IIIEE Theses 2024:03

An Exploratory Study for an International Extended Producer Responsibility for Plastic Packaging Waste

Perspectives from European and Asian Key Stakeholders

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Thesis for the fulfilment of the
Master of Science in Environmental Management and Policy
Lund, Sweden, May 2024

LUND UNIVERSITY

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THE INTERNATIONAL INSTITUTE FOR INDUSTRIAL ENVIRONMENTAL ECONOMICS

Published in 2024 by IIIEE, Lund University, P.O. Box 196, S-221 00 LUND, Sweden,
Tel: +46 – 46 222 02 00, Fax: +46 – 46 222 02 10, e-mail: iiiee@iiiee.lu.se.

ISSN 1401-9191

Acknowledgements

I want to dedicate this thesis to the parties who enabled and supported me to finish this research and Master's program.

I am grateful to have the support of my supervisor, Naoko Tojo, in working on this thesis. I am familiar with and enjoy the attention to detail and the critical feedback she has been giving during the two years of education at the Institute, but in this thesis supervision I am really grateful for her faith in me. Naoko really believed that I could finish this thesis on time, and that keeps me going. I also want to thank Thomas Lindhqvist for the contacts that he shared for this research with me and Jessika Richter for her feedback during the thesis group supervision.

This thesis would not happen without the kindness and support of the fourteen resource persons that I interviewed. Despite of their busy schedule, they still agreed to discuss and shared their knowledge and expertise with me. I am fascinated by the amazing ideas that they have for this niche research topic, and I am grateful that the interaction with them has become great learning experience.

One of the biggest challenges in this research is to connect with international stakeholders, and for this I am thankful for the help that has been given to me by a lot of people. My gratitude goes to Panate Manomaivibool, Carla Friedrich, Pak Danny Rahdiansyah, Ananda Purwaningdyah, Bilyana Ignatova, Axel Daarut, Isha Sen, and Rafi Arifman for connecting me with the resource persons. I also want to thank Jim Salzman who has taken the time to share his perspective on international EPR and international financing mechanism with me and Sebastian Wehrkamp for the discussion on the topic.

There are also parties beyond the thesis-writing that I am grateful of. I am grateful for the IIIEE and its amazing education. Kudos to the wonderful teachers from whom I learned a lot and the always supportive admin staffs. I want to extend my biggest gratitude and appreciation for my friends in EMP B29. Thank you for being the loveliest classmates I could ever hope to have. I really adore the sincerity and kindness that you show and share every day. I cannot wait to see how you all will shine after graduating from this program! I am also thankful for my family in Indonesia for their never-ending support and for always being there and listening to my stories. Lastly, I want to thank Lembaga Pengelolaan Dana Pendidikan for supporting me with scholarship during my study.

Abstract

Extended Producer Responsibility (EPR) is a policy principle commonly used to manage plastic packaging waste in which the producer is taking a major role. The current discussions reached a point that discusses the necessity of an international EPR, which could extend the producer's responsibility outside of its national boundary. However, the discussions are lacking those that involve multiple stakeholders' perspectives. Hence, this thesis aims to learn and understand the perspectives of governments and plastic producers as key stakeholders of EPR to address two main issues: drivers and barriers in the formulation and implementation of an international EPR for plastic packaging waste as well as definition of producers and their range of responsibilities. The thesis focused on the perspectives in European and Asian countries due to high traffic of (unjust) plastic waste trade in the two regions.

To answer those issues, interviews with fourteen stakeholders were conducted and five grey literatures were studied. Using two frameworks specifically developed to answer the issues, insights regarding the topic are discovered. Four categories of drivers and barriers are identified: allocation of responsibilities and dialogue among stakeholders, cost coverage, transparency and control, and external factors. Meanwhile, in defining the producer, plastic converter, filler, and multiple producers are proposed. Flexibility on deciding the producer is mentioned as well in regards to the international scheme's producer. Different forms of financial, physical, and informative responsibilities are proposed as well. The takeaways from the research for policy makers in relation to international EPR are to focus on the upcoming plastic treaty, international financing mechanism, capacity building for countries, informal sector involvement, and plastic polymer producer involvement. Meanwhile, for the academia researching EPR, focus should be on research that is more theoretical, increase the study subject and their sample size, and study the financing mechanism from plastic polymer producer.

Keywords: plastic packaging waste, Extended Producer Responsibility (EPR), international EPR, international financing mechanism

Executive Summary

Problem Definition

International EPR for plastic packaging waste, as it currently stands, remains a framework in theory despite the necessity of it to mitigate transboundary plastic waste. The existing academic studies on the topic cover theoretical proposal of an international EPR, but none includes the ideas and opinions of the stakeholders related to EPR. A study on international EPR that covers multistakeholders' perspectives, especially government and private sector's, is important because they are among the key stakeholders in EPR formulation. A focus is given to the stakeholders from European and Asian countries as the two regions experience intense (and unjust) plastic waste trade with the direction from Europe to Asia.

Aim and Research Question

This research aims to learn and understand the ideas and opinions of two key EPR stakeholders, national authorities and plastic producers, on the feasibility and potential form of an international EPR for plastic packaging waste. Hence, the research questions addressed in this thesis are as follow:

Research Question 1: What are the perceived drivers and barriers on the formulation and implementation of an international EPR for plastic packaging waste?

Research Question 2: How should producers be defined in an international EPR for plastic packaging waste and what are their responsibilities?

Research Design and Methods

Fourteen stakeholders were interviewed and five documents were collected and analysed in this research. In answering the research questions, two analytical frameworks were developed. The first one is from Monier et al. (2014) to analyse the driver and barrier in EPR implementation. In this framework, there are five factors on the EPR design and implementation that are set as the guiding factor in determining the driver and barrier for an international EPR scheme. The second one is a framework derived from the research of Bix et al. (2009), Alhazmi et al. (2021), and Tojo (2004) to define the producers and discuss their responsibilities across the different plastic lifecycle stages.

Main Findings

On the first research question, "*What are the perceived drivers and barriers on the formulation and implementation of an international EPR for plastic packaging waste?,"* the study found that there are some drivers: funding availability from the private sector, industrial coordination and collaboration, a need for harmonised standards of plastic packaging, waste management technology transfer, societal pressure, legislation, upcoming plastic treaty, and informal sector involvement. Meanwhile, the barriers identified outnumber the drivers, they are institutionalisation, fairness in defining the producers and their responsibilities, unclear definitions and responsibilities of the international scheme, difficulty in fee formulation, data quality, corruption issue, monitoring and reporting, different capacity and knowledge on EPR, informal sector involvement, and local regulation. Interestingly, the informal sector is the only factor that is perceived as both driver and barrier. Industry contribution and compliance, a need for harmonised standards for plastic packaging, and the upcoming plastic treaty are the three factors that are mentioned the most as the drivers for the international EPR for plastic packaging waste. Meanwhile, the top identified barriers are institutionalisation, difficulty in fee formulation, and different capacity and knowledge on EPR of the countries to implement an international EPR.

Concerning the second research question; "*How should producers be defined in an international EPR for plastic packaging waste and what are their responsibilities?"* , the study finds different proposals for producer in an international scheme of EPR, namely plastic converter, filler, and multiple producers where more than one actor needs to be involved in the scheme as producer. Flexibility in defining the producer of the scheme that follows and adapts the need of an international EPR is mentioned as well. The responsibilities of the producers in an international EPR are suggested as well, namely financial, physical, and informative responsibilities. Remembering the global scope of the potential international EPR, some interviewees in the study conveyed that financial mechanism of an international EPR needs to be specifically designed for each country and the global elements for it would serve as the coordinating function only. Still, several potential financial responsibilities according to the interviewees are; incentivisation for plastic design, plastic tax and fee, plastic credit, Advanced Disposal Fee, and superfund. Informative responsibility is also mentioned, through the creation of a global consolidated plastic recycling reporting, harmonised design and product guideline, and information provision about existing waste infrastructure. Lastly, physical responsibility is also proposed through the obligation to produce only recyclable plastic packaging.

With those research questions answered, this study has contributed to the discussion around the topic of international EPR for plastic packaging. The novelty that this research adds to the discussion is the perspectives of EPR key stakeholders, namely government and producer, that are absence in the existing studies on international EPR. This study also formulated analytical frameworks that are able to address the two research questions regarding the topic and may be used as a reference for the future studies.

Recommendations

From this research, several recommendations for policy maker related to international EPR are formulated:

1. Utilise the upcoming Plastic Treaty for ambitious national EPR policy.
2. Utilise the existing international multilateral financing mechanism for an international EPR (or EPR-like) financing mechanism.
3. Conduct capacity building for developing countries in formulating and implementing EPR scheme.
4. Ensure informal sector involvement in an EPR scheme.
5. Involve plastic converters to contribute more to the plastic waste reduction efforts.

Recommendations for academia are also formulated:

1. Define the international EPR through more theoretical research.
2. Involve more stakeholders as study subject from more countries and continents.
3. Increase the sample size for stakeholders being studied in research.
4. Focus the research on fee from plastic polymer producer as donor for novel international financing mechanism.

Table of Contents

List of Figures

List of Tables

1 Introduction

In 2016, the world produced 2.01 billion tonnes of waste where high-income countries are accountable for 34% of it (Kaza et al., 2018). According to Kaza et al. (2018), around 12% or 242 million tonnes of the waste generated is plastic, which is problematic as the mismanagement of it leads to contamination of both terrestrial and marine ecosystems. Plastic waste also poses a threat to our health as it can break down into microplastic, in which its exposure to humans can increase the risk of various health issues such as respiratory and digestive diseases, sleep disturbance, obesity, and diabetes (Ghosh et al., 2023).

Among diverse types of plastic, plastic packaging is a huge concern for the sustainability of the planet. This is because post-consumer plastic packaging is the main source of plastic waste (Parajuly & Fitzpatrick, 2020). Plastic packaging is made from different polymers and is used for many purposes; food and beverage, healthcare, cosmetic, shipment packaging, and so on (Groh et al., 2019). It possesses certain difficulties in its recycling due to the different handling characteristics of plastic packaging (Hopewell et al., 2009). Even in EU27, the recycling rate for post-consumer plastic packaging waste is merely 39.7% in 2021 (Eurostat, 2023).

One complication of plastic packaging waste is its transboundary movement that disproportionately affects developing countries. At the moment, the global plastic waste trade network is dominated by Europe and Asia, with several developing countries in Southeast Asia forecasted to be new importers of plastic waste in the future (Liu et al., 2022). Global waste trade from the Global North to the Global South has disproportionately burdened the latter because many of its regions do not possess basic waste management capacities (Diggle & Walker, 2022). Sending more waste to developing countries means that their waste collection and treatment systems will be overrun, and environmental challenges will increase (Cotta, 2020). The issue of global plastic waste trade shows the moral dimension, or the lack of it, of plastic pollution where plastic production and consumption, as well as their profit, mostly benefit a few companies and consumers in high-income countries. In contrast, the disposal and subsequent management of plastic must be borne by developing countries (GAIA, 2019).

Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal is the landmark international treaty that regulates international plastic trade, although with criticism on its implementation. Through its 2019 amendment, the Convention aims to tighten the conditions of transboundary plastic waste trade by enhancing its monitoring, requirements, and transparency (Nielsen et al., 2020). However, the effectiveness of the Convention remains dependent on how plastic is defined and categorized as well as how responsibilities are distributed between exporting and importing countries (van der Marel, 2022). Khan (2020) argued that a solution beyond the mandate of the Convention is necessary, especially one that addresses the financial and environmental responsibility of plastic waste within its supply chain. More on the discussion of the Basel Convention and its ineffectiveness in mitigating transboundary plastic pollution can be found in Section 2.1. To make amends for the Convention limitation, a policy approach that focuses on involving plastic producer to be responsible for its product is needed, and Extended Producer Responsibility (EPR) could be an alternative to that.

EPR is a policy principle that extends the environmental improvement responsibility of the producer toward various stages of a product's life cycle (Lindhqvist, 2000). Current EPR policies have mostly targeted end-of-life management though it should also encourage producers to improve their product design to be more sustainable (Tojo, 2004). Though the existing EPRs are all introduced at the national or even lower level of governance, a recent study asserted that EPR implementations at a global level need to be considered to involve industry at that level

(Raubenheimer & Urho, 2020). This may be beneficial as EPR, among other advantages, shifts the financial responsibility for the product's End-of-Life management from the public to the private sector, thus saving the former's budget (Lorang et al., 2022). In proposing a global EPR, Thapa et al. (2023) proposed an Ultimate Producer Responsibility for electronic waste that extends producers' responsibility to anywhere the waste is ended, regardless of the geographic location. Meanwhile, Forrest et al., (2019) proposed a voluntary contribution from fossil fuel-derived plastic (FFP) production that can support the transition to a circular economy. Raubenheimer & Urho (2020) proposed a global design standard as a form of international EPR that all plastic producers need to follow. However, existing academic studies on international EPR are mostly lacking multi-stakeholders' perspectives (See Section 2.2.2), especially those of the governments who have the capacity to formulate and implement it.

Studies on international EPR for plastic packaging waste are more urgent now than ever due to the recent development and dynamic of the international policy landscape on plastic pollution. Currently, the countries in the world are negotiating a Global Plastic Treaty that aims to end plastic pollution by addressing the full life cycle of plastic. In the current draft, an element of international EPR is mentioned through the call for producer's accountability enhancement in managing plastic products across international supply chains (UNEP, 2024). Should this element be approved in the final product of the treaty, which is ambitiously expected to be ready by the end of 2024, references on means of implementation and modality of an international EPR on plastic should start to be explored and studied. Such references should involve the practitioners' perspectives, in this case, government officials worldwide and international plastic producers, to reflect and answer the concrete need for an international EPR for plastic packaging.

1.1 Problem Definition

International EPR for plastic packaging waste, as it currently stands, remains a framework in theory despite the necessity of it to mitigate transboundary plastic waste. The existing academic studies on the topic cover theoretical proposal of an international EPR, but none includes the ideas and opinions of the stakeholders related to EPR (the need for stakeholders' perspective in policy formulation as briefly presented in Section 3.1). A study on international EPR that covers multistakeholders' perspectives, especially government and private sector's, is important because they are among the key stakeholders in EPR formulation in a national scheme, as discussed in, among others, Kunz et al., 2014).

This lack of government and private sector perspective studies limits our understanding of their vision in the formulation and implementation an international EPR for plastic packaging waste. Studying the stakeholders and their perspectives is important because there are different degrees of power, legitimacy, and urgency that stakeholders possess (Mitchell et al., 1997), with more of this being explained in sub-chapter 3.1, which may potentially affect how they envisage an international EPR. Furthermore, studying the perspectives will uncover the perceived driver and barrier for the stakeholder in formulating an international EPR. The necessity for stakeholders study also comes from the explore-worthy different responsibility allocation in EPR formulation and management, be it in the horizontal level (i.e allocation between producer, Packaging Recovery Organizations, national authorities) and vertical level (multiple levels of policy governance: international/federal level, national level, and municipal level) (Kalimo et al., 2015; Kunz et al., 2014). The lack of multistakeholders study also causes the inexistence of a study on the potential form of an international EPR that is envisioned by them, where elements of them are not well described. The elements of a national EPR for plastic packaging have been well described (Leal Filho et al., 2019a; Lorang et al., 2022; Watkins et al., 2017), however, this is not the case with the elements on international EPR (Forrest et al., 2019, 2019; Raubenheimer & Urho, 2020), where even the producer is not well defined. Producer definition and its

responsibility allocation are the basic elements that are missing from the academic discussions related to the international EPR for plastic packaging waste and prevent its further development. Furthermore, an urgent focus needs to be given to Europe and Asia, the two continents where plastic waste trade mostly take place and potentially affecting the latter in a negative outcome (Liu et al., 2022).

