IIIEE Theses 2016:42

# Implementing a Deposit Refund System for P.E.T bottles in the Maldives

An ex-ante analysis of political feasibility based the models of Kiribati and Palau

**Hawwa Nashfa**

Supervisor

Naoko Tojo

Thesis for the fulfilment of the
Master of Science in Environmental Management and Policy
Lund, Sweden, September 2016

iiiee
THE INTERNATIONAL INSTITUTE FOR
INDUSTRIAL ENVIRONMENTAL ECONOMICS

Published in 2015 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 express my deepest gratitude to my supervisor Naoko Tojo, for being an amazing supervisor. I thank you for your valuable feedback, and for giving me confidence and reassurance, ever since I developed an interest to pursue this topic. I would also like to thank Thomas Lindhqvist for his valuable feedback in thesis idea formulation, and providing valuable criticism and input. I also thank both of them for introducing me to the world of EPR, so that I developed a passion for it.

I would also like to thank the Swedish South Asian Studies Network (SASNET) for the travel grant, which allowed me to travel to the Maldives and conduct my fieldwork. I also thank Lund University for the Global Scholarship programme, and the Project Hope Foundation of the Maldives, without whom this entire educational journey would not have been possible.

I would like to express gratitude to the various institutions that provided information to this research. A special thanks goes to Mr. Ali Amir Deputy Minister, the Deputy Minister of the Ministry of Environment and Energy of the Maldives, and the Assistant Director Ms. Aishath Rashfa. I also thank Maldives Customs Authority, especially the Vice Chancellor Mr. Ismail Abdulla, the Chief Superintendent Ms. Fathimath Mohamed, and the Chief Customs Officer Mr. Ahmed Zubair for his immense support. I also thank Mr. Ibrahim Shujau, the Parliament member for the Baarashu Constituency, and Ms. Eva Abdulla from the Galolhu Constituency, for their time, and willingness to provide information. I also thank Mr. Stewart Williams from the Secretariat of the Pacific Regional Environmental Programme (SPREP), Mr. Makoto Tsujiki, and Ms. Ayako Yoshida, of the Japan International Cooperation Agency (JICA). I also thank Ms. Allison Woodruff of the Asian Development Bank (ADB), and Ross Craven from New Zealand Aid for International Development (NZAID). Furthermore, a special thanks to Alice Leney from Pacific Reef Savers, who contributed to the design of the Kiribati deposit refund system, and helped answer crucial questions.

I also thank all the staff of IIIEE who have taught me these past two years. These two years of education have truly transformed my knowledge. I would especially like to thank Luis Mundaca, and Mikael Backman for their contribution to this thesis, as well as Phillip Peck, for guiding me in the research of the case study of Kiribati, and providing me useful contacts. I also extend a very special thanks to Birgitta. You have been so wonderful, and have helped me in every single way while I have been in Sweden.

I thank my dear friends and colleagues from IIIEE. You are all so special, and I truly enjoyed getting to experience this journey with you. To Giulia, Lexie, and Marta especially, thank you for the endless laughter, and supporting me since the beginning. You have all made this entire journey so much more enjoyable. You will always be in my heart.

A most special thank you to Per, for being my comforter, partner, and my family away from home. For bringing me flowers and chocolates as I sat glued to the computer. *Tusind tak for alt.* Last but not the least, I extend my most heartfelt gratitude to my family. I especially thank my loving parents, for their relentless patience, trust, and unending support they have given me these past seven years, where I have lived abroad to fulfil my academic dreams. I can never thank you enough.

# Abstract

PET waste is the most visible environmental threat in the Maldives, a Small Island Developing State (SIDS). The thesis aims to propose the deposit refund system as a policy intervention, and evaluates the feasibility of introducing the system in the Maldives.

In order to see how other SIDS have implemented the policy, the research uses policy evaluation framework to analyse the implementation mechanisms (design of material and financial flows, and allocation of roles and responsibilities) and evaluate the environmental effectiveness of the policy, in Kiribati, and Palau, two SIDS in the Pacific. Collection of PET bottles, and reduction of PET litter are used as proxies to assess how much the policy achieved its goals of litter reduction. Based on these findings, and the analysis of the current Maldivian context, a blueprint of a hypothetical deposit refund system is presented, to be potentially implemented in the capital city of the Maldives, Male', by the newly established Waste Management Corporation (WAMCO). The assessment of the economic viability of implementing a deposit refund system for one year in Male', based on the Pacific model demonstrate that the deposit refund system can generate a net revenue for the Corporation. Moreover, the political feasibility of introducing this model, based on the assessment of stakeholders' power and interest reveal that introducing the deposit refund system in the Maldives depend upon the interest and knowledge of policy elites and Parliamentarians belonging to the ruling party. The ruling party has the ultimate power to induce the system, due to the political system being fraught with challenges to democratic consolidation, uneven distribution of power, and weak interest groups.


**Keywords:** deposit-refund system, Maldives, PET, political feasibility, SIDS

# Executive Summary

Plastics are defined as the "workhorse" of the modern economy. This is unsurprising, as plastics are lightweight, malleable, corrosion resistant, relatively inexpensive, and can be used for a myriad of purposes. Plastic use in the packaging sector captures one of the largest applications of plastics in the industry. Of these, beverage containers made from polyethylene-terephthalate (PET) are increasing. Millions of people rely on bottled PET water, both in developed and developing countries, due to convenience, or lack of reliable municipal drinking water. Of these post-consumer PET bottles, many end up in landfills, and consequently in the world's oceans, due to leakages coming from uncollected waste or litter, or gaps in the collection system itself (McKinsey Center for Business and Environment, 2015). Coastal and marine litter can jeopardise the health of marine ecosystems, and further cause direct economic, and environmental impacts on communities that depend upon fisheries and tourism (Gourmelon, 2015; Allsopp, Walters, Santillo, & Johnston, 2006). For a Small Island Developing State (SIDS) such as the Maldives, which is surrounded by 98% of water, reducing PET litter is a critical priority. PET litter is the major visible environmental threat, which undermines the natural resilience of its shores and oceans, harms marine life, and jeopardises the tourism industry of the country, which contributes to over 30% of the Gross Domestic Product (GDP). Furthermore, SIDS such as the Maldives lack the critical recycling infrastructure, space, and economic resources to address these issues in an environmentally sound manner.

Hence, the thesis aims to propose the introduction of the deposit refund system in the Maldives, and assesses the feasibility of introducing the policy in the Maldives. Deposit refund systems are hailed as an environmentally effective intervention in reducing litter via the high collection of post-consumer products (Opschoor and Turner, (1994); Fullerton and Kinnaman, (1995); Sigman, (1995); Palmer & Walls, (1996); Spiegelman (2005); Walls (2006).Deposit refund systems charge a deposit on top of the original price of the product, and refund the consumer once they return the product. Hence, the system incentivises the consumer to return bottles, in order to secure high collection of post-consumer products, and reduce litter. A study of the Swedish deposit refund system, which has a high collection rate for PET bottles, illustrates high producer responsibility, and minimal government intervention in the operation of the system. Nevertheless, there is limited research in the application of deposit refund systems in a SIDS context.

Hence, to understand the implementation mechanisms, and environmental effectiveness of a deposit refund system in a SIDS context, the case studies of Kiribati, and Palau, two Pacific island nations that have implemented the policy are evaluated. Kiribati is chosen because it is the first Pacific island nation to implement the deposit refund system, and Palau is chosen due to the striking resemblance of its economy to the Maldivian economy, which is heavily dependent on the tourism. The design of the material and financial flows are provided, as well as the allocation of roles and responsibilities, using information provided by stakeholders in the system, annual project documents, and phone, and email interviews. Next, the Maldivian context is analysed, using information from stakeholder interviews, and literature review, identify the current waste management practices, regulatory framework, PET producers, and actors involved in PET waste management.

