrastructure design and can define long-term EPR goals. The introduction of digital tools as control and transparency tools for PC projects can also help to get a better overview of waste flows in the long term and improve the quality of work of the different actors involved. This can also help local authorities to control more easily and also to sanction non-compliance. The integration of the informal sector and its safeguarding are also part of PC projects and are also very important in Lusaka.

The field study also showed how diverse the stakeholders involved in waste management are as well as in PC projects (see chapter 4.5). For example, residents are strongly affected by the topic, as they already have to live with waste in their city and may perceive rapid local improvements through PC projects. Local governments are tasked with improving waste management and can benefit from valid data and reliable funding with PC. Through PC, ministries can also document data and achievements at the international level (SDGs) and work on overarching visions for Africa. The informal sector has the opportunity to secure itself financially, but also socially. The formal sector, like producers, can optimize its business and transform it into a sustainable structure. NGOs can accompany projects and support the informal sector socially, as these projects are financially secured by PC. Teachers may have financial opportunities to develop educational campaigns on waste. City planners have the opportunity to plan better streets and neighborhoods based on the data collected, thus improving the waste situation in the long term.

Chapter 5 addresses a concretization of the situation and uses the SWOT analysis to define concrete actions that enable PC as a bridge concept for EPR systems (see chapter 5). In the SWOT analysis, the external factors surrounding waste management in Luska were related to the

strengths and weaknesses of PC and its ability to act as a bridge concept. The resulting actions, such as setting up explicit pilot projects which are referring to local and geographic specifies. The data should be collected using explicit monitoring processes and tools, as these can define the baseline for EPR systems in the long term. The collected data than serves as a basis for providing the introduction of PC with a positive impact on EPR systems. Furthermore, it is recommended to integrate PC as a tool within the EPR framework for Lusaka also via expanding legal opportunities for an easy legal integration. A key point is to involve producers in the whole process so that they can not only pay in the short term but also benefit from any incentives in the long term and thus also make lucrative and sustainable business decisions. Generating attention with the help of campaigns is also a building block for the success of PC as a bridge concept for EPR and can gain high relevance through strong communicative messages. Compliance with certain quality standards and sustainability requirements, must also be observed and can be understood as the basis for the success of PC in general. All this results/actions can be used to develop new PC projects, business models or optimize them. Since PC prices are a key factor, chapter 6 deals with a price approximation and the elaboration of further impact. The focus is on a simplified waste flow and the associated costs amount to **1.653,99 ZMW/t (81,05 EUR/t)**. With regard to further impacts, the removal of waste from the environment, reduction of CO_2 and or social security for waste pickers can be predicted.

Based on the present results, it can be assumed that PCs can be used as a bridge concept for an EPRS system in Lusaka under certain conditions. However, these conditions are essential and should be gradually integrated into PC projects. Although this involves more effort, it can lead to faster successes on the ground and promote the long-term development of waste management in Lusaka. Despite the field study, this work and the derivations from it are theoretical in nature. So far, there is no practical project that actually proves this interaction of PC and EPR. This would be desirable in the course of further research. Challenges will certainly lie in local specifics and initial results from the field, could create new opportunities for PCs and other supporting systems on the path to CE. In principle, Lusaka and possibly even the whole of Zambia seem to have

all the prerequisites for such a practical consideration. The results of this work can help to focus on the most important aspects during a possible PC implementation in Lusaka.