Seeing the lack of academic study on the topic, and the practical, urgent need on the knowledge of an international EPR for plastic, a thesis on the topic would be worth pursuing. Therefore, this thesis will explore the possibility of an international EPR scheme for plastic packaging waste by collecting relevant international stakeholders' perspectives.

1.2 Aim and Research Question

The research aims to learn and understand the ideas and opinions of two key EPR stakeholders, national authorities and plastic producers, on the feasibility and potential form of an international EPR for plastic packaging waste. The focus of this study would be the key stakeholders from European and Asian countries due to the urgency that is elaborated in sub-chapter 2.1. The research is firstly directed to explore stakeholders' perspectives on the drivers and barriers to the formulation of an international EPR. This will yield the critical factors that can determine the effectiveness of an international EPR scheme. Secondly, the potential modality of international EPR for plastic pollution is explored. Among many other elements of an EPR system, this study first addresses the need to define the potential plastic producers (e.g. manufacturers, importers, brand owners, etc) at the international level. The responsibilities of the producers in an international EPR will be explored as well by reflecting on the existing national schemes. This approach is selected since instruments of national EPRs scheme are already well studied and documented and might serve as a starting point for the stakeholders to further elaborate on how these elements could/should be reflected in the design of an international EPR. This will also reflect both the top-down (international) and bottom-up (national) EPR elements. Hence, the research questions addressed in this thesis are as follow:

Research Question 1: What are the perceived drivers and barriers on the formulation and implementation of an international EPR for plastic packaging waste?

Research Question 2: How should producers be defined in an international EPR for plastic packaging waste and what are their responsibilities?

1.3 Scope and Delimitations

Scopes were set in this exploratory study to ensure a focus on the subject being studied and to ensure that the research is finished in a timely manner. Among many stakeholders involved in an EPR system, this research focused on the national authorities and plastic producers' perspectives. The national authorities in this study were ministries of environment, environmental protection agencies, or similar national-level government agencies that work in the field of waste management and packaging production, while the plastic producers here were defined as plastic converter, filler, seller, and Producer Responsibility Organisation (PRO). Further explanation of the rationale for choosing the two stakeholders as the main objects is presented in sub-chapter 3.1. In terms of geographical scope, the study focused on European and Asian stakeholder, due to the urgency of transboundary plastic waste pollution caused by its trade in the two continents. Furthermore, compared to other continents, the two continents have more countries with EPR implementation so that the stakeholders in the regions were deemed to have the knowledge and experience on the topic and can provide ample information on the topic. Timewise, this study captured the existing perspectives during the period of February – May 2024. This temporal scope is important to be noted due to the dynamic of the

currently ongoing negotiations of the Global Plastic Treaty, with the reason as explained in the subsequent paragraph.

The scope of the research set off its delimitation as well. Firstly, this research covered only perspectives of government officials and representatives of plastic producers only. Meanwhile, although they are the key stakeholders in setting up an EPR system, the exclusion of other stakeholders related to EPR (i.e. municipal governments, informal waste operators, etc) means some perspectives are not well-represented in the study. Secondly, the study is based on the European and Asian stakeholders' perspectives. Certainly, these groups are not exhaustive hence not all countries are represented in the study. Thirdly, the research was conducted during the dynamic period on the Plastic Treaty negotiation where many issues related to plastic pollution is discussed, including elements on EPR and international financing mechanism from plastic polymer producer for implementing the treaty. After the fourth round of Intergovernmental Negotiating Committee (INC) meeting, held in late April 2024, the negotiation of the treaty discussed more about those elements. As most of the interviews were conducted before the INC 4, the insights on those EPR elements remained uncaptured.

1.4 Ethical Considerations

The research is the author's independent study and free from external influence. For the thesis, financial support from the Indonesia Endowment Fund for Education Agency was received, however, this did not influence the thesis study whatsoever. The Agency provides liberty for its scholarship holders to pursue thesis research that they are interested in and there is no instances for the Agency in the thesis fund disbursement procedure to influence the research direction. The Agency only requires the thesis to be submitted in the end of the semester as a form of an accountability report, which the author plans to timely do.

There were some ethical research responsibilities that were already being foreseen and measures were being prepared to safeguard them. Information about the research was briefed to the interviewees and their consents were asked and collected before acting upon or processing the information that they have provided. A third-party service transcription application, otter.ai, was used for the interview recording transcription purpose, and consent from the interviewees to use this third-party service was obtained (except for those who did not consent in which transcription was done manually). Once the transcription was obtained from otter.ai, the recording was permanently deleted from the website. During the analysis, selective attention towards the interviewees' statements was avoided and statements were captured and analysed in their full context to produce an objective information from them. In this thesis, the interviewees are fully anonymized and are presented by codenames to protect and maintain their privacy.

Lastly, efforts were put to handle and store the research's data. The interviews conducted through Zoom application and the recordings were strictly saved in the author's computer only to minimise the risk of data leakage. The naming system of the interview recording files was codified to prevent the interviewees from being identified, and the complete code and its respective interviewees' identities was being kept accessible for the author only. The master's coding document, interview recordings, and documents related to others' identities were all stored in an encrypted folder.

1.5 Audience

From the research, key stakeholders' perspectives on international EPR for plastic packaging waste were discovered. Knowledge on the perceived drivers and barriers for the international scheme's formulation and implementation were identified, as well as stakeholders' views of its basic yet crucial elements; the international scheme's producers and their responsibilities.

Analysis and discussion on the findings were also presented for the readers. Recommendation for the academic and non-academic audience is lastly provided in the thesis.

With those findings, this study will hopefully be able to serve as a preliminary reflection on the topic of international EPR, especially for policy practitioners and academia. The existing studies on international EPR do not explore the stakeholders' perspectives, especially the governments' who have the capacity to formulate policies on it. For policy practitioners, the findings will serve as support to grasp on the current landscape of stakeholders' standpoint on international EPR that may become consideration to formulate, or perhaps not, the international scheme. Meanwhile, for the academia, this thesis seeks to provide different stakeholders' perspectives and serve as an initial discussion for pushing forward the academic discussion on the topics.

1.6 Disposition

Chapter 1, as presented above, introduces the background and the research aim of the thesis. The chapter then sets the scope and delimitation of the study, explains the ethical considerations of the research, and describes the potential audience of the thesis. The chapter also provides an outline of the thesis.

Chapter 2 presents the existing literature on the topic of transboundary plastic pollution, international EPR on plastic packaging, and the research gaps arising from it. Frameworks of analysis of the research are also presented in this chapter.

Chapter 3 discusses the overarching research design for the thesis. Furthermore, methods for data collection and analysis are also presented in the chapter.

Chapter 4 presents the findings and results from conducting interviews and content analysis.

Chapter 5 discusses the analysis of research results as obtained in *Chapter 4* and compares them results with the existing literature. Interpretation of the result and analysis of the thesis is also presented in the chapter.

Chapter 6 concludes and answers the research questions with recommendations for both academic and practitioner.

2 Literature Review

This literature review highlights the academic discussion on the issues related to the international EPR for plastic packaging waste. The chapter first highlights the condition of plastic packaging and transboundary plastic pollution and its current situation in Europe and Asia. The chapter then discusses the insufficiency of Basel Convention as the main treaty regulating this issue. The next sub-chapter, sub-chapter 2.2, elaborates how EPR could potentially become a policy approach to complement the Convention in mitigating transboundary plastic pollution. In this part, EPR schemes on plastic packaging waste, implemented already throughout the countries, are explained, as well as the contemporary academic discussion on international EPR on plastic packaging waste. A sub-chapter (2.3) about international financing mechanism is presented as well as a comparison for international EPR as an international financing scheme. Lastly, frameworks to analyse the collected data in the thesis, that are based on the existing literatures, are presented in the sub-chapter 2.4.

2.1 Urgency of Plastic Packaging Waste and Transboundary Plastic Pollution

Plastic packaging is a huge contributor toward the economy which at the same time, contribute to an equally huge environmental problem. Plastic packaging became the top packaging solution for goods due to the lightweight nature of the material that reduces the product weight for saving transportation cost for the industry (Ncube et al., 2021). The global packaging market was valued at USD 383 billion in 2000 and reached USD 896 in 2022, with the growth being dominated by the replacement of reusable container by single-use container (Jambeck et al., 2015; Statista, 2023; Sydow & Bieńczak, 2019). However, this growth is not being balanced with a proper end-of-life management of the plastic packaging, with only 14% of it being collected for recycling and only 5% of plastic being successfully recycled into new plastic (Dauvergne, 2018; Hahladakis & Iacovidou, 2018). With the increasing world population and economic growth, without any measures taken plastic waste problem will only be intensifying (Ncube et al., 2021).

The fast, unchecked growth of plastic packaging waste leads to serious environmental damages and could only get worse in the future. An estimated number of 4 to 12 million tons of plastic waste was generated on land and entered the ocean in 2010 (Jambeck et al., 2015). Traces of microplastics, broken down from plastic waste, are already detected in the freshwater and soil ecosystems (Rillig, 2012; Wagner et al., 2014). With the business-as-usual mean of waste management, 12 billion tons of plastic waste will contaminate terrestrial and aquatic environment in 2050 (UNEP, 2018). When ending up in the ocean, plastic becomes a transboundary issue with a global scale and impact (Niaounakis, 2017). Furthermore, plastic often become a transboundary issue due to the trade of plastic from one country to another.

Plastic trade is rapidly growing, and its trade network spans internationally. From 1993 to 2016, the world's imports and exports of plastic rose drastically with 723% of import increase and 817% of export increase (Brooks et al., 2018). According to Wang et al. (2020), developed countries like USA, the Netherlands, Germany, and Belgium are constantly being the top plastic waste exporting hubs, while Asian countries became the major plastic waste importing country due to the cheap labour, low health cost, and weak environmental regulation. Despite its importance for the global economy, plastic waste trade negatively affects developing countries. Wealthy developed nations with robust waste management capacity ironically send plastic waste to developing countries with limited waste management capacity (Brooks et al., 2018). Wang et al. (2020) stated that this export is unlikely to stop due to the developed countries' motivation in preserving the function of the global plastic waste trade. In the discussion of global plastic waste trade, the regions of Europe and Asia deserve a highlight due to the high traffic of the trade in the two regions. Europe and North America are the largest exporters of plastic waste

while Asia is the largest importer and the countries in Europe and Asia always take the top ten plastic waste exporting countries (Wang et al., 2020; Zhao et al., 2021).

Due to the multilateral nature of plastic trade, an international regulatory instrument is necessary, and the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal was amended to also regulate a responsible and sustainable plastic waste movement among country. The Basel Convention, adopted in 1989 and entered into force since 1992, seek to manage the hazardous and other waste in the transboundary context (Peiry, 2013). At the Eleventh meeting of the Open-ended Working Group of Basel Convention (OEWG 1.1) in 2018, a proposal called that plastic and mixed plastic material be included as an amendment to the convention to better control the plastic waste flow and avoid poor plastic waste management (Basel Convention, 2018). This proposal then went into force on 1 January 2021 (Basel Convention Secretariat, n.d.). In this way, the amendment of Basel Convention provided harmonization of technical standards and practices to boost the capacity to manage plastic waste all over the world (Brooks et al., 2018). However, academic studies show doubts about the effectiveness of the convention in mitigating plastic waste trade. Van der Marel (2022) argued the ambiguity of the tradable plastic notion has led to conceptual tension between keeping waste as a commodity in global trade and ensuring the best outcome from waste management processes. On that matter, Khan (2020) voiced the same concern where there is a different interpretation for plastic waste shipments to be categorised as hazardous waste or non-hazardous commodity, which can lead to confusion for the stakeholders. Khan (2020) also argued that there needs to be a robust responsibility plotting in the plastic product supply chain, which was beyond the convention mandate.

From the academic literature review above, it is understood that plastic packaging waste is a pressing issue that has become a transboundary problem due to the plastic waste trade. The countries in Europe and Asia are areas of interest about plastic waste trade due to the high activity of the trade in the two regions. Basel Convention is supposedly able to mitigate or enhance the control of transboundary plastic pollution, but the limitations as mentioned above may have reduced its effectiveness. To complement the Convention, another policy alternative that involves plastic producer for mitigating transboundary plastic pollution needs to be considered. This is due to the international supply chain that a plastic producer has and its capacity to bring significant changes to its products. In this regard, a novel international mechanism based on the concept of Extended Producer Responsibility may play some roles to mitigate transboundary plastic pollution.

2.2 Current Knowledge Related to International EPR on Plastic Packaging Waste

International EPR schemes have already been discussed by academic studies as a potential mitigation method for product waste that end up in the countries outside of its use country. Those academic studies are described below, with a brief review on the existing national EPR system described before that to give a comparison on the national and international schemes.

2.2.1 EPR on plastic packaging waste

Extended Producer Responsibility (EPR) is defined as "a policy principle to promote total life cycle environmental improvements of product systems by extending the responsibilities of the manufacturer of the product to various parts of the entire life cycle of the product, and especially to the take-back, recycling and final disposal of the product." Lindhqvist (2000, p. 12). Lindhqvist (2000) in his research proposed the model of EPR. In the model, there are different forms of responsibility, liability (responsibility for proven environmental damages caused by the product), economic responsibility (responsibility to partially or comprehensively cover the cost for the management of a product), physical responsibility (responsibility on the physical managements of the products), ownership (where the producer is keeping the ownership of the

product and thus be responsible for the environmental problems of the products), and informative responsibility (responsibility to provide the environmental properties of the products). To illustrate how these responsibilities intersect and synchronise with each other, a figure of the model can be seen below (Figure 2-1). In EPR, producers play a key role due to them possessing the best capacity that is necessary to create significant positive change in their products (Leal Filho et al., 2019b).

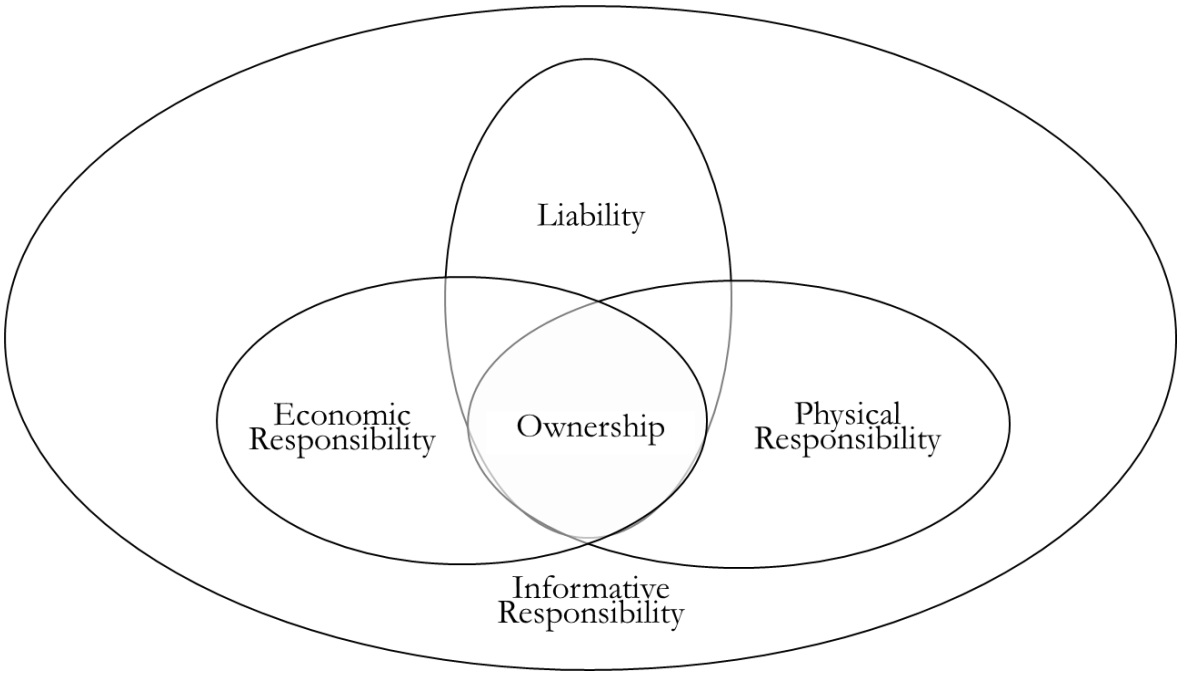


Figure 2-1. Model of producer's responsibilities in an EPR scheme as adapted from Lindhqvist (2000)

In implementing EPR schemes for plastic packaging waste in a country, collective producer responsibility (CPR) is often formed. In the CPR, producers are collectively responsible for the end-of-life management of their products and associated costs arising from it are distributed based on, among others, sales quantities (Atasu & Subramanian, 2012). Through CPR, producers typically work together through a producer responsibility organisation (PRO) that coordinate the efforts to manage plastic packaging waste on behalf of producers (Watkins et al., 2017). Producers provide financial contributions to the PRO that will be used to cover the PRO's operational activities cost (Mrkajić et al., 2018). The operational activities in PRO include the administration of private resources used to fund the waste system, the planning and implementation of waste collection and treatment operations, and the gathering and tracking of data related to these waste management activities (OECD, 2016).