The consolidation of information from these two tasks allow the presentation of a hypothetical deposit refund system blueprint, which can be used for the implementation of the system in the capital city of Male', by a state owned entity called Waste Management Corporation (WAMCO). Lastly, the political feasibility of introducing the proposed system is assessed using stakeholder's power and interest to implement the system in the Maldives. In

addition, the economic viability of implementing the system is analysed, by calculating the costs and incomes that can be accrued for the Waste Management Corporation for implementing the system in capital city Male', for one year. The undertakings of these tasks are addressed via the three research questions demonstrated below:

**RQ1** How does a deposit refund system function when implemented in other SIDS, using the case studies of Kiribati, and Palau in the Pacific?

**RQ2** What is the current situation in the Maldives regarding PET waste?

**RQ3** What is the feasibility of implementing the deposit refund system in the Maldives?

The research pertaining to those questions reveal that there is a lot of government responsibility in the implementation, enforcement, and management of the deposit refund system in Kiribati and Palau, and that producer responsibility is limited. Despite the limited data, information gathered via interviews with stakeholders, and consultations of international reports reveal that the deposit refund system is able to achieve the reduction of litter, via high collection of PET bottles. However, the study of Kiribati reveals that there are endogenous and exogenous challenges, which hinder the full operation of the system. For instance, because SIDS does not have recycling infrastructure, they need to export the PET for recycling. Due to the price of PET on the international market, they are unable to secure a private buyer for those bottles, and experience difficulties in exporting the bottles out of the island, thereby posing additional issues of storage, and economic viability to self-sustain the system.

In the event that the Maldives introduces the policy, it is unlikely that it will face these challenges, as it lies in close proximity to the Indian subcontinent, on strategic trade routes. Furthermore, the calculation of costs and incomes for implementing a deposit refund system for one year in Male', based on the Pacific model reveal that the deposit refund system can be economically viable. Nevertheless, the political feasibility of introducing this model, based on stakeholder's power and interest reveal that introducing the deposit refund system in the Maldives depend upon the interest and knowledge of policy elites and Parliamentarians belonging to the ruling party, as they are the ones who have the ultimate power to the implementation of the system. This is due to uneven distribution of power, disenfranchisement of interest groups, and lack of democratic consolidation. Thereby, the research reveals the need to increase the knowledge and interest of key policy elites in the country.

# Table of Contents

# List of Figures



# List of Tables

# Abbreviations

**ADB**-Asian Development Bank

**AIR**- Avoid Intercept Redesign

**AusAID**- Australian Aid for International Development

**BEAM-** Biodiversity Environment Awareness Maldives

**CAC-** Command and Control

**CDL-** Container Deposit Legislation

**CDSP-** Community Development and Sustainable Participation Project

**CSR-** Corporate Social Responsibility

**EIA-** Environment Impact Assessment

**EPA-** Environment Protection Agency

**EPR**- Extended Producer Responsibility

**EU**- European Union

**FSM**- Federated States of Micronesia

**FSPK**-Foundation for the Peoples of the South Pacific Kiribati

**GDP**- Gross Domestic Product

**HS**- Harmonised System

**JICA-** Japan International Cooperation Agency

**J-PRISM-** Japanese Technical Cooperation Project for Promotion of Regional Initiative on Solid Waste Management

**KSG- Koror State Government**

**LGA-** Local Government Authority

**MDP-** Maldivian Democratic Party

**MDA-** Maldivian Democratic Alliance

**MELAD**- Ministry of Environment Land and Agricultural Development

**MEMP-** Maldives Environment Management Programme

**MFED**- Ministry of Finance and Economic Development

**MIRA**- Maldives Inland Revenue Authority

**MOF**- Ministry of Finance

**MOU**- Memorandum of Understanding

**MPIIC-** Ministry of Public Infrastructure Industries and Commerce

**MWSC- Male' Water and Sewerage Company**

**NGO**- Non-Government Organisation

**NZAID**- New Zealand Aid for International Development

**PET**-Polyethylene-terephthalate

**PPM-** People's Progressive Party

**PRO**- Producer Responsibility Organisation

**SAP**- Strategic Action Plan

**SIDS**- Small Island Developing States

**SPREP**- Secretariat of the Pacific Regional Environment Programme

**USD**- United States Dollar

**UNDP**- United Nations Development Programme

**UNEP-** United Nations Environment Programme

**WAMCO- Waste Management Corporation**

# 1 Introduction

Plastics are often coined as the "workhorse" material of the modern economy (Mckinsey and Company, 2016). Ever since the first plastics were moulded in 1907, global plastic production, from virgin petroleum based feedstock has risen staggeringly, from 1.7 million tonnes in 1950 (Raynaud et al., 2014) to 311 million tonnes in 2014 (Plastic Europe 2015). According to McKinsey Center for Business and Environment (2015), the ICIS Supply and Demand database projects has estimated the global plastic production to increase to 380 million metric tons by 2025. This is unsurprising, as plastics are lightweight, malleable, corrosion resistant, relatively inexpensive, and can be used for a myriad of purposes such as packaging, agriculture, building and construction, transportation, medical and health industry, electronics, sport and leisure (Plastics Europe 2016). Hence, there is no doubt that plastic is the cornerstone material of the modern economy.

Plastic packaging for food and beverage capture the largest demand in the plastics industry. Out of the US$75 billion total natural cost of plastics used in the consumer goods industry per year, food companies are responsible for the largest contribution to the cost, with 23% of the natural cost, and soft drinks accounting for 12% (Raynaud et al., 2014). In Europe, the second largest plastics producer in the world, plastic packaging is the largest application sector for the plastic industry. In 2013, plastic packaging captured 39.6% of the total European plastics demand (PlasticEurope, 2015). The dependence on plastic packaging is clear from these statistics, as plastic packaging increases shelf life, and keeps foods and beverages fresh for human consumption (Raynaud et al., 2014). Millions of oil-derived plastics, made from polyethylene terephthalate (PET) are also increasingly used to bottle water, where consumers in industrialised countries drink for convenience and taste, while others in developing countries are driven to use it due to unreliable municipal water supplies (World Watch Institute, 2013). In Europe, PET captured 6.9% of the overall demand for plastics in 2013, which was a 1% increase from 2102 (Plastics Europe, 2015). In North America, 1 billion PET bottles are brought in to the United States every week, which is the world's largest producer of bottled water (Miller & Spoolman, 2012). Thus, demand for plastic packaging is a major driver of the plastics industry.

Despite the positive aspects of plastic packaging, the production and consumption of plastics negatively impact the environment in various ways. According to Raynaud et al (2014), the extraction and production of plastics deplete finite fossil fuel resources, and releases greenhouse gases into the atmosphere, which causes global warming, and induces climate change impacts. According to the Pacific Institute, 17 million barrels of oil were used to produce the plastic bottles consumed in the United States alone, in 2006, which approximately emitted 2.5 million tons of carbon dioxide(Pacific Institute, 2007). Furthermore, according to Raynaud et al (2014), the highest profile impact of plastic waste is when it is littered. It is estimated that between 22 percent and 43 percent of the plastic used worldwide ends up in landfills, which consumes land space, poses socio-economic and health issues for communities, and furthermore results in the loss of valuable resources (Raynaud et al., 2014). Specifically with regards to PET bottles, 1500 plastic water bottles are thrown away every second, where if the number of bottles thrown away every year were lined up end-to-end, it would circle the earth's equator eight times (Miller & Spoolman, 2012). Hence, plastic packaging have negative aspects such as depletion of fossil fuels, contribution to climate change, increase litter in landfills, and loss of valuable resources.

The most significant downstream impact from plastic litter is to marine and coastal ecosystems. Ever year, between 10 to 20 million tonnes of plastic end up in the world's oceans (Raynaud et al, 2014). It is estimated that at least 80 percent of ocean plastic comes from land

based sources, with 75% of land-sourced ocean plastic coming from uncollected waste or litter, while the remaining 25% comes from gaps in the collection system itself (McKinsey Center for Business and Environment, 2015). It is also estimated that the worlds' oceans contain over 150 million tons of plastic waste. (World Economic Forum, 2016). Moreover, if the plastic leakage into the oceans goes unchecked, the global quantity of plastic in the oceans is expected to double to 250 million metric tons by 2025 (World Economic Forum, 2016). Every year, plastic litter dumped from ships, and garbage barges, and left as litter on beaches kills up to 1 million seabirds, and 100,000 mammals and sea turtles (Miller & Spoolman, 2012). Moreover, plastic breaks down into fragments, known as micro plastics, and can become transferred in the food chain upon ingestion by marine organisms (Miller & Spoolman, 2012). Thus, plastic litter has a high impact on marine and coastal ecosystems.

Plastic waste in the oceans also has a direct economic impact, estimated to cost around US$13 billion per year in environmental damages to marine ecosystems (Raynaud et al, 2014). Furthermore, plastic litter incurs financial losses to fisheries, and tourism, and for time spent on cleaning beaches (Gourmelon, 2015; Allsopp, Walters, Santillo, & Johnston, 2006). For instance, according to the Asia Pacific Economic Cooperation APEC, it cost $1.3 billion in losses to tourism, fishing, and shipping industries due to plastic litter in the region alone (World Economic Forum, 2016). Hence, plastic litter also has an economic burden on communities.

The global issue of plastic litter has also not escaped the shores of the smallest Asian country, the Maldives. The archipelago of 1,190 islands scattered in the Indian Ocean, is especially vulnerable to marine and coastal pollution from plastics, specifically from polyethylene terephthalate (PET) bottles. This is because over 98% of the territory is composed of the ocean, with the tiny islands scattered in the Indian Ocean like drops of ink from a busy cartographer's hand. The once pristine islands have now become both a producer, and victim of plastic waste, where PET bottles have become as intrinsic to the landscape of the Maldives, as the sandy beaches and turquoise waters that tourist most identify the Maldives with.

The rise of plastic wastes in the Maldives follows the general trend of changing waste quantities, and composition of wastes in other Small Island Developing States (SIDS). In the 2004 booklet by the United Nations Environment Programme (UNEP), "Small Island Developing States: 1994-2004 and Future Perspectives", a fivefold increase in plastic wastes in SIDS was demonstrated in the 14 years (United Nations Environment Programme, 2004). In general, for SIDS, the rise in plastic waste can be explained by rapid population growth, improved socioeconomic status; change from subsistence lifestyles to consumerism, and consequent demand for imported goods. The case is similar for the Maldives, where socio-economic developments, and the consequent rise in imports changed the quantity and composition of wastes (Jeftic, Sheavly, Adler, & Meith, 2009).

Another factor that specifically exacerbates the issue of PET waste in the Maldives is the demand for fresh water. Most of the fresh water lens in the country, which occur in the porous coral sediments, especially in the urban capital Male' have been depleted from population stress, or contamination from sewage, chemicals, and pathogens (Ministry of Environment and Construction, 2004). While desalinated water is provided to the capital Male' and some tourist resorts, most consumers prefer bottled water for drinking, and the demand is met by private water bottling companies. This is in addition to the number of PET bottles imported as soft drinks, or other luxury water brands imported for the tourist resorts. The acute demand for bottled drinking water increases the domestic PET bottle production and sales, and thus the number of waste PET bottles.

The deposit-refund scheme is an environmental policy instrument, which is hailed as the most favourable policy instrument for reducing litter (Palmer & Walls, 1996), and increasing landfill diversion (Walls, 2006). According to various academic literature, deposit refund system policy is an effective policy, to reduce the amount of solid waste disposal, and to achieve high collection rates of recyclable products to increase recycling (Fullerton & Kinnaman, 1995;Sigman, 1995); (Palmer & Walls, 1996).Thereby, it is interesting to research how the deposit refund system have been implemented in a SIDS context such as the Maldives, and whether the policy mechanism can generate the desired outcomes such as high collection of PET bottles to reduce litter, and reduction of PET from the general waste stream. Furthermore, it the political feasibility of introducing the policy in the Maldives is required.

## 1.1 Problem Definition

The issue of PET waste in the Maldives is a recent phenomenon, as traditionally solid waste was discarded on designated beach areas, or uninhabited areas of the island for natural composting (Jeftic et al., 2009). However, the advent of tourism in the 1970's drastically shifted the subsistence-oriented economy of the Maldives, and transformed the Maldives from one of the poorest South Asian countries in the 1970's, to one of the highest per capita Gross Domestic Product (GDP) in the region (International Business Publications,2012).These socio-economic improvements, and the consequent demographic changes, and lifestyle shifts brought along the most marked vicissitude of modern human civilization to the Maldives: plastics wastes.

The management of PET wastes is more critical and complex for the Maldives, as it faces unique endogenous and exogenous challenges, similar to other Small Island Developing States (SIDS). According to the United Nations Conference on Sustainable Development in 2012, or Rio+20, SIDS have peculiar vulnerabilities resulting from the remoteness, geographical complexity, lack of technical infrastructure, narrow resource and export base, and vulnerability to external environmental and economic shocks. Currently, the Maldives disposes PET waste to landfills, and practices open burning of PET waste, due to competing uses for land in atolls with scarce land. Moreover, the Maldives lacks a waste segregation system, an efficient collection system to extract recyclables from the general waste stream, and technical infrastructure to recycle. In addition to the abovementioned aspects, there is a lack of disposal areas, fit for environmentally sound management of waste. Thus, there is rampant coastal and marine littering of PET waste. The proximity of the disposal areas to the shoreline damages the vital marine, and coastal ecosystems, which directly impact the country's main economic pillars, tourism, which depend on a pristine marine and coastal environment. The tourism sector directly contributed to 41.5% of the total GDP in 2014, and supported 32% of total employment (World Travel and Tourism Council, 2015). Furthermore, in the Maldives Visitor Survey of 2015, the main motivation for tourists to visit the Maldives was identified as the natural beauty of the country, especially the beaches, and the marine life, with snorkelling and diving identified as the highest rated activities enjoyed in the Maldives (CDE Consulting, 2015).Hence, the necessity to preserve the beaches and marine life from impacts of plastic pollution is evident, in order not to jeopardise the tourism industry.

In recent years, the visibility of PET waste has garnered nationwide attention, including various debates regarding the policy mechanisms for sound solid waste disposal and management for the Maldivian context. This is in recognition of PET waste as an environmental and social issue with consequences for human health, and the tourism industry. The nation has currently drafted the first bill proposing a new waste regulation, which embodies the principle of Extended Producer Responsibility (EPR). Moreover, the country has recently created a state-owned Waste Management Corporation (WAMCO) to be

responsible for the waste collection, treatment, and disposal for the entire country. It is unclear how the EPR principle can be adopted to reduce the state burden.

The deposit refund system is a variant of the EPR principle, and they have been used on various products, in different countries. Palmer, Sigman, and Walls (1997) state that the deposit refund system is the most favourable option for reducing waste disposal. However, Atasu and Wassenhove (2011) in their study of policy implications for electronic waste state that, while theoretical models on the application of deposit refund systems have been conducted, with useful analyses of economic systems, the research fails to address vital practicalities that result in significant variations between theory and implementation in different contexts of the world (Atasu & Wassenhove, 2011). There is limited research from Leney, (2005); Woodruff, (2014);(Richards, Haynes, & SPREP, 2014)JICA, (2016); SPREP,(n.d) about the design, implementation mechanism, and outcomes of a deposit refund system in a SIDS context, and their effectiveness as a policy to achieve environmental objectives.

## 1.2 Aim of Research

The overarching aim of the research is to propose a potential deposit refund system policy in the Maldives, and assess the feasibility of implementing the deposit refund system for PET bottles.

The research seeks to fulfil the aim in two ways. Firstly, the implementation mechanism, and the environmental effectiveness of two deposit refund systems in Kiribati and Palau (Pacific island nations in a SIDS context) are evaluated to demonstrate how deposit refund systems are implemented in a SIDS context, and whether the policy can achieve desired outcomes. Secondly, a hypothetical deposit refund system based on the Kiribati and Palau model is designed for the Maldives, and the feasibility of introducing the policy is assessed using political feasibility as a criteria, and via the assessment of economic viability, by calculation of potential expenses and income, which can be incurred by the newly established Waste Management Corporation (WAMCO) to operate the system in the capital city of the Maldives, in Male'.