In addition to that, there are different EPR instruments. Tojo (2004) explained that there are three different instruments; administrative instrument that sets the producer to fulfil a certain task, economic instrument that gives financial incentives or disincentives depending on whether the addressee fulfils the task that is desirable from societal perspective or not, and informative instrument that offers various types of information for product users and other actors (i.e. recyclers), such as product's environmental character and specification. To give a better understanding of the EPR instruments, Lorang et al. (2022) and Tojo (2004) provided examples for each EPR instrument. An example of administrative instrument would be take-back requirements where producers are responsible for their products' end-of-life collection and treatment. Meanwhile, for economic instrument there are Advanced Disposal Fee or eco modulation (PRO-differentiated fee that can be based on plastic waste weight, type, and recyclability) and Deposit Return Scheme (consumers pay a reimbursable deposit that can be

obtained when product is returned), and for informative instrument, there are labelling of products and components, information provision about product structure and substance, and reporting to authorities.

Another crucial element of EPR is its levels of coerciveness. Mandatory EPR is where the EPR is implemented through legislative measures, which has been the case for many existing EPR schemes (Tojo, 2004). In voluntary a EPR, the system is established voluntarily by the producers, often as a part of corporate social responsibility activity, and can further inspire the creation of a mandatory national EPR by demonstrating a positive performance of the system (Ocean Conservancy & Trash Free Seas Alliance, 2019). Lastly, there is also a negotiated agreement modality between the government and industry that can increase the latter participation and compliance with EPR regulation (Ribeiro & Kruglianskas, 2020).

EPR for plastic packaging has been implemented in various countries in the world with varying degrees of success. For example, in the European Union, many Member States used the EPR principle as a means to support the implementation of Packaging and Packaging Waste Directive 94/62/EC (Cotta, 2020). A study by Lorang et al. (2022) shows that in 2018, proper implementation of EPR has contributed to the achievement of the 50% plastic packaging waste recycling rate as stated in the Directive in Spain (50.7%), while Germany and Italy close to achieve the target with 46.4% and 43.4% recycling rates, respectively. EPR has also been implemented in developing countries. Johannes et al. (2021) studied EPR implementation in the Philippines, Indonesia, Thailand, Malaysia, Viet Nam, and India and discovered that its implementation is facing some challenges like the competition of system with existing recycle industry, limited waste collection system in rural area, and limited facility to recycle plastic waste.

2.2.2 International EPR on packaging plastic waste: rationale, existing conceptual schemes, and challenges

Several studies have highlighted the rationales of implementing an international EPR. Raubenheimer & Urho (2020) argued that developing countries have limited capacity in waste management, hence, the financial support from international producers can then be used to improve their capacity on managing plastic waste until a robust waste management system is established there. In a different study, Raubenheimer et al. (2018) stated that international guideline or initiative that might be an element of an international EPR can promote further development of plastic industry's commitment because they do not want to be held as accountable by not fulfilling the existing guideline and initiative. Lastly, on the topic of justice, the distributive justice aspect (that is concerning the benefit and burden distribution of the involved parties) of an EPR scheme with an international scope addresses the question about global allocation of responsibility between Global North and Global South countries (Steenmans & Malcolm, 2023). On the practical side, the upcoming Global Plastic Treaty comes into play. This treaty is a mandate from the United Nations Environmental Assembly (UNEA) resolution 5/14 that obligates UN Member States to convene and formulate an international legally binding instrument on plastic pollution (Dreyer et al., 2024). EPR is one of the elements being negotiated in the Plastic Treaty, where in the current draft (April 2024), an EPR with international scope is mentioned as a necessity.

Various academic studies have proposed the potential schemes of an international EPR. Thapa et al. (2023) studied the unsustainable flow of electronic waste from the European Union to Nigeria. Thapa et al. (2023) argued that this flow is neither just nor environmentally safe as there is a lack of proper system and infrastructure in Nigeria to manage the incoming electronic waste. To mitigate that unjust and unsustainable practice, Thapa et al. (2023) proposed Ultimate Producer Responsibility (UPR). Through UPR, the original producer of electronic waste be held accountable and the existing EPR structure could be utilized further to create a fund transfer

mechanism, technical support, or other support that can uphold a proper electronic waste management in Nigeria. By doing this, UPR "provides resources and infrastructure to prevent harm caused by shifting geographies of EU waste and create safe, well-paying jobs in destination countries, adding equity and justice dimension that the current EPR lacks." (Thapa et al., 2023, p. 45).

Other than that, Forrest et al. (2019) proposed a voluntary contribution from fossil fuel-derived plastic (FFP) producer to manage the global plastic waste crisis. According to the authors, a solution to solve the crisis is "to apply an appropriate contribution to FFP at first production, whereby the supply chain passes on this price premium on raw FFP resin equitably through to the trillions of plastic items purchased each year by end consumers" (Forrest et al., 2019, p. 4). Setting a higher cost for FFP production will level the playing field for polymer producers and trigger them to substitute virgin plastic with lower-cost feedstocks. This would drive a higher demand for recycled polymer as well as stimulating higher recovery and recycling of plastic. Forrest et al. (2019) further argued that resin production is the most effective point to apply and collect the contribution as only a small number of producers are concentrated in this point of the supply chain. In this upstream point, the contribution can be facilitated in a simple, equitable, and transparent per-weight basis.

Developing a global design standard to manage plastic product's end of life is another proposed element of an international EPR scheme (Raubenheimer & Urho, 2020). This standard could be developed upon by various existing standards and an intergovernmental expert working group could be established to oversee this process. This global design standard in the international EPR will serve as a "template" for the national EPR in which smart, sustainable, and waste-less design of plastic is incentivized. If a country is lagging in following the global standards, that is implemented through a National Plastic Management Plan, the country can develop a National Finance plan to fund the implementation of it. Raubenheimer & Urho (2020) argued that for developing countries, this finance plan should first be funded by international agreement for funding waste management activities until they have the capacity to sustain them. This is to enable the developing countries to be able to independently fund their waste management activities from domestic resources originating from the private sector as well as national budgets.

Despite the potential advantages of an international EPR, there are challenges in formulating and let alone implementing it. Implementing a global EPR would require an immensely complex institutionalization involving governments and plastic producer from different value chains (Per-Olof et al., 2022). Furthermore, the negotiation process to have a global EPR would be complicated and political resistance from the stakeholders involved, especially the plastic industry, would be immense. Therefore, any upcoming international treaty or other legal instruments on plastic pollution mitigation must consider and address these challenges between and within nations by proposing a comprehensive treaty design that leaves no country behind (Cowan & Tiller, 2021).

2.3 International EPR and International Financing Mechanism

From the previous sub-section, it is clear that one of the main focuses in the current discourse international EPR is securing financial resources with developing countries as the beneficiaries. The nature of resource mobilisation from the developed to developing countries here is similar with various international funding mechanism commonly found throughout various Multilateral Environmental Agreements (MEAs). Therefore, in this sub-section, a brief explanation on international financial mechanism is presented to contrast them with an international EPR.

A global agreement can be successfully implemented if its main financial mechanism is well designed and able to address the main finance needs as well as ensures an effective and efficient financial resources mobilisation (Per-Olof et al., 2022). A well-designed funding mechanism is a crucial success factor of a global agreement, Mohrenberg et al. (2019) explained that MEAs with funding mechanism have a higher participation probability than those without. The authors also stipulated that participation probability is higher if the fund contribution is voluntary and if the fund disbursement only applies to selected states.

The financial mechanism found in MEAs usually serves one of two primary purposes, or both (UNEP, 2005). On one hand, a financial mechanism can have a funding function where it generates and disburses financial resources to support the parties in MEAs to implement the activities related to the fulfilment of the objectives in the international agreements. Financial mechanisms with funding functions can channel financial resources through a single and comprehensive general-purpose fund (e.g. Basel Convention Trust Fund to Assist Developing Countries and Other Countries in Need of Technical Assistance) and different funds that supports specific activities (e.g. Global Environment Facility (GEF) Trust Fund that is being utilised by the Minamata Convention for conducting implementing activities such as assessments, inventories, and national action plans) (UNEP, 2005). Financial mechanism can also have a coordinating function. This function does not aim to generate new, additional financial resources, but it assists the parties in MEA to distribute the existing financial resources by helping them accessing the existing donors and supporting them in obtaining these funds. An example of coordinating function of a financial mechanism is the Global Mechanism for the Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa (UNCCD) that supports developing countries to access financial resources from donors to implement the agreement (UNEP, 2005).

To provide a specific example of an international financing mechanism for mitigating plastic pollution, a proposal from Raubenheimer and McIlgorm (2018) for global marine plastic debris can be highlighted. The proposed global fund is modelled based on the level of each country's plastic leakage to the ocean, or what the authors called "stock." Through the calculation of this stock, all states' contribution towards the accumulation of marine plastic debris can be determined and they will need to contribute financially to the global fund with the amount that correlates to their plastic stock level. The authors argued that this model would work the best due to the transparency the model demands from calculating the national plastic stock, strengthened state's accountability arising from its transparency on plastic stock, and increased effort to reduce plastic leakage into the ocean to reduce state's contribution towards the global fund (Raubenheimer and McIlgorm, 2018). Akin to climate change adaptation cost, this stock is Common But Differentiated Responsibility principle being implemented where the assignment of financial burden of a country is decided based on historical responsibility, equality and capacity to pay (Dellink et al., 2009).

While the conceptual frameworks of international EPR as described in Section 2.2.2 mentioned the use of EPR as a template for international financing mechanisms, there are two sources that elaborated how financing by plastic producer is different from existing financial mechanism of global treaties.

Minderoo Foundation published a report entitled The Plastic Pollution Fee that discusses an innovative financing mechanism originating from plastic polymer producers to finance the upcoming Plastic Treaty implementation (Charles & Dons, 2023). This Fee would be a mandatory contribution from the private sector. The mandatory nature for the private sector is what makes the Fee different with conventional financing mechanisms that are funded either

mandatorily or voluntarily from the public sector, or voluntarily from the private sectors or international development organisations.

In the report, the Minderoo Foundation also argued how the Fee is different from that of existing EPR national schemes (Charles & Dons, 2023). As EPR is implemented in national level, it has a limited capacity in formulating and developing waste management infrastructure at the appropriate geographical scale. This is because through the national level lens of EPR, efficiencies of infrastructure development when developing waste infrastructure through a regional perspective across multiple countries can be missed out. In this regard, the Fee has a better scope and flexibility to generate and distribute fund at a global and regional level for managing various issues beyond end-of-life management. However, the Fee can play a complimentary role to the existing EPR schemes, whereas EPR fund is mainly used for waste collection and management in waste management facilities, the Fee could finance the development of more waste management facilities (Charles & Dons, 2023)

This Minderoo Foundation's proposal is similar to that of Ghana on the Global Plastic Pollution Fee (GPPF). GPPF is proposed as a financing instrument to fund sustainable plastic management, especially in developing countries. In the discussion of the Global Plastic Treaty, in the GPPF, polymer producers pay a fee that can be collected by a regional or international entity to be then redistributed to the developing countries for managing plastic waste (Ghana, 2023). According to the proposal, the mechanism will be able to close the plastic pollution gap between the global volume of produced plastic waste and the capacity to safely manage it. GPPF is especially important to support developing countries in which financial and technical capacity to manage plastic waste in a sustainable manner is limited (Ghana, 2023). In a different document, Ghana stipulated that GPPF is a call for EPR scheme extension from midstream to upstream actors (Boachie, 2023). GPPF will complement national EPR scheme, that only focuses on some producers and products, to access the global fund of all plastic production.

2.4 Conceptual Frameworks to Analyse Elements of International EPR on Plastic Packaging Waste

The thesis seeks to understand the perspectives of governments and private sectors, in this case, plastic producers, on an international EPR for plastic packaging waste as well as the potential form of an international EPR. This understanding is expected to be gained by exploring their understanding and perception of the international EPR's potential role and barrier. Furthermore, through the perspective study, the author seeks to gain insights on how the producers for the international scheme should be defined and what responsibilities should be allocated in an international EPR. To retrieve such knowledge from the interview, different frameworks of analysis are identified and presented in the next sub-section. These frameworks are chosen and utilised to answer and provide explanation for this thesis' respective research questions.

2.4.1 Analysing drivers and barriers in formulation and implementation

In analysing the driver and barrier, a framework was adapted from the findings in the report from the European Commission on guidance development for EPR (Monier et al., 2014). The report analysed various EPR schemes in the EU countries, namely batteries and accumulators (B&A); electrical and electronic waste (EEE); end-of-life vehicles (ELV); packaging; graphic papers, and oils. An in-depth analysis of thirty-six case studies was conducted for the six EPR schemes throughout various EU countries to draw lessons and identify good practices. In the case study, interviews were conducted to obtain a complete understanding of the countries. This study has led to the identification of four main design and implementation features of an EPR

scheme. Monier et al. (2014) selected these four features as they are the most relevant in terms of efficiency and effectiveness of EPR schemes, applicability in different product categories, and frequency of mention by the stakeholders in the studies. In the explanations of the features, the authors included issues under consideration that elaborate the features further. The four features and their issues under considerations are:

1. *Allocation of responsibilities and dialogue among stakeholders* focuses on the typology of producer responsibility and the need for dialogue among stakeholders. Issues under consideration in this feature are the type and distribution of producers' responsibility such as financial or organizational (i.e. physical) responsibility and a dialogue/institutional area where the EPR players can coordinate and cooperate.
2. *Cost coverage* highlights the issue of EPR cost coverage and proportion. This feature considers the issues of the extent of EOL costs covered by the producer and the modulation of the EPR fee to reflect the true cost.
3. *Fair competition* highlights the economic competition within EPR schemes. The issues under consideration are competition among PRO and competition among waste management operators.
4. *Transparency and control* discuss the reporting requirement and enforcement of the EPR scheme. Issues under consideration are transparency on techno-economic criteria on costs and performances and harmonised reporting modalities.

The authors elaborated that there are also five external factors outside of the four features of design and implementation of the EPR scheme, namely population density, historical development of the waste collection and treatment infrastructure; value of secondary materials on the national market; awareness of citizens about the existence of separate collection schemes as well as their willingness to participate in collection schemes, and existence of other waste policy instruments.