Through this research, the author also aims to contribute to the overall literature regarding deposit refund systems, and reveal issues of general relevance for the Maldives, and other SIDS struggling with policy options on how to deal with PET waste, and other recyclable product categories.

## 1.3 Research Questions

In order to first understand how deposit refund systems function when implemented in other SIDS, an *expost* evaluation is conducted to assess the **implementation mechanism**, and **environmental effectiveness** of the programme. Secondly, the Maldivian waste context is provided to prop the ex-ante analysis of understanding the **political feasibility** of implementing the programme, and the **economic viability** of operating the deposit refund system Male' city, based on the Pacific models. Below, the research logic and sequence of research questions are conveyed, including the sub questions.

**Expost evaluation of Kiribati and Palau**

**RQ1** How does a deposit refund system function when implemented in other SIDS, using the case studies of Kiribati, and Palau in the Pacific?

- *How is the material and financial flow designed in the system?*
- *How are the roles and responsibilities allocated within the system?*
- *What is the environmental effectiveness of the system, using collection rates as a proxy?*

**Exante evaluation of Maldives**

**RQ2** What is the current situation in the Maldives regarding PET waste?

- *What is the general waste context of the Maldives, including the current import data for PET bottles, and who are the main producers of PET in the Maldives?*
- *What is the regulatory framework for the management of solid waste, and in particular related to PET?*
- *What are the current waste solid management practices, including PET, on a national and local level?*
- *Who are the main actors involved in the management of PET waste?*
- *What is the design of a material and financial flow in a potential deposit refund system to be introduced in the capital city Maldives?*

**RQ3** What is the feasibility of implementing the deposit refund system in the Maldives?

*-What is the political feasibility of introducing the deposit refund system in the Maldives?*
- *What is the potential economic viability for implementing the deposit refund system similar to that of Kiribati and Palau in the capital city Male', by the Waste Management Company (WAMCO)?*

## 1.4 Overview of Methodology

The primary research methodology is driven by policy evaluation of three case studies pertaining to the deposit refund system of three Small Island Developing States (SIDS): Kiribati, Palau, and the Maldives. Miles & Huberman (1994) define the case as, "a phenomenon of some sort occurring in a bounded context". According to (Yin, 2003), a case study design should be considered when the focus of the study is to answer "how" and "why" questions, as well as the focus of the study is to cover contextual conditions because they are relevant to the phenomenon under study. The case study approach is an appropriate unit of analysis for evaluation research, (Fischer,1995), especially in the in-depth evaluation of specific contexts (Yin, 2003). In this research, mini-case studies are also used to provide additional information. For instance, Sweden is used as a mini case study to illustrate how the material and financial flows of a deposit refund system are designed in a developed economy context. Furthermore, the mini case study is used to illustrate case of Maafushi Island in the Maldives, to illustrate the issues of with PET waste, outside of the capital city.

For the purposes of this study, intervention theory is used as an analytical framework, to guide data collection, and analysis. Collected data is triangulated to enhance external validity and substantiation of results (6 & Bellamy, 2012;Eisenhardt, 1989).Literature review is used to analyse the key components of deposit refund systems in general, and identify the typical material and financial flows in two different contexts. The deposit refund system of Sweden, and the deposit refund system model of the Pacific is used to highlight the differences in the allocation of responsibilities in the two systems. Furthermore, relevant literature review guides the identification of evaluation criteria used to assess the performance of deposit refund systems.

The first two policy evaluations are conducted *expost*, based on the case studies of Kiribati, and Palau in the Pacific, to help assess *how* deposit refund systems are implemented in a SIDS context, and whether the outcomes of the programme reflect the goals of the policy. The study uses environment effectiveness as a policy evaluation criteria, to assess the immediate

outcome using collection rates as a proxy. In addition to literature reviews, information gathered via interviews, with experts involved in the design and implementation of the systems in the Pacific, highlights the roles and responsibilities allocated in the system. The analysis of the roles and responsibilities allocated in the Pacific island systems are analysed using the Tojo (2004)[1] analytical framework.

Based on the findings from the two Pacific case studies, as well as on the context analysis of the current Maldivian situation, an *exante*, or hypothetical deposit refund system is created, for the capital city Male', of the Maldives. Furthermore, the political feasibility of introducing the deposit refund system is assessed using Stakeholder Analysis method. The Stakeholder Analysis method involves first identifying stakeholders who are involved in policymaking, and the implementation of waste management activities in the Maldives, and who can have potential roles in the design and implementation of the system. Secondly, their functions were identified, and thirdly, their power and interest for introducing a deposit refund system in the Maldives was analysed using information via qualitative, semi-structured interviews. The Stakeholder Analysis method is regarded as a holistic approach as the stakeholders are immersed in the evaluation process, and it is directed towards the spectrum of affected people from a policy intervention (Vedung, 1997). The study further calculates potential costs and income for implementing the system, for the state owned- Waste Management Company (WAMCO), to assess the economic viability of implementing a deposit refund system in Male' city. The monetary values for costs and income are obtained from two private parties (Secure Bag Pvt.Ltd and the Non-Governmental Organisational (NGO) Biodiversity Environment Awareness Maldives (BEAM) who are involved in the export of PET waste in the Maldives.

In order to complete the Maldivian case study, several data collection methods were used such as literature reviews, interviews with stakeholders, and field visits, to assess the general waste situation in the Maldives, investigate the import data for PET bottles, find information about the current producers of PET bottles, the actors involved in waste management, as well as the regulatory framework governing waste management. **Table 1** provides an overview of the methodology used in this research. For a more thorough explanation of methodology, methods for data collection, and methods for data analysis, see **Chapter 3**.

| Research Question | Overarching research design methodology | Method for data Collection | Data Sources | Method for Data Analysis |
|---|---|---|---|---|
| 1- What does a deposit refund system look like when implemented in Kiribati and Palau? | **Expost evaluation** of case studies | Literature Review<br>Interviews | Annual Reports, Experts from organisations ADB, SPREP, JICA | Analysis of Implementation mechanism using Tojo (2004) Framework |
| 2-What is the current situation in the Maldives regarding PET waste? | Ex ante evaluation | Literature review<br>Interviews<br>Field visits | Government documents<br>Consultancy reports<br>Stakeholders (producers, parliament members, private recycling actors, NGO's) | Triangulation of data, Design of material and financial flow using Pacific case studies |
| 3- What is the feasibility of implementing the deposit refund system in the Maldives? | Exante evaluation of political feasibility, and economic viability | Literature review<br>Interviews | Stakeholders (parliament members, producers, government, PET recyclers | Stakeholder analysis (power and interest matrix)<br>Calculation of costs and income |

*Table 1 Overview of research methodology*

[1] Doctoral dissertation of Dr. Naoko Tojo titled "Extended Producer Responsibility as a Driver for Design Change- Utopia or Reality?" (2004).

## 1.5 Scope and Limitations

The main geographical focus of the study is the Maldives. In addition, the geographical scope extends to the small island states of Kiribati, and Palau in the Pacific.

The Pacific islands are chosen because they are SIDS, which are geographically more similar to the Maldives, as they also archipelagos, or atoll nations. The Republic of Kiribati is one such archipelago with 32 atolls, and one raised coral island, and is chosen as a case because it is the first Pacific island that adopted the Container Deposit Legislation (CDL), and has been hailed as a success in the Pacific. Furthermore, deposit refund systems were implemented in other Pacific islands based on the Kiribati model. Therefore, it is important to study the first successful deposit refund system in the Pacific and learn lessons from how it was implemented. On the other hand, the Republic of Palau, which consists of 250 islands, is chosen because of its strong resemblance to the Maldivian economy. It is also listed as an upper middle-income economy along with the Maldives, and has the strongest tourism base of all the Pacific countries, contributing to 56% of the GDP in 2010 (Pacific Islands Forum Secretariat, 2013)

PET bottles are chosen as a product scope because they constitute the majority of recyclable packaging waste that end up as litter in the coastal areas, and in the oceans in the Maldives. This is due to the increasing demand for bottled water in the Maldives, as well as from the rise in imports due to the socio-economic improvements, and change in quantity and composition of wastes.

For the expost evaluation, the substance evaluation model is chosen, which focuses on goals and outcomes (Vedung, 1997). Environment effectiveness is chosen as an evaluation criterion as it demonstrates the achievement of goals, or results of a policy (Vedung, 1997).The major goals of implementing the deposit refund systems in Kiribati and Palau were to achieve high collection of PET bottles, and thereby reduce the problem of littering, and reduce the burden on landfills (SPREP, n.d.;MPIIC, 2014).These goals are relevant to the Maldivian island nation context, as the Maldives has the environmental problem of rampant PET litter. Thereby, major focus of the research is the analysis of the immediate outcome of the deposit refund policy intervention, which is a high collection rate. Collection rates are chosen because secure and efficient collection systems are the first step to eliminate litter, and secure that plastic leakages do not end up in the ocean (McKinsey Center for Business and Environment & Ocean Conservancy, 2015). It is also the central factor in affecting results according to (Backman, 1984), one of the main architects of the Swedish deposit refund system.

The criterion used for the ex-ante evaluation of implementing the deposit refund system in the Maldives is limited to political feasibility. Political feasibility is chosen as a criterion because stakeholders' power and interest play an enormous role in policy proposal, formulation, implementation, and achievement of policy goals (Roberts, Hsiao, Berman, & Reich, 2002). Furthermore, the Maldives has been struggling with democratic consolidation since it shifted from a 30-year long single-party system, to multiparty systems in 2005. The current political landscape is entrenched by polarisation, and political feasibility of policies is often dependent on party loyalties, stakeholders' connections and influences over other stakeholders', as well as on patron-client relationships. Thereby, it is vital to evaluate the political feasibility. The selection of key stakeholders in the stakeholder analysis of political feasibility is also limited to the potential roles they will have in a hypothetical deposit refund system, which is based on the Kiribati and Palau model. For instance, it is policy makers in the Parliament, producers, and the Waste Management Corporation's interests and power that are analysed. Retailers and consumers are left out of the scope. Retailers are excluded from the scope because in the system proposed by the author, they do not have an administrative role in the deposit refund

systems, nor are involved in financial transactions. Consumers are excluded because the major focus is in this research is the analysis of stakeholders who have influence in proposing the policy. Furthermore, it was difficult to access a representative sample of consumer views and perspectives within the time frame the author was in the Maldives for field research.

In addition, as part of assessing the political feasibility, this research calculates the economic viability of implementing the proposed deposit refund system in Male' using potential costs, and incomes. Economic viability is assessed because of the specific SIDS context of the Maldives. With its unique geography and dispersed islands, it is imperative to choose a policy that does not burden the already weak economic, and resource base. Furthermore, in the assessment of political feasibility, economic viability expressed as a concern by the Ministry of Environment, and the Waste Management Corporation (WAMCO). Thereby, the scope for assessing the economic viability is based on the estimation of the potential monetary expenses, or costs, and income that will be incurred by the newly established Waste Management Corporation (WAMCO), for implementing the system, in the capital city Male'. The capital city is chosen as a geographical scope, because it is the most densely populated island, and the financial and political hub of the Maldives, with the most amount of waste generated. Furthermore, interviews with stakeholders revealed that it is harder to implement harmonised waste management policies on a national scale, including the outer atolls, due to complications with logistics, transportation, and the low volume of waste. WAMCO is chosen because the state has already allocated the responsibility of waste management of the entire country to the company, and thereby it is logical to calculate the costs of implementing an EPR scheme for the only recognised, state supported institution.

## 1.6 Ethical Considerations

This thesis strives to disclose, and convey the information obtained via interviews thoroughly and honestly. All the information provided by interviews is treated with integrity, and sensitive information has been secured unless they consented to information disclosure.

## 1.7 Audience

This thesis is written as part of the final requirements of the Master of Science programme in Environmental Management and Policy at the International Institute for Industrial Environmental Economics (IIIEE) at Lund University, in Sweden.

The research provides Maldivian policy makers a blueprint on how to implement the deposit refund system in the Maldives, for beverage PET bottles, using case studies from two SIDS countries analyses the political feasibility, and economic viability of implementing the deposit refund system in the capital city Male', by the Waste Management Corporation (WAMCO) of the Maldives. Thus, the research and its findings have the possibility to be useful for policy makers in the Maldives, in the assessment of its potential introduction to the Maldives.

## 1.8 Disposition

**Chapter 2** provides the literature on deposit refund systems as a variant of Extended Producer Responsibility principle, and analyses how deposit refund systems are implemented in practice, with a focus on the Swedish context, and Pacific island context (SIDS). The chapter also reviews literature on the evaluation of deposit refund systems and highlights the main criteria used for evaluating deposit refund systems in this research. The chapter also provides an analytical framework for this research, based on intervention theory.

**Chapter 3** presents the methods for data collection and analysis.

**Chapter 4** unravels the experiences of the two Pacific islands with deposit refund systems, and presents an ex-post analysis of the environmental effectiveness of the programme.

**Chapter 5** provides a current context analysis of the Maldives. It provides import data for PET, as well as the regulatory framework, and main policies for PET management. Furthermore, it highlights the general waste management practices for Male', atolls, and tourist resorts, including the PET producers, and main actors involved in PET waste management.

**Chapter 6** presents the potential design of the material and financial flows of the deposit refund system to be introduced in Male' city

**Chapter 7** presents the stakeholder perceptions and analyses the political feasibility of implementing the programme in the Maldives using a power and interest matrix. This chapter furthermore analyses the economic viability of implementing the system by the Waste Management Corporation (WAMCO), in Male', the capital city of the Maldives.

**Chapter 8** critically discusses the findings and analysis from Chapters **4,5,6, and 7, and** the implications of those findings and analysis. Furthermore, this chapter critically analyses the research methodology, analytical theory and how they can affect the results of this research

**Chapter 9** provides the major conclusions of the analysis, checks if the research questions are answered and explains the implication of the findings of this research to the potential introduction of the deposit refund system in the Maldives, and to the overall literature about deposit refund system. Recommendations and further questions for future research are presented as well.

# 2 Deposit Refund System: Theory, Practice, and Evaluation

This chapter provides an introduction to the deposit refund system, explains its general form, its primary policy goals, the products it is usually applied to, and demonstrates the effectiveness of deposit refund systems as a policy intervention, based on existing literature. Furthermore, the chapter explains the role of as a variant of the with Extended Producer Responsibility (EPR) policy. The chapter then presents how deposit refund systems are implemented in different contexts, using the example from Sweden, and the general deposit refund model in the Pacific island nations. Sweden is chosen as an example, as it is the first European country to implement the deposit refund system, and furthermore, it is chosen due to the author's familiarity with the system, as the International Institute of Industrial Environmental Economics (IIIEE) is based in Lund, Sweden, and the Master's programme has highlighted the deposit refund system of Sweden in various lectures related to EPR. The general Pacific model furthermore captures how deposit refund systems are implemented in the majority of Small Island Developing States (SIDS). The chapter then discusses policy evaluation of deposit refund systems, and introduces the evaluation criteria for deposit refund systems. Lastly, the chapter presents an analytical framework for policy evaluation in this research, and presents the evaluation criteria used in this research.

### 2.1.1 Introduction to Deposit Refund System

The deposit refund system is a combination of a product charge and a subsidy (Spiegelman, 2005). In a deposit refund system, consumers pay a deposit (product charge) at the time of the purchase, on top of the price of the product. Once consumers return the waste product to the seller, or an authorized collection point, they receive a refund, or subsidy (Opschoor & Turner, 1994).

The goal of the deposit refund system is, via the enhancement of collection of post-consumer products, to reduce litter, reduce the volume and cost of waste disposal, and to discourage illegal or unsafe disposal (Spiegelman, 2005). Furthermore, deposit refund systems have a significant goal to extract recyclable items out of the waste stream, and increase the amount of returned empty or waste packaging, so as to reduce the raw material usage, and energy (Spiegelman, 2005). This is because the greenhouse emissions, and associated environmental impacts become smaller with increased recycling rates of one-way packaging (Zero Waste Europe, 2010). Deposit refund systems also aim to induce behavioural change, and discourage anti-social littering behaviour (Opschoor & Turner, 1994).