For this research, the factors from the reports were deemed to be the most suitable in identifying the drivers and barriers for international EPR formulation. The suitability for using these findings as the analytical framework is due to the four features of the EPR scheme design and implementation which were overarching in nature thus can cover many issues under each feature. Furthermore, the five external factors also contain various socio-political aspects that have the potential to affect the design and implementation of an EPR. The four features were categorised as the factors to identify both driver and barrier for the formulation and implementation of an international EPR for plastic packaging waste. The five external factors were merged into one umbrella factor that consisted all of them. In the end, there are five factors to identify driver and barrier for the formulation and implementation of an international scheme which can be seen below:

Table 2-1. Five factors of EPR development and implementation to identify the drivers and barriers of an international EPR scheme as adapted from the research of Monier et al. (2021)

Factors on EPR Design and Implementation According to Monier et al. (2021)	**Driver**	**Barrier**
Allocation of responsibilities and dialogue among stakeholders		
Cost coverage		
Fair competition		
Transparency and control		
External factors • Population density and country geography; • Historical development of the waste management infrastructure; • Value of secondary materials on the national market; • Awareness and willingness of citizens to participate; • Existence of complementary waste policy instruments.		

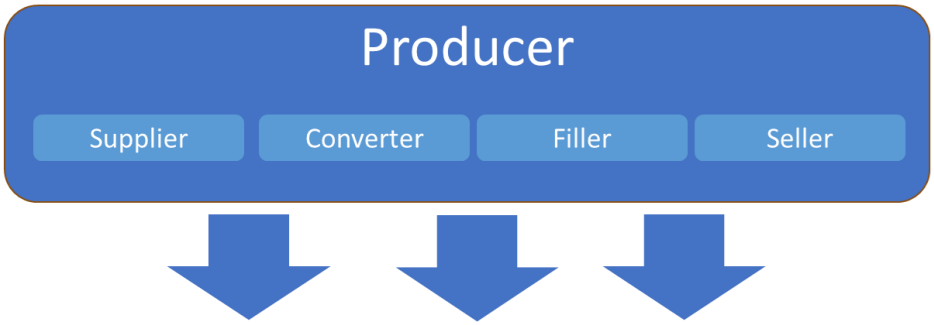
In developing the analytical framework for answering RQ1, there were other potential frameworks considered before the current one from Monier et al. (2014) was selected. Firstly, a framework could be developed from the research of Kunz et al. (2014) who discovered seven key implementation issues in EPR that, similar to the framework from Monier et al. (2014),

could serve as either driver or barrier. These issues are recycling standards, waste value, competitive market, design incentives, legislative complexity, simplicity in implementation, and EPR coordinating framework. Though comprehensive in terms of identifying EPR implementation issue, this finding did not determine factors external to the EPR scheme implementation which are equally important. The other potential framework was from Portugaise et al. (2023) who presented a list of external and internal drivers and barriers for producers in implementing the EPR system for WEEE. The identified drivers and barriers in that research were comprehensive as well, was developed for the producer/private sector context, however, it was deemed to be difficult to judge whether a driver or barrier could be an external or internal one when it comes to the national or international level context.

2.4.2 Defining producers and their responsibilities in an international EPR

To define the producers and identify their responsibilities in an international EPR, a framework was developed by merging and adapting three existing frameworks in the literatures. This development is because there is no previous study that fulfils the goal of this research question.

The first framework is regarding the producer in packaging, in which the research from Bix et al. (2009) about packaging design is considered. The research discusses the long supply chain of packaging and presents the different stakeholders that are involved in it. There are *suppliers* that deliver raw materials and components to converters and fillers, *converters* that convert materials to packages, *fillers* that fill packages with products, *sellers* that sell packaged products to another seller, institution, or end customer, *end consumers* that use packaged products, and *end-of-life* manager that manage the EOL of the product. For this study, the stakeholders that are adapted into the framework are the *suppliers* to *sellers* as they are the stakeholders with the role of producing packaging. The second framework originated from the research of Tojo (2004) regarding the types of responsibility a producer has in the downstream segment of an EPR scheme. These responsibilities are physical management (collection, take back, and recovery), financial mechanism (payment of cost related to the product's EOL management), and information management (collection and provision of the activities of the two previous responsibilities). In the research, Tojo (2004) divided the EOL phase into three phases; collection, recovery, and monitoring and enforcement. This framework focused only on the downstream segment of the life cycle, hence, another framework is added and adapted so that the upstream and midstream segments are included as well. A study by Alhazmi et al. (2021) was used as a reference to complement the plastic product life cycle stages. In their study, it is stated that the stages of the plastic product life cycle are raw material extraction, production, fabrication, use, and end of life. While the rest of the life cycle stages are deemed clear enough, production and fabrication need to be clearly delineated. Alhazmi et al. (2021) defined plastic production as the phase to process monomer and manufacture plastic resin, while fabrication is defined as the phase to fabricate and distribute plastic end product. The combined framework is presented below (Figure 2-2).



Types of Responsibility	Plastics Product Life Cycle				
	Extraction	Plastic Resin Production	Fabrication and Distribution of Plastic Product	Use	End of Life
Financial mechanism	Form of Responsibility 1	Form of Responsibility 4			
Physical management	Form of Responsibility 2				
Information management	Form of Responsibility 3				Form of Responsibility 15

Figure 2-2. Framework to determine producers and their responsibilities across plastic packaging lifecycle in an international EPR for plastic packaging waste developed based on the research of Bix et al. (2009), Alhazmi et al. (2021), and Tojo (2004).

The author could not identify any study on an international EPR for plastic packaging waste that involves stakeholders' perspectives, thus, no reference was available to be adapted as an analytical framework for this research. Hence, this called for the development of an analytical framework that picked up different elements from different studies and merged them into a sound analytical framework. In that regard, this framework was developed to capture the comprehensiveness of the plastic producers as well as the life cycle approach that covers all stages of plastic products. The producers as seen in the figure are also used as the uniformised terms for identifying them. This is because the interviewees might give responses on the same producers but with different terms. Case in point is "brand owners" and "packaging users" which actually mean filler, or "retailers" and "distributors" which mean seller. This term adaptation is used throughout this study report to ease the understanding of readers as well. Furthermore, using a life cycle approach instead of downstream only provides benefits. This is because changes to push plastic sustainability need to come from all the lifecycle stages of plastic, thus it is important to identify the upstream measures as well.

Similar to the development of the analytical framework for the first research question, there was also another framework considered for the development of this second analytical framework. For identifying the producer in an international scheme, a framework combined from the findings of Kalimo et al. (2015) and Mayers et al. (2012) was considered. In the papers, the authors discussed the division of responsibility among producers and other stakeholders in the EPR for electrical and electronic equipment. The papers employed a framework that captured the EPR from three distinctive levels: the general level, conceptual level, the multiple levels of governance in policy-making, i.e international/federal (in the context of the papers, this referred to the European Union), the Member State and the municipal level, and lastly the practical EPR implementation level. Though the framework may be able to successfully identify the producer in the international and national level, the framework was not expected to be able to identify

clearly the producer in the long supply chain of plastic producer. Hence, this framework was not used and the reference from Alhazmi et al. (2021) was used instead.

2.5 Conclusion of Literature Review

The literature review discussed the current situation of transboundary plastic pollution and how an international EPR might be a mean to mitigate it. Forrest et al. (2019), Raubenheimer & Urho (2020), and Thapa et al., (2023) all instigated various academic proposals for it, with elements of them similar to the existing national EPR scheme for plastic packaging waste. Those studies proposed different schemes (i.e. global design standard, fund transfer mechanism to developing countries, and pollution fee for polymer producers) and different means of implementation (i.e. creation of a binding plastic management plan, international scope expansion of existing national EPR scheme, and creation of a global Producer Responsibility Organization) for an international EPR. However, as has been teased out many times in this thesis, the studies did not incorporate the perspectives of stakeholders, creating an urgency to conduct research that includes them. The importance of focusing the study towards European and Asian countries is highlighted as well in this chapter. In this literature review, the existing international financial mechanism for implementing a treaty and how EPR could utilise this type of mechanism were also discussed. As there seems to be differing opinions on international EPR could serve as an international financial mechanism or not, studying stakeholders' perspectives might provide more lessons about how the two connect.

Furthermore, the literature review also provided two analytical frameworks that can be used to analyse the collected information in the research. The first one is from Monier et al. (2014) to analyse the driver and barrier in EPR implementation. In this framework, there are five factors on the EPR design and implementation that are set as the guiding factor in determining the driver and barrier for an international EPR scheme. The second one is a framework derived from the research of Bix et al. (2009), Alhazmi et al. (2021), and Tojo (2004) to define the producers and discuss their responsibilities across the different plastic lifecycle stages.

3 Research Design and Methods

This chapter elaborates the design and methodology used when conducting the research. The chapter firstly describes the research design that serves as the background for the data collection and methodology. Subsequently, the data collection method and the materials collected are elaborated. In the end of the chapter, the method for data analysis is presented.

3.1 Research Design

This research seeks to explore the ideas and opinions of stakeholders on the topic of international EPR, hence, qualitative research is deemed to be the most appropriate approach for this thesis. This is because the approach enables the exploration and understanding the meanings of individuals attributed to a social problem (Creswell & Creswell, 2018). Furthermore, qualitative research is also suitable for this research as it enables the researcher to explain "complex phenomena that are difficult to measure with quantitative studies" (Kalu & Bwalya, 2017, p.1) The research is shaped by the Constructivist worldview that relies on the multiple research participants' perspectives through their varied experience and expertise to generate a new understanding (Creswell & Creswell, 2018).

This research falls into the domain of exploratory policy study based on stakeholder values. According to van Ittersum et al. (1998), the benefit of actively involving the stakeholders in a policy study is that a firm basis for innovation can be created and this will lead to the progression in the policy formulation process. More specifically in EPR policy research, stakeholder perspective approach can be considered important. This is because learning different stakeholder and policy objective can enable the coordination and reconciliation in the EPR's collection, recycling, and other practices (Gui et al., 2013).

The interview and study focus on government and producer was due to them being key stakeholders that possess the three attributes; power to influence, legitimacy of claims, and urgency of claims in the matter of EPR (Kunz et al., 2014). Power to influence is possessed by stakeholders who can enforce their will and influence because they have the physical, material, financial or symbolic resources (Etzioni, 1964). Legitimacy of claims is possessed by stakeholders with actions that are desirable, proper, or appropriate within accepted norms and values (Suchman, 1995). Meanwhile, stakeholders whose claims are critical and time-sensitive possessed the urgency of claims (Mitchell et al., 1997). Governments have the power and legitimacy to implement and set national targets for EPR and their claims for EPR compliance are urgent too. Meanwhile, the power of the producers lies in its influence towards the set up and operation of PROs as they are actors who bear various responsibilities. Meanwhile, their legitimacy comes from alignment of their activities with the PRO system and their claim of urgency comes from the concerns that they have in the EPR system such as the stability and cost-efficiency of the system (Kunz et al., 2014).

3.2 Methods Used to Collect Data

The data collected for this research were stakeholders' perspectives on international EPR for plastic packaging waste. The main data collection method was interview to gain the interviewee's views by utilizing open-ended questions. In addition, literature review from grey literature in the topic of international EPR was conducted to complement the primary data from the interview.

3.2.1 Literature Review

Literature review in this thesis was used for two purposes; providing academic literature background and developing analytical frameworks of the research, as well as capturing the contemporary discussion of the international EPR (or EPR-like) scheme.

For the first purpose, academic literature was searched through Google Scholar since it is considered as the search engine for peer-reviewed articles with the highest coverage (Martín-Martín et al., 2018). The main keywords used in the search engine were "International EPR", "EPR for plastic", "financing mechanism from plastic producer", and "transboundary plastic waste". Studies were then chosen based on their relevance in setting up the academic background and analytical framework of the study. The snowballing method was also used at this stage, where from those studies, more studies were followed up and referenced in the thesis. The literatures were then put in a synthesis matrix to ease the analysis and writing process.

A literature review was also conducted as a data collection method to investigate issues adhered to the two research questions. International EPR is a conceptual framework, hence it is important to add contemporary, non-academic sources to further enrich the understanding on the topic. The search for the grey literature and document was conducted through Google search to expand the possibility of finding suitable references and keywords of "international EPR" and "plastic producer global financial mechanism" were used. Aside from the Google search, some references were also found through the snowballing method that was conducted while reviewing the academic literature. Five documents related to the topic were collected for this study, which were presented in Table 3-1. These documents were obtained from their respective organisations' website.

Table 3-1. Documents collected and analysed for the research

Title	Year	Author	Document Tye
Extended Producer Responsibility: Basic facts and key principles	2024	OECD	Report
Global Plastics Pollution Fee (GPPF): Ghana's Proposal for the International Legally Binding Instrument on Plastics Pollution	2023	Boachie	Presentation
New Aspects of EPR: Extending producer responsibility to additional product groups and challenges throughout the product lifecycle	2023	Brown et al.	Report
Proposal for a Global Plastic Pollution Fee in the legally binding instrument to end plastic pollution	2023	Ghana	Proposal
The Plastic Pollution Fee: Outlining the Options Ahead of INC-3	2023	Charles & Dons	Report

3.2.2 Semi-structured interview

In this research, interview was used as the main data collection method. There was sparse research on the topics, thus, interview was deemed to be the most suitable data collection method for this exploratory research. This is because by doing an interview, there was a chance to ask probing questions and get to know the research participants personally (Jain, 2021). Purposive sampling was conducted, specifically to target governments and producers in Europe

and Asia. Semi-structured interview was chosen as it has the advantage of enabling follow-up queries for the questions asked in the interviews (Adams, 2015).

The interview questions were developed based on the two research questions. Questions about interviewees' background and their work and institution on EPR were asked at the beginning of the interview. This was then proceeded by key questions related to the two questions. Supplementary questions that revolve around different topics such as plastic waste export – import, informal waste sector inclusion, and upstream design change were also asked during the interviews when there was time remaining during the interview. The list of questions can be seen in Appendix 1. Interview Guide. Prior to the interview, a consent form (Appendix 2. Interview Consent Form, for reference) was sent and collected from the interviewees. For the interviewees who did not fill and send the form back, a verbal consent statement was recorded at the beginning of the interviews.

Prior to the interview, a brief research design was sent to the interviewees to provide them with the information and goal of the research. All the interviews were conducted through Zoom except for two that were done through Microsoft Teams. The average length of interview time was around 45 minutes. The interview was conducted in English, except for the stakeholders from Indonesia where Indonesian was used. Interview invitations were distributed in early March and all the interviews were conducted from the timeframe of 11 March – 6 May 2024.

Fourteen interviews were conducted in the study, with six interviewees from the government side and eight from the producer side. The complete lists of the interviewees and their profile are presented in Table 3-2. The interviews conducted were transcribed using a third-party service; otter.ai. For the interviews in Indonesian, there was a different prior step that was conducted that is translating the text into English, in which Google Translate was used. This was then transcribed using the same third-party service. The transcription, as well as the Indonesian translation, was manually checked to ensure that there was no mistake in the transcription and translation process by the website. This process was done for all the interviews except for one that did not give consent to the use of third-party transcription services, in which the transcription was done manually.

Table 3-2. List of interviewees in the research

Stakeholder Group	Respondent Code (for in-text referencing)	Position	Institution
Government	G1	Deputy Director for Solid Waste Reduction	Ministry of Environment and Forestry, Indonesia
	G2	Director of Waste Minimization Sub-division	Ministry of Natural Resources and Environment, Thailand
	G3	Senior Policy Advisor	Environmental Protection Agency, Sweden
	G4	Head of Strategy & External Relations pEPR	Department for Environment, Food and Rural Affairs, the United Kingdom
	G5*	Officer	European Commission
	G6	Deputy Director for Resource Circulation of Plastics and Packaging	Ministry of Environment, Japan
Producer	P1	Managing Director	Expra (alliance of packaging and packaging waste recovery and recycling organizations)
	P2**	Officer	Rigid plastic packaging producer in Europe
	P3	Sustainability Director	Amcor Flexibles (plastic converter company)
	P4**	Officer	Multinational FMCG company based in Indonesia
	P5	International policy officer	CITEO (PRO in France)
	P6**	Consultant	A PRO in Europe
	P7	General Manager	Indonesia Packaging Recovery Organization
	P8	Research and Innovation workgroup leader	Indonesia Packaging Recovery Organization

**G5 opted not to be identified by position for this research*

***P2, P4, and P6 opted not to be identified through position and institution for this research*

3.3 Methods Used to Process Information

In analysing the data, qualitative content analysis was conducted, utilising the book from Schreier (2012) as a guidance and using the NVivo 14 software. Following Allsop et al. (2022) suggestion on NVivo coding, an Open Coding was conducted as the interview amount was under twenty. Open Coding itself is coding activity in which a reading through of the interview and recording was conducted and giving a brief conceptual code that reflects what the interviewees are discussing (Marks, 2015).