The deposit refund system is applied to various products. The policy instrument is largely applied to packaging products, and beverage containers such as PET bottles, or aluminium cans, but it has also been applied to products such as lead-acid batteries, motor, oil, and tires, (Walls, 2011;Spiegelman, 2005).

Deposit refund systems have been implemented in various countries since the 1970's to reduce the amount of packaging waste. As technology advanced, and bottling and distribution became more centralised, glass bottles and reusable containers became replaced by one-way beverage containers (Container Recycling Institute, 2016). Consequently, the amount of litter from these containers also proliferated. In order to address the growing litter problem, British Columbia in Canada implemented a mandatory deposit return system for soft drinks and beer containers under the terms of the Litter Act, in 1970, with the state of Oregon in the United States also implementing a deposit return system for beer and soda to reduce litter in 1972 (Fitzsimons, Lee, Slater, & Beukering, 2010). The states of Vermont, Maine, Iowa, and

Michigan complied in the 1970's, with Connecticut, Delaware, New York and Massachusetts, and California following suit in the 1980's (Container Recycling Institute, 2016). In 2011, 10 states in the United States, and 11 Canadian provinces had a deposit refund system (Walls, 2011). In Europe, according to Schneider et al., (2011), Denmark, Germany, Iceland, Slovakia, Sweden, and Norway have mandatory deposit refund systems for one-way beverage containers, with Estonia, Finland, and Netherlands having voluntary systems. European deposit refund systems are distinct from the North American system as there are higher deposits on products (US $0.22-0.56) to provide a greater incentive to return the products (Fitzsimons et al., 2010). On the other hand, U.S systems use a lower deposit (US$ 0.05-0.15) to reduce litter, and capture sales packaging for recycling purposes (Fitzsimons et al., 2010). Deposit refund systems have also been implemented in countries such as Australia, Barbados in the Caribbean, and islands in the Pacific (Bottle Bill Resource Guide, 2016). As of 2010, 335 million people in 21 countries used a mandatory deposit refund system (Fitzsimons et al., 2010).

Deposit refund system policy is a highly effective policy, according to existing literature. Several studies demonstrate the environmental effectiveness of deposit-refund systems to reduce the amount of solid waste disposal, and to achieve high collection rates of recyclable products to increase recycling (Fullerton and Kinnaman, 1993; Sigman, 1995; Palmer and Walls, 1996), as opposed to direct fees or taxes levied on disposal, which have proven to be difficult to enforce, and moreover incentivizes illegal dumping (Dinan, 1993;Sigman, 1995). According to Walls, (2011) contrary to Pigouvian taxes on disposal which can encourage households and firms to dump waste illegally, deposit refund systems can curb this issue by providing refunds to consumers once they return the waste product. Moreover, it is easier to implement a deposit refund system, than a direct tax on litter disposal. This is because it is harder for consumers to evade an upstream deposit on product sales (Walls, 2011; Fullerton and Kinnaman, 1995).

Deposit refund systems have also proven to be environmentally effective in practice. For instance, in Germany, deposit refund systems have achieved higher collection rates for beverage packaging, as compared with curbside collection, and other recycling programs. Furthermore, mandatory deposit refund systems for one-way beverage containers have achieved collection rates up to 80% internationally, where in some countries the collection rate is above 95% (PricewaterhouseCoopers, Albrecht, Brodersen, Horst, & Scherf, 2011). In Europe, mandatory deposit refund systems imposed on one-way beverage packaging have also achieved the highest recycling rates, than in other European countries with voluntary systems (Schneider et al, 2011). In Denmark, return rates in 2007 were 84% for cans, 93% for plastic bottles and 91% for glass bottles within the scope of a deposit refund system (Gandy, Fry, & Downes, 2008). Furthermore, in Sweden, the recovery rate for in the past 15 years for aluminium cans have been between 85 and 92%, whereas for PET it has been between and 74 and 85% (Tojo, 2011). Hence, mandatory deposit refund systems achieve high collection or return rates, when compared with deposit free beverage packaging (Schneider et al., 2011; (PricewaterhouseCoopers et al., 2011), and can thereby contribute to the significant reduction of litter, and reduction of recyclables in the general waste stream.

Deposit refund systems also facilitate high recycling rates. For instance, one-way beverage packaging which are collected separately within a deposit refund scope can be more easily recycled due to targeted sorting of packaging waste (PricewaterhouseCoopers et al., 2011). Consequently, high collection rates often correspond with recycling rates, and reduce the use of virgin materials in the production of new products, thereby minimising resource consumption and the associated environmental impacts. In a comparative study of 27 EU countries, deposit refund systems also revealed a lower rate of rejects, high material value and

quantity from collection and recycling, as opposed to kerbside collection or residual waste sorting (RWS) methods (Hogg et al., 2011).

### 2.1.2 Deposit Refund System as a Market Based Instrument

The deposit refund system is market- based instrument, which uses economic incentives to alter consumer behaviour, and solve environmental problems. By imposing a deposit on the product, the consumer is charged implicitly for littering, illegal dumping, or burning of the waste. However, when consumers return the products for recycling, or disposal, they receive a refund, thereby providing an incentive for the consumer to return the product and consequently minimise littering and illegal dumping (Stavins,1998). In this way, consumer behaviour is altered using economic incentives, as it charges the consumer for consumption and potential polluting activities, and rewards the consumer for returning the product for better management of the product. Economic instruments are claimed to be more cost effective in achieving environmental, social, and health policy objectives for society, as compared to Command and Control (CAC) approaches (European Environment Agency, 2006), as it uses price mechanisms to alter human behaviour to prevent environmental damages.

### 2.1.3 Deposit Refund System and Extended Producer Responsibility

Deposit refund systems are a variant of the Extended Producer Responsibility (EPR) policy. EPR extends the producer's physical and financial responsibility for a product to the post-consumer stage of a product's life cycle (OECD, 2001). This responsibility can be a physical one, as in a take-back mandate, or a financial one, in which the cost of the end-of life-management are borne by the producer (Walls, 2011), or even an informative responsibility to disseminate information to the general public regarding how the system works.

Thomas Lindhqvist first presented the EPR concept as a policy strategy to the Swedish Ministry of Environment in 1990. A refined model to define and identify responsibilities in an EPR scheme was developed by Lindhqvist in 1992 **(Figure 1).** Lindhqvist defines economic responsibility where the producer is responsible for the full, or partial expenses for the collection, recycling, or final disposal of the products he is manufacturing, either paid directly by the producer, or via a special fee (Lindhqvist, 2000). Physical responsibility means the systems where the manufacturer is involved in the physical management of the products and/ or their effects. Informative responsibility signifies the various possibilities to extend responsibility for the products by requiring producers to supply information on the environmental properties of the products they are manufacturing (Lindhqvist, 2000).

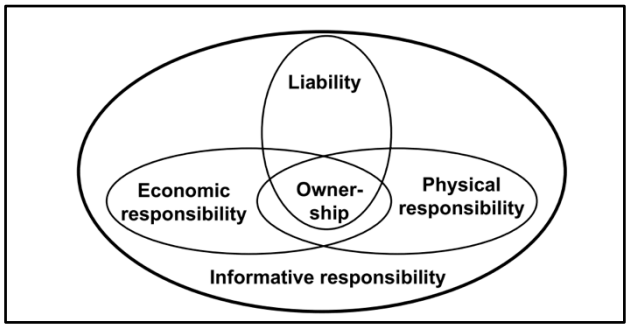


*Figure 1 Model for Responsibilities (Source: (Lindhqvist, 1992)*

EPR takes a holistic, life cycle approach to waste management by making the producer bear responsibility for the total life cycle costs of the product. (Lindhqvist, 2000) claims that EPR is a "necessary condition" to reflect the full life cycle costs in the price of the product.