The coding was conducted deductively, with themes that were pre-determined before the coding and were developed as a derivative of the two research questions. For the first research question, there were ten themes that were used to guide the coding process. The first five themes were "driver – allocation of responsibilities and dialogue among stakeholders", "driver – cost coverage", "driver – fair competition", "driver – transparency and control", and "driver – external factors". The rest five themes for this research question were the same but with the "driver" replaced by "barrier". Meanwhile, for the second research questions, eight themes were developed. The first four themes were to identify the producer in an international scheme, they were "supplier", "converter", "filler", and "seller". Meanwhile, the remaining three themes were developed to identify the responsibilities of the producers in an international scheme, they are "financial mechanism", "physical management", and "information management".

After the coding of the interviews in the NVivo was finished, the coding result was collated and presented in a framework matrix, a feature that was available in NVivo. This framework matrix was then exported to a Microsoft Excel spreadsheet to ease the reading and interpretation of the result. The grey literatures also went for the same coding process for its qualitative content analysis.

4 Results and Analysis

This chapter presents the results and analysis from the data collected from the interview as well as documents. This chapter is structured by setting each research question as a sub-chapter. Collected data from documents related to the research topic are also presented, with some adjustments following the corresponding research question, to complement the interview and add depth to the discussion of the topics.

4.1 Drivers and barriers for the formulation and implementation of an international EPR for plastic packaging waste

During the interviews, the barriers to the formulation and implementation of the international scheme are always brought up first, signifying how it is mostly a challenging task to establish the international scheme. The interview with the stakeholders yields several driving and obstructing factors in the formulation and implementation of the international EPR for plastic packaging waste. The results from the interview and literature review on the drivers and barriers on the international EPR formulation and implementation align with the analytical framework as presented in sub-chapter 2.4.1, except for the fair competition factor which is not found during the study. In this sub-chapter, the findings of drivers and barriers are presented in four sections corresponding to the factors used as the analytical framework of the study.

4.1.1 Allocation of responsibilities and dialogue among stakeholders

This factor covers the allocation of producers' responsibility and coordination among stakeholders related to EPR schemes. In this regard, from the data collected in this research, this factor yields as both driver and barrier to the formulation and implementation of an international EPR scheme for plastic packaging waste. Five interviewees (G3, G4, G6, P1, and P7) opinioned that this factor is a driver for the international scheme. Meanwhile, more than half of the interviewees (G1, G5, P1, P2, P5, P6, and P7) considered that this factor is the major barrier to the establishment of the international scheme with different concerns voiced by them. A summary of the drivers and barriers in this factor and the interviewees who raised them can be seen in Table 4-1 below and a detailed explanation of them are presented in the subsequent paragraphs.

Table 4-1. Drivers and barriers in allocation of responsibilities and dialogue among stakeholder factor and the staekholders that raised the issue

Factor: Allocation of responsibilities and dialogue among stakeholders	
Driver	**Barrier**
Funding availability from the private sector (G3, G6)	Institutionalisation (G1, G6, P1, P2, P5)
Industrial coordination and collaboration (G4, P1, P7)	Fairness in defining the producers and their responsibilities (G1, P2, P4)
	Unclear definitions and responsibilities of the international scheme (G5, P5, P6)

There are several reasons why the allocation of responsibilities could be a driver, especially for the producer or industry, to support the formulation of an international EPR. G3 stated that

funding availability from the private sector for improving waste management could drive an international EPR implementation. With the available funding, EPR formulation and implementation can be pushed and with this, a lot of things can be achieved. Producers will be taking the responsibility for managing waste in environmentally sound way and then they will be improving the plastic product design to be more sustainable. Other than that, with the available funding other activities related to plastic waste management can be conducted as well, such as cleaning up the legacy plastic. Meanwhile, related to this sub-factor, G6 provided an example of the Alliance to End Plastic Waste (AEPW). It is a coalition of various organisations in which the world's major petrochemical companies are its members. AEPW funds and supports the implementation of various plastic waste management projects in countries all over the world, which according to G6 is a form of global producer voluntary responsibility to tackle plastic waste problem. Meanwhile, G4 elaborated that *industrial coordination and collaboration* can also push an international EPR scheme, or at least a regional one. G4 provided an example of the packaging dynamic in North America, where producers in Canada produce their packaging in the United States. The regional EPR scheme would make sense in the case where the producers work together in a region to fulfil their responsibilities. According to P1, *industrial coordination and collaboration* can push an international EPR because for the industry it would be easier to contribute to one, global EPR scheme instead of to multiple EPR schemes for their products that are spread internationally. Lastly, P7 stated that through this international coordination and collaboration is important as plastic waste is a transboundary problem thus requires, and will eventually push for, a collaboration from different producers from different countries. P7 also stated that a massive collaboration from many different producers is needed to reduce the risk of free riders.

In this first factor, however, the identified barriers outweigh the driver. G1 highlighted the *institutionalisation* of an international EPR which requires coordination of relevant international producers and stakeholders. In a national scheme, the producers can be easily bound through national legislation to be involved in an EPR scheme as a producer and implement the scheme according to the role decided for the producer. Meanwhile, in an international scheme, it would be difficult to bind the producers directly to the scheme, so the scheme must first bind the states and then the states to bind the private sectors. This can become complex and will be further complicated when the relation between the producers and other stakeholders at states-to-states level, states to regions level, and so on needs to be defined. Related to *institutionalisation,* P5 questioned whether an international EPR would still be considered an EPR per se if the management is carried out by non-producers. Furthermore, in an international EPR, the existence of a potential global PRO would still require national PROs from different countries because it is the national PROs that understand better the local plastic waste situation and how the fund is used in the best way. Thus, coordination between the global – national PRO is needed. Also, national PROs are needed because there are local, small to mid-sized companies that need to contribute to the EPR instead of the global, major plastic producers only (P1). Deciding the implementing body for the scheme and how it would be regulated and controlled, and monitoring compliance of the private sector are other institutional challenges for an international EPR (P2). Also, international EPR is only possible to be formulated and implemented at an international level where there is a global discussion and agreement on how the international scheme should be like. Just like other international agreements, this one would be difficult to achieve due to the different opinions and aspirations that the stakeholders bring into the negotiation (G5).

G1, P2, and P4 highlighted *fairness and legitimacy in defining the producers and their responsibilities* as the barrier of international EPR for plastic packaging waste from the first factor. G1 suspected that an international EPR scheme would serve as a legalised mean to send waste to the target countries as long as the sending countries pay the EPR fee. This will then become a license to

pollute, where the sending countries can irresponsibly ship their plastic waste abroad without further responsibility on managing the plastic waste in the recipient countries. P2 and P4 as producers offered a different take on the fairness issue. P2 argued that an international EPR might have a fairness and legitimacy issue in defining its producers and their responsibilities. Providing example of plastic pollution in the ocean, P2 argued that plastic industry has long been experiencing "Plastics Bashing" over this issue and is often demanded to mitigate this issue while it is Abandoned, Lost and Discarded Fishing Gear (ALFDG) that polluted the ocean the most[1]. Meanwhile, P4 argued that international EPR disproportionately affects multinational companies in developing countries compared to those in the developed countries. This because the producers in developing country bear bigger responsibilities than their counterparts in the developed countries as they must invest more for the scheme due to the limited waste infrastructures and human resources in latter.

Lastly, G5, P5, and P6 highlighted *unclear definitions and responsibilities of the international scheme* as a barrier. G5 and P5 elaborated on the current plastic treaty negotiation where there are two separate elements related to this topic. The first element is on the inclusion of EPR as a scheme to manage plastic waste in the state members of the negotiation and the second is on the global plastic pollution fee. As the negotiation is ongoing, these two elements are abstract and conceptual only thus no clear definition and responsibility of the international scheme. However, for the global fee, already there are some concerns such as resistance toward the fee that can be seen as an international tax and deciding the institutionalisation of a global fee. In this matter, P6 elaborated on the need to define and set the primary responsibilities of the international scheme be it through a top-down approach (from the UN to member states) or a bottom-up approach (from the state members to the global negotiation).

4.1.2 Cost coverage

This factor covers the EPR cost coverage and proportion. In this factor, only barrier is identified, namely on fee formulation for the international EPR. Table 4-2 below shows the summary of the identified barrier in this factor and the stakeholders who raised the issue.

Table 4-2. Drivers and barriers in cost coverage factor and the stakeholders that raised the issue

Factor: Cost Coverage	
Driver	**Barrier**
	Difficulty in fee formulation (G3, G5, P1, P3, P6)

There are a lot of different considerations that lead *difficulty in fee formulation* to be a challenging issue in an international EPR scheme. P1 argued that EPR fee is different from one country to another, and it is challenging to identify, formulate, and draw the money that is needed from the countries in an international scheme. The complexity of EPR fee is also exacerbated with different purchasing power level in different countries, where a price increase for a product due to added cost of an international EPR fee could significantly affect consumers in developing countries (P3). Meanwhile, according to G3, the existing EPR like proposal (Ghana's GPPF) is

[1] Different studies state different data in terms of the most polluting item in the ocean. As a reference, study from Ronkay et al., (2021) briefly discusses the statistical background of marine debris composition and abundance.

close to global tax. Until now, countries have been and are very reluctant for any kind of global or international tax. Regarding to global tax, G5 also shared the same concern with G3. A tax at the global level would be quite novel. There has been attempts to introduce such tax, such as the carbon tax, in an international level, but none has worked so far due to the international community reluctance. There would be resistance on this tax too as there would be a double-taxing (in international and national level) issue for the private sector. Lastly, there will be issue of fair competition as well, related to how different players in different jurisdictions react to this global tax. In terms of the Global Plastic Pollution Fee (GPPF), there are also practical questions on its formulation and implementation such as the calculation method, fee collection procedure, and proportion of the fee to be used internally or externally. P6 shared another doubt on this global tax that is the use of the revenue. Once collected, the revenue from the packaging tax is not always allocated for purposes related to plastic waste management activities such as packaging design improvement, waste collection enhancement, or effective recycling. This can get trickier when the tax is collected in an international level, where there are many stakeholders with different administrative processes.

4.1.3 Transparency and control

Transparency and control factor focuses on the transparency on techno-economic criteria on EPR costs and performances as well as harmonised reporting modalities. In this factor, the study identifies one driver and four barriers for the formation and implementation of international EPR. A summary of the identified drivers and barriers for this factor are presented in Table 4-3 below.

Table 4-3. Drivers and barriers in transparency and control factor and the stakeholders that raised the issue

Factor: Transparency and control	
Driver	**Barrier**
A need for harmonised standards of plastic packaging (P3, P8, OECD)	Poor data quality (G4, Brown et al.)
	Corruption issue (P1)
	Monitoring and reporting (P1)

For the driver, P3 and P8 mentioned *a need for harmonised standards of plastic packaging*. Such harmonised standard is important as it can set the mandatory requirements for the environmental properties of plastic packaging. When the harmonised standard is applied in different jurisdictions, then the flow of plastic packaging and waste can go easily from one jurisdiction to another as they are of the same standard and quality, and this can be a precedent for the development of an international EPR scheme. P3 provided an example of Packaging and Packaging Waste Directive in the European Union. In it, there is a provision on recycled content of post-consumer plastic which must be sourced within the European Union and if it comes from outside the European Union, it must be basically collected and processed with similar environmental standards. P3 further elaborated that this harmonised standard is important to avoid fraud in plastic recycling. Case example is the availability of post-consumer recycled plastic in some Asian countries while it is, in fact, virgin plastic. With harmonised

standard, the international trade of such fraudulent plastic product can be avoided. Meanwhile, the report from OECD (2024) elaborated that EPR system harmonisation (in, for example, scope of product coverage, reporting requirements, and data format and definition) could contribute to the reduction of transaction cost and ensure compliance, especially for products where the same producer operates in multiple national markets.

For the barriers from transparency and control factor, three of them are identified, namely *poor data quality, corruption issue,* as well as *monitoring and reporting. Poor data quality* is an issue because there are producers who do not possess sound information on the tonnage of the plastic packaging that they produced (G4). This is due to the companies that are not used to collecting such data and only estimating them. Furthermore, long and complex supply chain is another challenge in ensuring a sound plastic packaging data. Plastic packaging being put on the market is often distributed through various retailers, this increases the difficulty in collecting plastic packaging data. Brown et al. (2023) provided another example on why data quality is a barrier in international EPR formulation. When determining a potential Advance Disposal Fee as a form of EPR for products across border, there is often data uncertainties on the exported product, which cause the formulation as well as the accountability of the fund to be problematic. P1 also mentioned the looming *corruption issue* in an international EPR scheme. This could arise because the fee collected in a global scheme could be in a huge amount and this will attract many stakeholders with their different interests and priorities. From the involvement of many stakeholders, the chance of corruption on the fund could increase. *Monitoring and reporting* are another challenge for an international EPR according to P1. For the top plastic companies, disbursing fee to the global EPR is not much of a difficulty. However, for local, smaller companies, it is challenging to pay the fee to this global EPR where the office of this global EPR might be located somewhere far away.

4.1.4 External factors

The last factor affecting the formulation and implementation of an international EPR is the factor external to the EPR design and implementation. Out of five sub-factors, three sub-factors are identified in this research, namely historical development of the EPR policy and waste management infrastructure, awareness and willingness of citizens to participate, and existence of complementary waste policy instruments. The study discovers that external factor serves as both driver and barrier for the international scheme formulation and implementation. The summary of the drivers and barriers in three external sub-factors is presented in Table 4-4.

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Table 4-4. Drivers and barriers in external factor and the stakeholders that raised the issue

Factor: External factors		
Sub-factor	Driver	Barrier
Historical development of the EPR policy and waste management infrastructure	Waste management technology transfer (P7) Legislation (P6)	Different capacity and knowledge on EPR (G1, G3, P4, P5, P7) Local regulation (G4 and P3)
Awareness and willingness of citizens to participate	Societal pressure (P2)	
Existence of complementary waste policy instruments	Upcoming plastic treaty (G1, G3, G6, P5) Informal sector involvement (G3)	Informal sector involvement (G2)

The first sub-external factor that serves as a driver is the historical development of the EPR policy and waste management infrastructure, to be specific, *waste management technology transfer* (P7). Waste management technology is ever-growing, and different kinds of plastic can be mitigated and recycled in an environmentally sound manner. The more advanced the technology of a country, the more plastic waste can be managed. As plastic waste is a transboundary issue and to close the gap in waste management capacity between developed and developing countries, waste technology transfer is seen as necessary to have coordinated efforts throughout the world to clean up waste. This waste technology sharing, once distributed to the majority of the countries, can prepare the world for implementing an international scheme for managing plastic waste such as international EPR.

The second identified sub-external factor is the awareness and willingness of citizens. This is evident from the answer of P2 that mentioned *societal pressure* as a driver for formulating the global scheme. In recent years, criticism towards the plastic industry have created a push for more recycling. Now, there are a lot more recycling activities taking place than it was ten years ago. A similar push and outcry from society could push forward the agenda of international EPR formulation and implementation.

The third sub external factor that serves as a driver is existence of complementary waste policy instruments. This third sub-external factor is mentioned by P6 as *legislation* that can create a competition fairness where there is a clear rules for all the stakeholders. It cannot be left for the market alone to self-regulate because market will never be able to solve the problem. Legislation on the local, provincial, and national level need to be prepared before then they are brought for a further discussion in the global level. Furthermore, the *upcoming plastic treaty* is identified as a driver due to its global implementation in mitigating plastic pollution. According to G1 and P5, the Internationally Legally Binding Instrument on Plastic, with its negotiations to be completed by the end of 2024, is a driving factor for the formulation and implementation of an international EPR due to its binding nature. International EPR will only work if it is a mandatory scheme instead of a voluntary one, and the upcoming plastic treaty will be one scheme that pushes that (G1). The plastic treaty could also provide a global legal basis for setting common frameworks for EPR for countries all over the world to follow (P5). Lastly, the discussion

currently taking place in the treaty negotiation also focuses a lot on applying the concepts of EPR and Polluters Pay Principle for the financing of the treaty. Though not discussed in the context of international EPR, the application of those principles may enable responsibility sharing on financing the treaty implementation (G6). The last one related to waste policy instrument is i*nformal sector involvement* that is mentioned as a driver for an international EPR by G3. If the communication is done properly, the introduction of an international EPR could help the informal sector to get a more decent work, working situation, and social right.

For the barriers, two sub-external factors are identified as such, namely historical development of the EPR policy and waste management infrastructure and existence of complementary waste policy instruments. For the historical development of the EPR policy and waste management infrastructure, *different capacity and knowledge on EPR* are the first barrier in formulating and implementing an international EPR. Different countries have different capacities to support the implementation of an international EPR. Reflecting on the considerably young EPR system for plastic packaging in Indonesia, G1 argued that the governance and the management of the EPR of the country needs to be strengthened first before implementing an international EPR scheme. This calls for a manifold improvement in various fields be it infrastructure, regulatory system, and coerciveness of the EPR regulation. According to P5, different countries are also at different stages of EPR implementation, and it could be difficult to oblige countries in early stage of EPR implementation to financially support a global EPR fund. Meanwhile, G3 elaborated differently on the matter of capacity. G3 elaborated that Sweden, where G3 is from, and the European Union have worked for a long time in implementing EPR, with lots of experience and knowledge on the implementation. However, this can lead them to "*...stuck with our way of thinking about how the EPR system should look like and we can also be a bit reluctant to change our minds*" (G3, personal communication, 9 April 2024). This fixed and unchanging mindset leads to the challenge in the implementation of a novel concept such as international EPR. P4 also stressed the limited waste management infrastructure and education or knowledge on the EPR in developing countries which could challenge the implementation of an international EPR. According to P7, understanding and interest on EPR are not always necessarily shared between one country to another, and this could become an obstacle in formulating an international EPR.

Meanwhile, for the existence of complementary waste policy instruments, *informal sector involvement* and *local regulation* are identified as barriers. *Informal sector involvement,* aside from being identified as a driver, is also being identified as a barrier. This aspect is a challenge in implementing international EPR for plastic packaging waste, especially in developing countries where informal sector is driving mechanism in their waste management. According to G2, waste pickers, as a part of waste informal sector, are dominantly poor people with limited access to healthcare albeit the hazardous and dangerous nature of their work. They are also unwilling to be included in the formal sector unless they are offered good income. An international EPR must be able to incorporate informal sector into its scheme and mitigate the challenges the waste pickers are facing to attain the Sustainable Development Goals (SDG), especially SDG 1 No Poverty, SDG 3 Good Health and Well-being, and SDG 8 Decent Work and Economic Growth. This becomes a challenge because an international scheme will need to be able to accommodate all these rights of the informal sector that are different from one country to another.

The other challenge is *local regulation* (G4 and P3). Certainly, regulation of EPR is different from one country to another. Even in different states and provinces of a country, EPR policy could have different form of design and implementation. The harmonisation of those local regulations is a challenge should a country implement an international EPR. G4 provided an example of Canada where its provinces have their different type of EPR schemes and consolidation on this is being pushed forward. However, consolidation is not an easy task as well due to the

differences among provinces (i.e. in the Canada case, language barrier where the Québécois speak French). Simultaneously, P3 provided an example of the United Kingdom where its municipalities have hundreds of different collection schemes with different logistics, and this proliferate also for the EPR schemes.

4.1.5 Summary of the drivers and barriers

From the interviews, the drivers and barriers for the formulation and implementation of international EPR for plastic packaging waste are identified and presented in Table 3 below. The drivers and barriers are presented according to the five factors of EPR design and implementation framework from sub-chapter 2.4.1. Three factors in the framework, namely allocation of responsibilities and dialogue among stakeholders, transparency and control, and external factors consist of both drivers and barriers for the formulation and implementation of the international scheme. Interestingly, informal sector involvement from external factor is identified as both driver and barrier. Meanwhile, in the fair competition factor, there is neither driver and barrier identified. In cost coverage factor, there is only barrier identified, which is fee formulation. The summary of all the drivers and barriers for the formulation and implementation of an international EPR for plastic packaging waste can be seen in Table 4-5.

Table 4-5. Summary of drivers and barriers in the formulation and implementation of an international EPR for plastic packaging waste as adapted from Monier et al. (2014)

Factors on EPR Design and Implementation According to Monier et al. (2021)	Identified Drivers	Identified Barriers
Allocation of responsibilities and dialogue among stakeholders	Funding availability from the private sector, industrial coordination and collaboration.	Institutionalisation, fairness in defining the producers and their responsibilities, unclear definitions and responsibilities of the international scheme
Cost coverage		Difficulty in fee formulation
Transparency and control	A need for harmonised standards of plastic packaging	Data quality, corruption issue, monitoring and reporting
External factors • Historical development of EPR policy and waste management infrastructure • Awareness and willingness of citizens to participate • Existence of complementary waste policy instruments	Waste management technology transfer, societal pressure, legislation, upcoming plastic treaty, and informal sector involvement	Different capacity and knowledge on EPR, informal sector involvement, and local regulation

4.2 Defining producers and their responsibilities in an international EPR

In defining the producers for an international EPR for plastic packaging waste, the responses from the interviewees can be categorised into three: plastic converters, plastic fillers, and multiple producers. Meanwhile, the responsibilities of producer in an international scheme as determined by the analytical framework in 2.4.2, namely financial mechanism, physical management, and information management, are also identified. The following sections describe the findings from the interviews as well as from the complementary literature review.

4.2.1 Producers in an international scheme

The interviewees responded that in an international EPR for plastic packaging waste, the producer taking the main responsibility should either be plastic converters, plastic fillers, or multiple producers. None of the interviewees answered that plastic suppliers or sellers should be the main producer in the international scheme. Reiterating from sub-chapter 2.4.2, on the producer categorisation; converters are producer that converts materials to plastic packages while fillers are producers that fill plastic packages with products. Meanwhile, multiple producers is a category emerging from the interviews in which a mandatory involvement of all said producers in operating an international EPR is needed. During the interviews, it should be noted that some of the interviewees considered the polymer fee (i.e. collecting fees from multinational plastic converters) as a form of international EPR, while others did not. The elaborations of this, as well as other producers' definitions, are presented below.

Plastic filler as producer

G4, G5, P2, P3, P4, P5 and P6 proposed that *plastic filler* should be the producers in an international scheme. G2 argued that this is because plastic filler has the design control of the product and packaging design, and it is difficult to justify why other producers need to be involved in this. Plastic converters do not have a lot to say on what happens to the material, while plastic sellers do not really have a choice on what kind of packaging the products they sell are made from. Similar opinion comes from P6 who stated that it is the plastic fillers who decide the packaging design and they will try to find the plastic converter that can fulfil their demand on the design that they need. Related to this, P3 similarly stated the same reasoning since the plastic fillers are clearly the first producers who put the products into the market. Also, on setting up plastic converter as the international scheme's producer, it is not always clear since what they produce not always becoming a product packaging. G4 also voiced out the same concern as it is complicated to identify the upstream suppliers that are usually multiple. Lastly, G5 and P5 put a clear separation on the producer definition based on the current discussion in the Plastic Treaty negotiation. If the term "international EPR" is referring to the setting up of national EPR schemes in the member states of the Treaty, with a possibility for its scope to extend international as it currently stands in the current Treaty draft, then the producer is plastic filler as the final product producer, not the chemical or polymer producers.

Plastic converter as producer

The next identified producer for an international EPR scheme is *plastic converter* that are proposed by G1 and P4. Plastic converter is proposed as the producer because of the international scope of its commodity, plastic material, polymer, and ore, is known for its international trade. Packaging industry also imported its material from abroad. Meanwhile, for the plastic fillers, their products are mostly marketed and sold inside of a country only. In Indonesia, for example, to increase the production in the country, the imports of the products from abroad are limited, making a minimal international product circulation in the country. This makes plastic converter the suitable producer for an international scheme (G1). The other rationale to set plastic converter as a producer is because the upstream nature of it. To push the change from the upstream side would trickle down to a positive change from the downstream side compared to targeting midstream or downstream producer (P4).

Regarding the definition of plastic converter as the main producer in an international scheme, it is also important to note perspectives that think otherwise, especially in relation to the upcoming plastic treaty. G5 and P5 opinioned that multinational plastic converters provide fund to support waste management activities or the implementation of the plastic treaty in developing countries is not an international EPR. That form of contribution would be a new international financing mechanism, as written in the current draft of the Plastic Treaty.

Aside from the perspectives collected from the interview, the study from the grey literature provides a glimpse on the EPR-like international financing mechanism called Plastic Pollution Fee proposed by the Minderoo Foundation (Charles & Dons, 2023). In this proposal, Charles & Dons elaborated the advantage of setting a fee from plastic converters as previously discussed by Fullerton & Wolfram (2012) and Williams (2016), who stated that the converters are the "natural choke point" in the supply chain where the number of stakeholders is relatively small, thus reducing collection and enforcement cost as well as reducing risk of improper collection of the fee. Furthermore, plastic converters are concentrated to a small number of industry players in a small number of countries where none of them are found in Least Developed Countries (LDCs) or Small Island Developing States (SIDs). This highlights the ease of pinpointing them and asking their contribution for the Fee. Charging the Fee further down in the value chain, such as plastic filler or seller, is inadvisable as it would increase the number of industries involve thus increasing the administrative complexity, cost, and non-collection risk (Charles & Dons, 2023).

Imposing a Fee on the producers will rectify the market's failure to impose the costs of pollution on the producer (Charles & Dons, 2023). However, the report also mentioned the disadvantage of setting a fee on the plastic converter. That is, the difficulty to distinguish different pollution costs in the downstream product. Therefore, this Fee could be complemented with other national-level economic instruments to target problematic downstream products (Charles & Dons, 2023).

A similar proposal for international financing mechanism based on the contribution of plastic converter producers is from Ghana; the Global Plastic Pollution Fee (GPPF) (Ghana, 2023). The collection of GPPF would be considered as an effective effort as the supply chain is concentrated at that stage; there are relatively few plastic converters/countries in the world. As GPPF is globally coordinated, it could create a level playing field for all producers compared to the fragmented national fees. In this proposal, Ghana argued that producer countries should receive a sizable share of the GPPF to cover the cost of collection of the fee from their producers. In a separate document, Boachie (2023) as the Plastic Treaty National Focal Point for Ghana elaborated that the GPPF is the extension of Polluters Pay Principle. By this, the GPPF can demand the accountability of upstream plastic producers rather than the accountability of those in midstream – downstream only as normally found in conventional EPR schemes.

Multiple producers as producer

The last category for producer is multiple producers, where both plastic converters and are involved, and even other producers as well (G2, G3, and P8). According to G2, different producers (plastic fillers, Original Equipment Manufacturers) should be involved with various levels of responsibilities. The biggest responsibility should be on the plastic fillers because they are mostly big companies. Small-Medium Enterprises (SMEs) could be involved too albeit with a much smaller responsibility. The involvement of SMEs as producer is due to the role they play as plastic sellers, where they use single-use plastic bag or food container to fulfil the high demand for it by the street food vendors in G2's country of origin, Thailand. Other than plastic and plastic raw material producers, importers could be set as producer in an international scheme as well, where there will be different methods to collect their contribution (i.e. fee for the volume of plastic raw materials or Eco-modulation fee for the plastic product) (G3). Lastly, according to P8, the producer in this international scheme could be whoever who puts the packaging products for the first time in the market, including plastic seller. Because of this, several types of producers could be set as the main producers in an international EPR.

Flexibility in defining producer

Perspectives on the flexibility on defining the producer in an international scheme are also identified. According to P1, producer definition in an international EPR will be different depending on the scheme's goal itself. If the goal is just to collect fund, then it is the easiest to target material producers as globally they are the smallest number of players. However, if it is to reduce the overall environmental impact by reducing the amount of packaging put on the market, then plastic fillers and sellers are the better partners. Meanwhile, according to P6, "*But, there needs to be an international advisory body first, where later they will determine who the producers are and maybe later the emphasis will be placed on the national context of each country*" (P6, personal communication, 23 April 2024). P6 elaborated EPR scheme in each country is different, and there are many country-specific aspects there. This is where the global advisory body has a role to play; to collect and compare different views and perspectives from different countries to draw out the common ground on EPR schemes that potentially can be implemented globally. This advisory body also has the role to map the stakeholders in the world and what impacts, contributions, interests, and relations they will bring to an international scheme.

4.2.2 Producers' responsibilities in an international scheme

The next point of the discussion with the interviewees was the responsibilities of a producer in an international scheme. The responsibilities of the producers as laid out in the analytical framework in sub-chapter 2.4.2, namely financial mechanism, physical management, and information management are all proposed by the interviewees as well as by the existing related literature.

Financial mechanism

G3, P1, P4, and P6 stated that the financial mechanism of an international EPR must be adapted to each country's specific context. Speaking from the experience of the plastic treaty negotiation, G3 argued that each country wants a system that fits its own needs and has flexibility on how the money should be collected and used. G3 proposed that in terms of a global EPR, it better take the form of a global binding obligation for each country to develop an EPR system, at least for some prioritised sectors like packaging and fishing gear. In its implementation, the countries should have a high degree of national flexibility. Similarly, according to P1, waste management is a local topic, hence it needs local solutions as well. It will be much easier and quicker to oblige countries to create local PRO systems where a global PRO system will collect the fund to support them. This local approach is important because there are many national companies that need to be responsible in the EPR aside from only multinational companies. P6 stated a similar opinion, stating that the financing should be at national level so that it can reach out easily to the state, provincial, and municipal levels. P4, though supported the creation of a global EPR, stressed the importance of having local PROs in countries first, not the other way around. This is to safeguard in case the global EPR does not work, then at least the countries would already have a national PRO. In relation to global PRO, P2 stated that through a global organisation, the knowledge and experience of waste management from each country would be accumulated in one place. Thus, it would be easier to help the countries in managing their plastic waste as there are already knowledge pool readily available.

P7 elaborated that the financial mechanism of an international EPR for plastic packaging waste should be decided by the existing international financial institutions such as the World Bank. This is because they have the experience in carrying out or provide financing activities in a global scale. Whether the financing itself comes from plastic converter, filler or other producer, such decision can be decided later by the international institutions and the related stakeholders. This institution can then cooperate with each country's PRO to determine the key action areas in term of national EPR scheme development and implementation.

According to G1, the financial mechanism of an international EPR for plastic packaging would be applying tax for the plastic converter. This is because effort on plastic pollution also needs to start being focused on the upstream players as well. However, G1 thinks that a fair tax formulation for the plastic converters would be difficult, let alone its implementation. Regarding the tax or fee from the international plastic converter, G5 has a different point of view. G5 categorised this as a financing mechanism to support the implementation of the upcoming plastic treaty. Furthermore, according to G5, this financing mechanism is a contentious issue in the plastic treaty negotiation, as it is still a matter to be established in the treaty.