(Lindhqvist, 2000) furthermore states that without an EPR approach, the producer or manufacturer of the product may oversee the costs such as waste collection, recycling or disposal. Thereby, EPR provides an innovative solution for governments to finance waste management, rather than raising taxes or increasing charges for municipalities, especially for developing countries (Lindhqvist, 2000).

Some of the major environmental goals of EPR are to facilitate collection, recovery, and recycling of products, to decrease the environmental impacts associated with the extraction and processing of virgin materials (Lindhqvist & Van Rossem, 2005).

## 2.2 Deposit Refund Systems in Practice

Deposit refund systems can either be voluntary, or mandatory schemes imposed by the government (Opschoor & Turner, 1994). A major aspect of setting up a deposit refund system is the design of the collection system. This is because the design of the collection system affects the central aspect of a deposit refund system, which is the collection rate, or retrieval rate of products (Backman, 1984). They are influenced by the availability of technology, design of the redemption centre, and the costs and benefits, and the availability of information. (Backman,1984). Furthermore, the collection rate also depends on the perception of consumers about the necessity to return the products, and attitudes towards the action of returning, economic incentives, characteristics of returned product, as well as factors such as time or burden required to return the objects, and time or burden required to store the products (Tasaki, Numata, Matsumoto, & Tojo, 2010).

The mechanism for the collection and recycling of products in deposit-refund schemes varies from country to country, as with most EPR schemes. In the European Union (EU), the collection and recycling mechanism range from voluntary industry initiatives to mandatory schemes imposed by the government This indicates that the mechanisms for the allocation of responsibilities are not particularly the same for all contexts. This is because the transfer of responsibility for waste collection, treatment and recycling from municipal authorities to producers is complex (Kunz, Atasu, Mayers, & Van Wassenhove, 2014).

The extent of producer responsibility in deposit refund systems also varies from context to context. In some systems, producers bear financial responsibility through contracts with public authorities, bear full financial responsibility, partial organisational responsibility, or bear full responsibility for both financial and organisational aspects (European Commission, 2014). In most economically developed countries, producers do not physically collect material themselves, but belong to a Producer Responsibility Organisation (PRO). PRO's assume responsibility for collection and recycling, and covers the cost of the service through member company fees, which among others, can depend upon per weight of material and material type. (Walls, 2011; (Kunz et al., 2014). PRO's were created to facilitate an efficient collection and recycling scheme, and they are oftentimes collectively owned by breweries, importers, or retailers, to organise and administer the collection and recycling of waste on behalf of producers. There are also other approaches where governments charge fees or taxes to producers and pay for waste collection and recycling as with Taiwan, Korea, and Hungary (Kunz et al, 2014).

In the following two sections, two different variants of the deposit refund system illustrate the difference in implementation, and allocation of responsibilities.

### 2.2.1 Deposit Refund Systems in a Developed Economy Context: the Case of Sweden

Sweden is the first European country to implement the deposit refund system, in 1982. Under the Swedish deposit refund system, the direct economic responsibility with regards to the collection and recycling of recyclable products are borne by a Producer Responsibility Organisation (PRO) called Returpack (AB Svenska Returpack). In Sweden, Returpack-PET (AB Svenska Returpack-PET) for PET bottles was established in 1994 (Tojo, 2011). The current ownership is shared among PET manufacturers (50%) the association of large retail chains (25%) and the association of small and individual retailers (25%) (Tojo, 2011).Returpack is responsible for the main activities of the deposit refund system, and organises the collection and recycling of the products, via membership fees. Hence, the major economic and physical responsibility of post-consumer waste is borne on the producer, as importers and producers in the system (excluding single stores) are responsible to pay a yearly fee of SEK 10,000 to Returpack, for organising the main activities such as collection, and recycling of products. There is minimal government intervention, as the only responsibility of the government is to act as a supervisory authority, once Returpack passes the fees to the Swedish Board of Agriculture (Jordbruksverket, 2016).The Swedish Environment Agency is furthermore responsible for the official statistics (Returpack, 2016).

Retailers in the Swedish system also have an important role in that they are involved in administrative and financial transactions. Retailers are responsible for refunding the consumers, after they return the empty bottles to Reverse Vending Machines (RVM). Consumers receive a small slip from the RVM's, which indicates the amount of refund to be paid. It is the retail shop, which then pays the refund to the consumer. Retailers are paid a compensation fee from Returpack for handling charges. Returpack then registers the payment to the shop via an online system connected from the RVM to Returpack, and takes responsibility for the collection, and sorting of bottles according to coloured, and non-coloured bottles. Then the bottles are baled, and brought to a plant called Cleanaway, where the bottles are broken down into small flakes and cleaned (Tojo, 2011). **Figure 2** illustrates the material and financial flows of the deposit refund system in Sweden.

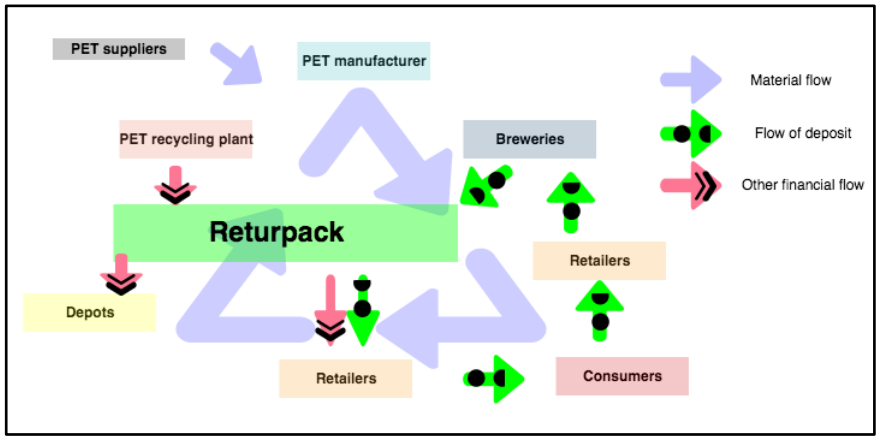


*Figure 2 Material and Financial Flows of the Swedish Deposit Refund System (Adapted from Source: Tojo, 2011)*

### 2.2.2 Deposit Refund Systems in the Pacific

In SIDS such as the Pacific Islands, the design of the material and financial flows are considerably different, and the allocation of roles and responsibilities also differ from a developed economy context, such as Sweden.

With regards to how deposit refund systems function in the Pacific islands, there are four main differences, compared to the Swedish deposit refund system. Firstly, in the Pacific nations, deposits are also imposed, on importers. In the system, importers of beverage containers pay a deposit per container, at Customs, upon entry of the product into the country. These deposits are accrued to a "Special Fund" which is created under the auspices of a "Container Deposit Legislation", and monitored by a state authority such as the Finance Ministry. Furthermore, once consumers return the empty bottles to a collection centre, the collection centre generally issues the refund to the consumer, which is claimed from the Special Fund. Thereby, retailers in this system do not handle financial transactions, are not involved in an administrative aspect, unlike the Swedish system. The refund amount ranges from 50% to 100% of the deposit value, where in the case where a 50% refund is paid, the rest maybe used as a handling fee, to cover operational costs to run the collection centre. The collection centre can be either run by a State Agency, or a private contractor hired by the government. Moreover, the overall system operator in the Pacific islands is also usually the Government, or a State Agency, often in collaboration with a private company under contract to the government. Thus, the state plays a crucial role in the implementation and monitoring of the system, which is unlike the Swedish system, which have minimal government intervention, and more responsibility imposed on the producers/importers. The products that are collected are also treated differently in the two contexts. Since Pacific island nations lack recycling infrastructure, the products that are collected are exported to other countries for recycling, whereas in the Swedish context, they are recycling within the country, on site. **Figure 3** below illustrates the material and financial flows of deposit refund system in the Pacific, and **Table 2** compares the main features and elements of a typical system in Sweden, and the Pacific.