G2 proposed a "damage fee" or superfund as a part of economic instrument for an international EPR. Ocean and coastal area's plastic clean-ups are regularly conducted in some areas of the world, and the most polluting plastic filler can be determined from that activity. In this superfund, plastic fillers whose products are found during the clean-ups need to be held responsible to financially contribute to the clean-up effort of the area. This superfund is important to clean-up plastic hotspot in areas beyond national jurisdiction, such as the Great Pacific Garbage Patch. Regarding to this, G2 conveyed that a damage fee calculation is currently being studied in Thailand to be implemented in the country's regulations related to river and ocean clean-up.

Incentivisation for an environmentally friendly packaging design is also proposed as an economic instrument for an international EPR (G2 and G4). If producers already follow the harmonised guideline for plastic packaging that is existing in a potential international EPR, then incentives should be provided to them. This is especially important for producers in developing country to push a more recyclable plastic packaging (G2). Incentives could also be given to plastic producers that buy recycled content as their materials for producing plastic (G4).

The use of plastic credit that works similarly to carbon credit is also an alternative for international EPR economic instrument (P4). Plastic credit is traceable for plastic converter as the amount of polymer that they buy can be easily noted. From here, different price for different types of polymers can be decided to eventually discourage the production of problematic plastic such as PVC.

A form of Advanced Disposal Fee (ADF) is proposed as a form of financial mechanism by G6. In the case of international EPR, the ADF is designed to transcend national boundary and paid to the country where plastic products are exported to. This aims to financially support the plastic waste management activity caused by the imported plastic product. An alternative for this is to set and harmonise the same ADF regulation on the exporting – importing countries so that additional regulatory measures are not needed.

As teased out previously in the literature review, there is a proposal on the EPR-like financial mechanism by the Minderoo Foundation (Charles & Dons, 2023). In the proposal, the Fee from the plastic converters can take form as either financing instrument or economic instrument, or both. As a financing instrument, the primary role of the fee is to raise fund to support the plastic treaty implementation for developing countries. This means that there should be a calibration for the Fee to ensure that the needs of those developing countries are met. Meanwhile, as an economic instrument, the levying of the fee aims to push the switching of the production and consumption of virgin plastic to recycled polymer or non-plastic substitute. The effectivity on this, however, is dependent on the market dynamics. If demand is not responsive to change of price (inelastic), then only a very high Fee could shift such demand or even the Fee is unable to shift such demand at all (Charles & Dons, 2023).

There are several proposed financial elements for the Fee in Minderoo Foundation's proposal (Charles & Dons, 2023). The proposal raised the issue of geographic differentiation in the Fee, where the lower Fee is imposed to plastic converters in developing countries compared to those in developed countries. However, the differentiated Fee might compromise the competitive level playing field for the plastic converters across the globe and producers might move their production operations to developing countries to avoid the higher Fee. Therefore, it is important to have an uniformised Fee across geographical areas (Charles & Dons, 2023).

To support the economic incentive role of the Fee, exemption and modulation of the Fee can be introduced. The exemption and modulation apply to the polymer product that are deemed sustainable, such as recycle polymers or biopolymers that meet sustainability criteria. Examples of the basis of sustainable criteria could be toxicity, GHG emissions intensity, plastic-to-plastic yield, and biodegradability in the marine environment (Charles & Dons, 2023).

The proposal of GPPF from Ghana has a similar financial mechanism principle with that of the Minderoo Foundation (Ghana, 2023). GPPF's end goal is to generate enough fund to develop waste management infrastructure and cover the cost of implementing the upcoming Global Plastic Treaty. GPPF would be drawn from the plastic converters regardless the country where the plastics end up and whether it ends up recycled or disposed. There could be some modifications to the fee level that could be introduced over time. These modifications could be the addition phase-in period to adjust the impact on plastic demand or the eco-modulation to boost the production of more sustainable plastics.

Ghana also proposed some technical details regarding the institutionalisation of the GPPF (Boachie, 2023). In establishing the GPPF, global standards and regulations for plastic waste management must be established. Furthermore, an assessment of fees based on production volumes and eco-modulation of the fees is conducted. Lastly, the funding for global waste management regulations, systems, infrastructure & services. Boachie (2023, p. 10) also elaborated the five roles of national governments in relation to GPPF, they are:

1. Need for national legislation based on GPPF provisions in treaty;
2. Collection and administration of assessed fees;
3. Retention of % of fees for administrative purposes;
4. Allocation of fees to GPPF fund after national retention; and
5. Reporting on fee collection and allocation to the Conference of Parties (COP).

Information management

There are several information management schemes proposed by the interviewees. G4 elaborated that financing mechanism in an international EPR would be difficult to implement, so an international EPR should be focused on information sharing through a consolidated reporting. This consolidated reporting consists of information on how producers have recycled their plastic products and can create competition among producers on phasing out their non-recyclable packaging so that they look good in this consolidated international report. G2 and G6 proposed a harmonised design and product guideline that should be existing in an international EPR. This consists of standard about the plastic packaging such as recyclable content and post-consumer plastic content. This can ease the producers, especially in the developing countries, to export their products to the developed countries as the standards are all now harmonised. Lastly, P2 mentioned the need to provide information for the downstream consumer about the existing waste infrastructures owned by the producers. This will help the consumers in knowing where their waste needs to go thus increasing the waste collection.

Physical management

P3 mentioned another type of responsibility, that is physical management, that can be achieved by producing packaging that can be sorted and recycled. There is already a clear design requirement that tells products that can be put into the market are those that can be recycled. If it is not recyclable, then the product is not fit for the EPR system.

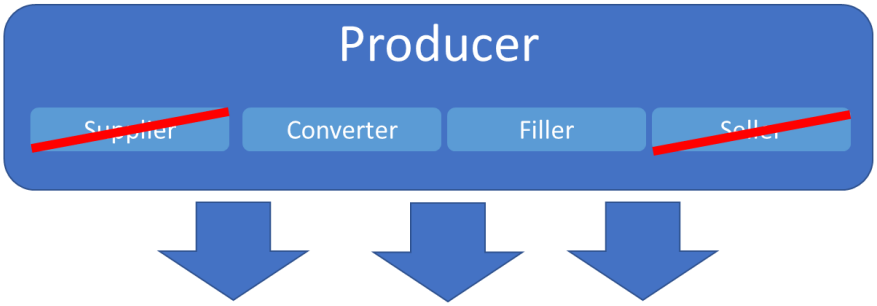
4.2.3 Summary of the producers and their responsibilities

From the interviews and literature review in this study, proposals for defining the producers and their responsibilities in an international EPR scheme are collected. Using the analytical framework in sub-chapter 2.4.2, it is discovered that the majority of the interviewees responded that plastic fillers should be the main producer in an international scheme. Meanwhile, two interviewers responded that plastic converter should be the main producer. None of the interviewees answered that either plastic supplier or seller should be the producer. However, other responses regarding producer definition that are not covered by the analytical framework also come up, such multiple producers as main producers in an international EPR and deciding a producer to a global advisory body on international EPR.

Producer responsibilities in an international scheme are also identified as well, in which financial mechanism is the most proposed form. Financial mechanisms suggested by the stakeholders in this research are a tax for the plastic converter, superfund, incentivisation for an environmentally friendly packaging design, Advanced Disposal Fee, plastic credit, and plastic fee. However, there are also some responses that cannot be categorised accordingly to the analytical framework. For example, some of the stakeholders responded that financial mechanism of the international EPR needs to be decided by and adapted to each country's different context. Another interviewee responded that such financial mechanism needs to be decided by an international finance institution. The existing studies collected and analysed in this study highlighted fee collection from multinational plastic converters to secure financial resources for the implementation of the treaty. It should be noted that for this fee collection, the existing studies do not categorise the fee collection as a form of international EPR, but instead, as an international financial mechanism to fund the upcoming Global Plastic Treaty.

Other than financial mechanism, two other responsibilities of a producer in an international scheme are identified. They are information management that takes form of consolidated reporting on plastic recycling rate, harmonised design and product guideline, and information provision for the downstream consumer about the existing waste infrastructures owned by the producers, and physical management in the form of only producing packaging that can be sorted and recycled.

The data collected in this study show a widely varied ideas and opinions on defining producers and their responsibilities in an international EPR for plastic packaging waste. The analytical framework developed to answer this research question cannot identify most of the international EPR elements stated by this study's subjects. Those elements that can be identified using the analytical framework are presented in the figure below.



Types of Responsibility	Plastics Product Life Cycle				
	Extraction	Plastic Resin Production	Fabrication and Distribution of Plastic Product	Use	End of Life
Financial mechanism		Plastic tax and fee	Incentivisation for an environmentally friendly design		- Superfund - Plastic credit - Advanced Disposal Fee
Physical management		Producing only packaging that can be sorted and recycled			
Information management		Harmonised design and product guideline			- Consolidated reporting on recycling rate - Information about existing waste infrastructure

Figure 4-1: Summary of identified producers and their responsibilities in an international EPR for plastic packaging waste as presented using the analytical framework developed from Bix et al. (2009), Alhazmi et al. (2021), and Tojo (2004).

5 Discussion

This chapter contains a discussion and critical reflection on the research project. In the discussion sub-chapter, the interpretation of the result as written in chapter 4 is presented as well as its alignment with the existing studies. Meanwhile, in the subsequent sub-section, a critical reflection on the study's methodology, legitimacy, and generalisability is discussed.

5.1 Discussion on the study's result and analysis

There is no study regarding the drivers and barriers to the formulation and implementation of an international EPR that is based on perspective study of international stakeholders that can be used as a reference to compare the results from this study. However, there are studies on such topic that were conducted in the national level, such as the study of Portugaise et al. (2023) who presented a list of external and internal drivers and barriers for producers in implementing the EPR system for WEEE and Tojo et al. (2001) who presented the factors affecting the results of the EPR programmes on packaging, battery, end-of-life vehicle, and electrical and electronic equipment. Comparison of the study results shows that the drivers and barriers identified in this research are already discovered in those two studies except for two factors, namely informal sector involvement and the upcoming plastic treaty.

Informal sector involvement is interestingly considered as both driver and barrier for the formulation and implementation of an international EPR for plastic packaging waste. The prospective of informal sector improvement all over the world through the design of a socially just treaty can push the formulation of it. Meanwhile, informal sector involvement can be a barrier as well as it is difficult to formulate a global treaty that can safeguard the well-being of informal sector that is unique and different from one country context to another. Informal sector indeed play a big role in developing country's waste management system and it needs to be included in EPR scheme to improve its working situation and well-being (Pani & Pathak, 2021; Woggsborg & Schröder, 2018)

The *upcoming plastic treaty* is mentioned as a driver for the international scheme's formulation and implementation. In the updated version of the draft for the upcoming plastic treaty, the closest that it has to an international EPR is the proposal for the establishment of *national* EPR scheme for plastic products with a coverage that spans across the international supply chain (UNEP, 2024). However, in the fourth Intergovernmental Negotiating Committee (INC) on Plastic Pollution held in April 2024, there are differing opinions of the countries on this matter. From the in-session submissions for the negotiation, for example, an excerpt of India submission for the EPR element states, "EPR mechanisms shall have to be nationally driven taking into account national circumstances and capacities. There shall not be any EPR obligation beyond national boundaries and these shall not extend to international supply chains" (India, 2024, p.1). Meanwhile, an excerpt from Iran reads, "However, the recommendation to require countries producing and exporting raw materials used in plastic industries to pay compensation to an international fund for damages caused by plastic pollution is not acceptable to my country" (Iran, 2024, p.1). There are also submissions that are more supportive of the EPR with an international scope, such as those from Sri Lanka and the Philippines (Republic of the Philippines, 2024; Sri Lanka, 2024).

The framework adapted from the research from Monier et al. (2014) is able to identify the drivers and barriers for the formulation and implementation of an international EPR. Four out of five factors in the framework, namely allocation of responsibilities and dialogue among stakeholders, cost coverage, transparency and control, and external factors are identified from this study. Only one factor from the analytical framework, fair competition, that is not identified in this research. As for the external sub-factors, three out of five sub-factors from the

framework are identified, they are historical development of the EPR policy and waste management infrastructure, awareness and willingness of citizens to participate, and existence of complementary waste policy instruments. Population density and country geography as well as value of secondary materials on the national market sub-factors are not identified in this study. Overall, the adapted framework serves well to answer the first research question.

For the second research question, an international EPR with multiple producers (supplier, converter, filler, and seller) involved is proposed by some interviewees during the study. In the conventional, national-level EPR for plastic packaging waste, the majority of the time it is the plastic filler that fulfils the role of producer in the scheme, however, the stakeholders in the study propose that other producers of packaging should be involved in the scheme. The rationale for this is the need to identify and involve as many producers as possible remembering the global scope and huge financial need in the international scheme.

In the process of understanding the producers and their responsibilities, some interviewees are doubtful about the involvement of producer in an international scheme, thus, whether the international scheme could be called EPR at all. For some interviewers, EPR is very synonymous with the robust involvement of the producer, but then, in an international scheme where many non-producer stakeholders are involved, it might just be an international financing mechanism. Furthermore, regarding fee collection from plastic converter, there seems to be a mixed up whether it should be considered a form of international EPR or not. According to the draft of the Global Plastic Treaty, plastic pollution fee from polymer producer is a financing mechanism for the Treaty implementation, not a form of international EPR. An interview with an international law expert also suggested that plastic pollution fee is not an international EPR. This is because the pollution fee is basically a Pigouvian tax on plastic pollution, similar to carbon tax. It is an EPR scheme only if the producers implement, or fund, a plastic take-back mechanism. Furthermore, the political feasibility for implementing this fee is nearly zero due to the difficulty of fund transfer from private sector to sovereign country (J. Salzman, personal communication, 24 April 2024). In this case, it seems preferable to just utilise the existing international financing institutions and mechanisms such as the World Bank and Global Environment Facility (GEF) to develop a financing mechanism for plastic pollution mitigation. This is because such entities are already experienced in conducting fundraising and collecting a huge amount of money for disbursement towards environmental project and they are entities of high credibility among the international donors.

The second framework adapted from Bix et al. (2009), Alhazmi et al. (2021), and Tojo (2004) captures stakeholders' perspectives on defining the producers and their responsibilities in an international EPR. The framework is able to capture the perspectives of the stakeholders in defining the producers and their responsibilities. However, in defining the producer, there are some proposals from the stakeholders that lie beyond the categories of four producers as proposed in the framework, namely multiple producers. In defining the producer responsibilities, the framework managed to capture the differing proposals on different form of responsibilities (financial, physical, and informational) in different plastic product life cycles (from plastic extraction to end-of-life).

During the INC 4 in April 2024, in-session submissions from the Member States were also received for the plastic pollution fee from polymer producers. These submissions are generally not in favour towards the creation of a global plastic pollution fee. An excerpt from the submission of Kazakhstan says, "Kazakhstan has a mechanism of extended producer responsibility primarily for the development of environmentally sound waste management. Global plastic fees for developing countries are not supported" (Kazakhstan, 2024, p.1).

Indonesia is not in favour as well because of the operational uncertainty of the financing mechanism (Republic of Indonesia, 2024).

There are some precautions in the formulation and implementation of the international EPR for plastic packaging waste. One noteworthy challenge of the international EPR is the involvement of local and national companies. International EPR for plastic packaging, when implemented, will likely focus on multinational companies only. Meanwhile, many national companies need to be involved and be held accountable for the plastic products in the entirety of their life cycle that they produce. This concern has already been voiced by some interviewees in the study and should become an important consideration when formulating and implementing an international EPR scheme. Another issue is the possibility of double taxation, where fee from producers is both taken at the national and international levels. With this double taxation issue, it is difficult to get Member States' approval in the formulation of the plastic pollution fee.

In this study, there is no significant difference of the perspectives from the governments and producers throughout the two different continents. It is difficult to see the perspective trend from each stakeholder and continent group. Possibly, this is because the sample number is too small so that no perspective trend can be clearly seen among the research participants.

5.2 Critical reflection on the study

The research answered the two formulated Research Questions in the study. However, methodology and legitimacy-wise some aspects can be reflected upon, which are elaborated in the following sub-chapter. Furthermore, the generalisability of the research is brought up as well to provide insight regarding the transferability of the study.

The author noticed the possibility of bias in conducting this research, especially in the methodology of the research. The coding of this research is conducted deductively by following the themes that were already set in advance. There is a possibility that the result will be different if the coding is conducted inductively. An effort to mitigate this, which is data triangulation, is also deemed not too significant as there are very limited number of grey literatures on this topic. Hence, it is difficult to complement the interview data with the grey literature in an appropriate amount. During the interview, the question on financial mechanism was asked as a standalone question, compared to physical and information management that were asked together as "other responsibilities". This might affect how the interviewees response the latter questions because they thought that those questions are of less importance. It is also important to mention and acknowledge that the author is an Indonesian, where the plastic issue is pressing, and with professional background in plastic waste management. With this background, it is a possibility that the analysis of this study is processed to somehow give advantage toward developing country. To mitigate this, the author strictly and objectively followed the data analysis and interpretation method as discussed in sub-chapter 3.3.

The methodology and analytical frameworks used in this research lead to the answer to the research questions asked in this study. Drivers and barriers to the formulation and implementation of the international EPR are identified, as well as the proposed producers in the international schemes and their potential responsibilities. In answering the second RQ, the framework showed limitation. The framework is able to identify some producers in an international scheme according to the perspectives of the interviewees. However, the framework is not able to fully identify and categorise the responsibilities of the producer and in which stage of lifecycle that should be. Mainly, this is because some of the answers regarding the responsibilities focused on their formulation in a national, not international, context of the EPR. Hence, the process of interpreting the responsibilities of the producers and their relevant

life cycle stages should be taken with consideration on the national contexts of the EPR that most of the interviewees gave.

In this research, both research questions are answered, but introducing another research question and modifying the second would have been a great step to help the interviewees make some further considerations about the topic. The way the two research questions organised was to first understand the factors that push and prevent the formulation and implementation of the international scheme, then explore the preferred modalities of the international scheme, specifically about the producers and their responsibilities. However, in exploring RQ2, especially on the part of the producers' responsibility, there was often doubt and confusion on what to answer and a few interviewees asked for further clarification on how is "international EPR" defined. This makes a lot of sense since the existing concept of international EPR is all only in the literature. Therefore, perhaps it would be a good idea to first ask the interviewees to define what is an international EPR and who should be its producer according to them and continue to explore the next research question on defining the producers' responsibilities.

In this research, interviewee recruitment is one of the major challenges. Interviews invitations were sent out in early March 2024 to tens of ministries of environment in Europe and Asia, but this did not yield many interviews. This difficulty is presumably due to the negotiation process for the Global Plastic Treaty that the world's governments are currently involved in, where the fourth round of negotiation was conducted in late April 2024. Interviewee recruitment for the producers is equally challenging, especially in recruiting the producer from Asian countries. The author only managed to secure an interview in Indonesia, the author's home country, due to the connection through mutual a colleague.

The generalisability of this study is limited to specific geographical factors as well as capacity and experience of the countries in waste management and EPR policy. EPR is a well-known policy approach and is widely implemented in Europe. In Asia, some countries already implemented it, and many others are following this step. This is certainly different from different regions e.g. South America and Africa thus there are certainly different contexts in such regions that might hinder the relevance of this study there. Related to that, existing waste policies in one country might also limit the application of the study results. This is because there are different stages of waste policy implementation, and some countries might be more advanced on this compared to others. The gap in this capacity among the countries is what makes the results of the study to be difficult to generalise. Lastly, the nature of exploratory study limits the generalisability of this research as well. This is because as the results obtained in this study serve more as a basis for further research than definitive recommendations that are generalisable.

6 Conclusion

The research contributes to the better understanding of international EPR scheme which is based on stakeholders' perspectives. This study captured the ideas and opinions of fourteen EPR key stakeholders,' namely governments and producers, in Asian and Europe on the formulation and implementation of the international scheme for a plastic packaging waste. Perspectives from five documents related the topic were collected as well to complement the interviews. The summary of the stakeholders' perspectives, that are answering this study's research questions, are presented in this chapter. From these results, there are recommendations for both non-academic and academic audiences. Firstly, the study provides recommendations for policy practitioners on advancing further the agenda of international EPR for plastic packaging waste. Secondly, the study also provides key academic discussion point to be explored in the future's research related to the international EPR. These recommendations are subsequently presented in sub-chapter 6.2 and 6.3.

6.1 Overall Findings

From the study, an overarching finding is that there is no clear-cut understanding of an international EPR among the stakeholders. Still, the factors that push and prevent the formulation and implementation of an international EPR for plastic packaging waste were identified, and who the producers are and what are the responsibilities in an international scheme were explored.

On the first research question, "*What are the perceived drivers and barriers on the formulation and implementation of an international EPR for plastic packaging waste?",* the identified drivers are funding availability from the private sector, industrial coordination and collaboration, a need for harmonised standards of plastic packaging, waste management technology transfer, societal pressure, legislation, upcoming plastic treaty, and informal sector involvement. Meanwhile, the barriers identified outnumber the drivers, they are institutionalisation, fairness in defining the producers and their responsibilities, unclear definitions and responsibilities of the international scheme, difficulty in fee formulation, data quality, corruption issue, monitoring and reporting, different capacity and knowledge on EPR, informal sector involvement, and local regulation. Interestingly, the informal sector is the only factor that is perceived as both driver and barrier. Industry contribution and compliance, a need for harmonised standards for plastic packaging, and the upcoming plastic treaty are the three factors that are mentioned the most as the drivers for the international EPR for plastic packaging waste. Meanwhile, the top identified barriers are institutionalisation, difficulty in fee formulation, and different capacity and knowledge on EPR of the countries to implement an international EPR.

The study is also able to answer the second research question; "*How should producers be defined in an international EPR for plastic packaging waste and what are their responsibilities?"* by using the combined framework as explained in section 2.4.2. There are answers that do not fit the analytical framework as prepared for this research question. The study finds different proposals for producers in an international scheme of EPR, namely converter, filler, and the out-of-analytical-framework multiple producers where more than one producer needs to be involved in the scheme. The responsibilities of the producers in an international EPR are identified as well, namely financial, physical, and informative responsibilities. Remembering the global scope of the potential international EPR, some interviewees in the study conveyed that financial mechanism of an international EPR needs to be specifically designed for each country and the global elements for it would serve as the coordinating function only. Still, several potential financial responsibilities according to the interviewees are; incentivisation for plastic design, plastic tax and fee, plastic credit, Advanced Disposal Fee, and superfund. Informative responsibility is also identified, through the creation of a global consolidated plastic recycling

reporting, harmonised design and product guideline, and information provision about existing waste infrastructure. Lastly, physical responsibility is also proposed through the obligation to produce only recyclable plastic packaging.

With those research questions answered, this study has contributed to the discussion around the topic of international EPR for plastic packaging. The novelty that this research adds to the discussion is the perspectives of EPR key stakeholders, namely government and producer, that are absence in the existing studies on international EPR. This study also formulated analytical frameworks that are able to address the two research questions regarding the topic, and may be used as a reference for the future studies.

6.2 Practical implications and recommendations for policy practitioners

The results of the study serve as a basis to formulate recommendations for policymakers and practitioners regarding the potential formulation of an international EPR for plastic packaging waste. The recommendations are as follows:

Utilise the upcoming Plastic Treaty for ambitious national EPR policy. Already in the current draft of the upcoming plastic treaty EPR exist as one of the elements for the Plastic Treaty. This should be utilised by the negotiators of the treaty to put up an ambitious EPR scheme to be implemented in countries as a part of a strategy for mitigating global plastic pollution.

Utilise the existing international multilateral financing mechanism for an international EPR (or EPR-like) financing mechanism. The institutionalisation of an international financing mechanism is arduous and time-consuming. With the need for plastic pollution mitigation being urgent, it would be ideal to utilise the existing international multilateral financing mechanism such as the GEF and GCF to serve this purpose. Existing international financing mechanism organisations are already proven to be credible and have the capacity to manage global funds.

Conduct capacity building for developing countries in formulating and implementing EPR scheme. One of the key findings in this research is the different capacities of countries in EPR implementation. Regardless of the implementation of an international EPR scheme, conventional EPR is a commonly implemented, and thus well understood and designed, policy approach to mitigate plastic packaging waste. Hence, support must be provided to developing countries to enable the formulation and implementation of an EPR scheme that is adapted to the country's specific contexts and needs.

Involve informal sector in EPR schemes. Informal sector incorporation into an international scheme is one of the important discussion points during the interview with the stakeholders. This should motivate policymakers to give close attention to the sector's well-being and ensure that they are not left behind in the transition efforts for a plastic waste-free world. This goes the same for the private sector, where in many developing countries, plastic producers rely on waste pickers as to collect recyclable plastic waste that is used as material for their production. Private sector should ensure that the waste pickers and other informal waste management actors that they work with has a good working condition and remuneration.

Involve plastic converters to contribute more to the plastic waste reduction efforts. In the conventional EPR, the role of producer is being carried out by plastic filler in the majority of the times. However, in a long and often transboundary supply chain of plastic products, it is necessary for all the involved producers to take part in implementing measures to reduce the plastic pollution arising from the production processes. Thus, involving and significantly increasing the role of plastic supplier, converter, and perhaps seller becomes a necessity to maximise the efforts and the resources to combat plastic pollution.

6.3 Recommendations for future research

Research on an international EPR or EPR-like scheme for plastic packaging is sparse, and this study is, so far, the only one that takes into consideration the perspectives and diverse understandings of relevant stakeholders on it. This study discovers the driving and challenging factors on the formation and implementation of international EPR for plastic packaging waste, which is also a novelty as past studies focusing on the conventional, national EPR scheme only. Furthermore, the study also discusses the producers and the role they need to have in an international EPR scheme.

However, this research is only initial research on the topics, and much more research is required to draw a more concrete and comprehensive knowledge of international EPR. There are some recommendations that can hopefully lead to better ideation in international EPR research:

Define the international EPR through more theoretical research. The nature of the research's objective is more practical than theoretical. During the interview process, the interviewees' initial thought on the international EPR scheme was greatly varied. This shows that it is quite a challenge to ask practical policy question without clear and exact conceptual definition of the topic. An explanation on what potentially an international EPR (that is based on research of Forrest (2019) and Raubenheimer (2018) was then provided to them, and only after that there seemed to be an understanding of what the concept entails. To complement this research, the next studies could be more on the theoretical side by focusing on defining what is actually an international EPR and clearly delineates it with an international financing mechanism.

Involve more stakeholders from more countries and continents. As an international EPR is something that has not yet properly defined, then future study needs to define it by asking more stakeholders on it, particularly academia whose work are related to policy innovation. International EPR for plastic packaging and its implementation in the country level will ultimately affect municipalities and their local waste management ecosystem, so it is also important to get their perspective for this type of study. Furthermore, more perspectives from different countries and continents, i.e., the South Americas and Africa, where EPR is just emerging recently need to be explored as well.

Increase the sample size of the interviewed stakeholders. In this research, there was no significant differences between the perspectives of government and producer in Europe and Asia. A possible reason to explain this is because the sample size is too small to draw such conclusion. Hence, future research should include more samples to enhance the legitimacy of the findings.

Focus the research on fee from polymer producer as donor for novel international financing mechanism. There are already several literatures regarding global plastic pollution fee from polymer producer with clear description of the financial mechanism of the fee. This well-developed concept means that the stakeholders could be aware and understand the concept more easily and have more knowledge about it. It would be interesting and much easier for the future's research to focus only on the fee from polymer producer as an international financing mechanism.

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Appendix 1. Interview Guide

For the data collection, semi-structured interviews were conducted to allow an exploration towards the interviewees' responses. Prior to the interview, a brief research design was sent to the interviewee to provide information about the research. The interviews were started with an introduction on the research objective and methodology and followed with key questions on the thesis topic. When there was time remaining for the interviews, supplementary questions were asked to dive deeper into the stakeholder's perspectives. The key and supplementary questions are:

Key Questions

1. Introduction and initial understanding on (international) Extended Producer Responsibility (EPR)
    a. What is your current role in your institution?
    b. How is your role related to EPR for plastic packaging waste?
    c. What is your thought on the formulation and implementation of an international EPR for plastic packaging waste and its potential role for mitigating transboundary plastic waste?

2. Drivers on international EPR formulation and implementation
    a. What are the drivers on its formulation and implementation?

3. Barriers on international EPR formulation and implementation
    a. What are the challenges for its formulation and implementation?

4. Elements of international EPR for plastic packaging waste
    a. How should the producers and their roles be defined on an international EPR for plastic packaging waste?
        a. Would it be raw material suppliers, manufacturers, converters, producers, importers of packaged goods, distributors or retailers of packaged goods?
        b. What would their main responsibilities be?
        c. In such international scheme, would other different producers need to be involved as well and would they have different responsibilities?
    b. How should the financing mechanism in an international EPR be designed?
        a. Who collect the fee and how the mechanism is formed?
        b. How is the money distributed and to whom?
        c. How should the fee be formulated?
        d. What does the fee cover?
        e. How do we differentiate international EPR with the existing international financing mechanism (e.g. GEF, GCF, etc)?
    c. What other elements of EPR (i.e. physical responsibility, informative responsibility, ownership, liability) should be incorporated to an international EPR?
    d. How do you think an international EPR be implemented (i.e. establishment of a dedicated institution, amendment on the Basel Convention, etc)?
        a. How do you think the upcoming Global Plastic Treaty play a role in the potential formulation and implementation of an international EPR?

Supplementary Questions

1. (For government) Does your country accept plastic waste import? If yes, how do you manage the imported plastic waste?
2. (For government) Does your country export plastic waste? If yes, how do you ensure a sound management of it in the receiving country?
3. How should an international EPR for plastic packaging balance the responsibility on downstream management of a product (e.g. waste management) vs its upstream management (e.g. design change)?
4. (For government and private sector) How should the informal sector be involved in an international EPR?

Appendix 2. Interview Consent Form

THESIS RESEARCH: AN EXPLORATORY STUDY FOR AN INTERNATIONAL EXTENDED PRODUCER RESPONSIBILITY FOR PLASTIC PACKAGING WASTE

CONSENT FORM

This form is to ensure that you have been given information about the thesis research and to give you an opportunity to confirm that you are willing to take part in this research. For all activities below, please indicate which applies to you with an 'X' mark:

	I have been **familiarised** with the thesis research, I have had the possibility to ask questions and I have received satisfactory answers to my questions before being interviewed
	As a research participant, I am aware of my **right to withdraw participation** at any time
	I give my consent that the interview can be **recorded in writing**, translated and analysed
	I give my consent that the interview can be **audio- or video-**recorded, transcribed using a third party speech-to-text transcription application, translated, and analysed
	I give my consent to **be identified by my organization**
	I give my consent to **be identified by my position in my organisation**
	I understand that the results of the research will be presented so that **no information can be traced to me personally**/I have been informed that **pseudonymity of participants will be ensured**
	I give my consent that a record of my interview can be **safely stored** for future reference

Note: Your participation is voluntary. As an interviewee, you do not have to answer all the questions that are asked; you reserve the right to refuse or cease participation in the interview process without stating your reason and may request to keep certain materials confidential. In addition, you have the right to review any summary or synthesis of the interview at any time up until the research period ends on 17 May 2024.
After completion of the research project, data will be securely stored for 10 years. After that time, any personal data collected will be deleted. In addition, you have the right to request deletion of your data at any time. Audio-recordings, if authorised, will be deleted after they have been transcribed and analysed, hence they will not be stored for 10 years. You can also file a complaint about how your personal data is used.

Please, sign below to confirm your consent – digital signatures are possible:

Participant Name	
Signature	
Date	