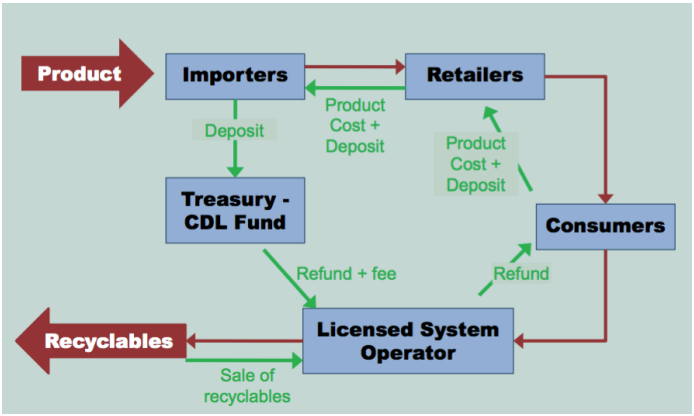


*Figure 3 Typical Design of Material and Financial Flows in the Pacific Deposit Refund Systems (Source: (Richards et al., 2014)*

| Feature | Pacific System | Swedish System |
|---|---|---|
| Deposit due | On import, and after sale | After sale |
| System Operator | National/State Government Private Company under contract to government | Returpack (Private Company) |
| Fund Manager | Treasury Department | Returpack (Private Company) |
| Fate of Materials Collected | Exported for recycling | Recycled by Returpack in Sweden |

*Table 2 Comparison of the deposit refund systems in Sweden and the Pacific (Source: Richards et al., 2014).*

## 2.3 Environmental Policy Evaluation

This section describes the key concepts employed in the evaluation of public intervention, such as understanding policy evaluation of interventions, and the goal of policy evaluation. Furthermore, this section delves into the use of theory (intervention theory) as a conceptual framework for policy analysis, and highlights the criteria used for evaluation. Finally, the analytical framework that is used in this research is presented.

Policy evaluation is the "applied social science discipline which uses multiple methods of inquiry and argument to produce and transform policy-relevant information" (W.N. Dunn, 1981):p. 35).Vedung, (1997), also describes policy evaluation as the "careful retrospective assessment of the merit, worth and value of administration, output and outcome of government interventions, which is intended to play a role in future, practical action situations.' Furthermore, Vedung (2000) states that evaluations are "intended to play a role in future, practical action situations", (p. 3) and that it should examine ways the real life outcomes are a product of the policy i.e. how do programme mechanisms affect the outcomes.

Overall, the goal of policy analysis is to produce and transform policy relevant information so that it may be utilised in political settings to resolve policy problems (W.N. Dunn, 1981): p. 35; William N. Dunn, 1994).

### 2.3.1 Theoretical Background for Policy Evaluation: Intervention Theory

The role of theory-based evaluations have been emphasised by renowned policy evaluators such as (Chen, 1990), to reconstruct the intervention (or programme) to model how a policy is supposed to function (Bickman, 1987). The intervention theory refers to "all empirical and normative suppositions that public interventions rest upon" (Vedung, 1997, p.301). The "suppositions" concern both the goals of the intervention, and the process of the achieving the goal (Vedung, 1997, p.138). Intervention theory is used as a tool to guide data collection and analysis, and guide the evaluator to identify how the intervention has been implemented, and what effects it has had in practice. (Mickwitz, 2003; Vedung, 1997).

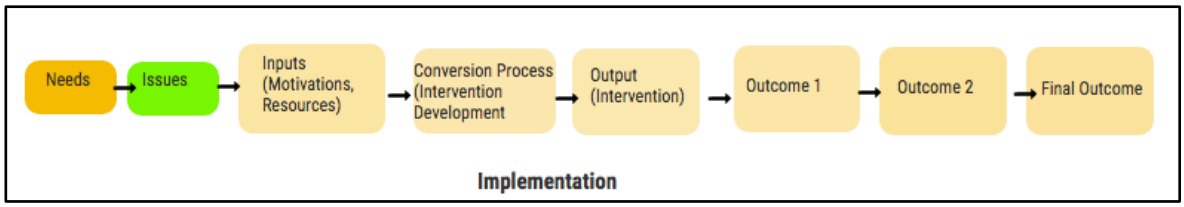


*Figure 4 Input-Output System Model adapted for Intervention Evaluations (Source: Adapted from Vedung, 1997)*

**Figure 4** introduces a schematic model adapted for mapping a general public intervention. In this model, the initial needs contribute to the underlying issues, which can be addressed by policy intervention to achieve desired outcomes. In this model, "input" refers to the various forms of monetary, physical, or human resources that contributes to the implementation of the programme, as well as the motivations behind the intervention, such as the needs, and goals of a policy intervention (Hildén et al., 2002). The "conversion" or intervention process includes the various actors who contribute to the development of the intervention. The actors in a conversion process are defined by (Hildén et al., 2002) as the major decision-making entities such as authorities, companies, NGO's, individuals, including *agencies*, which implement the policy instrument, and *addressees* who are the targets of the instrument. Hence,

an important aspect of intervention theory includes identifying the stakeholders, who contribute to the intervention development, as their input contributes to the reconstruction of the public intervention (Richter & Koppejan, 2015). A stakeholder is an actor affected by and having an interest in the intervention, its activities, implementation and outcomes(Hansen & Vedung, 2010)"Outputs" or intervention in this model refer to the matters that the addressees, or targets of an intervention are faced with (e.g. deposits levied on producers or consumers and their specific conditions), and how the matters are implemented i.e. design of the implementation mechanism (Hildén et al., 2002). "Outcomes" refer to the actions that are taken by addresses as they are faced with outputs (Mickwitz, 2006), such as collection of PET bottles, as well as the consequence of these actions. Outcomes can be categorised into immediate, intermediate, and ultimate outcomes (Vedung, 1997).

Patton (1997) identifies three different approaches to the development of intervention theories: the deductive approach, based on literature, the inductive approach based on field work, and the user-focused approach based on the implicit theory of action of the intended users.

### 2.3.2 Criteria for Environmental Policy Evaluation

Policy evaluation is fundamentally normative, and therefore, value criteria to base the normative judgements must be utilised (Fischer, 1995; Mickwitz, 2003; (M.-L. Bemelmans-Videc, Rist, & Vedung, 2003). The purpose of evaluation criteria is to specify the dimensions of the policy instruments, so that the merit of the intervention policy can be assessed. (Hildén et al., 2002).

Literature reviews on environmental policy evaluation reveals various criteria for policy evaluation (Barde,1995) suggests the following aspects to be examined: environmental effectiveness, economic efficiency and political and administrative aspects such as distributional effects, acceptability and simplicity. Bemelmans-Videc, 1998)further suggests effectiveness, efficiency, legality, democracy and legitimacy as evaluation criteria. Mickwitz (2003) suggests the evaluation of the following aspects such as relevance, impact, effectiveness, persistence, flexibility, predictability, efficiency, legitimacy, transparency and equity

This research focuses on two criteria, namely environmental effectiveness, and political feasibility. As discussed in the Scope and Limitations in 1.5**,** they are chosen because the environmental effectiveness criteria analyses the degree to which Kiribati and Palau have achieved the goals of the policy intervention, and thereby the findings can be used to persuade policy makers in the Maldives concerning the introduction of the deposit refund system. Political feasibility criterion is chosen because the level of political feasibility influences the actual enforcement of an intervention (Barde, 1995, p.206), and thereby will determine whether the policy can be implemented in the Maldives or not.

### 2.3.3 Environmental Effectiveness Criteria

The effectiveness criterion is the most dominant criteria in traditional evaluation practice (Vedung, 1997, p.37-83). It concerns whether, and by how much the goals of the intervention have been attained. The extent to which a public intervention meets its objectives is one of the most widely researched topics in the field of evaluation research (Vedung, 1997).

Vedung (1997:37-39) states that the effectiveness of an intervention can be considered from two perspectives: 1) whether, and how much the outcomes correspond to the goals of the intervention (goal-achievement measurement), and 2) whether, and how much the outcomes are produced as a result of the intervention (attributability assessment). The goal achievement

evaluation method is substantive, and focuses on the outcomes, and linkage of the outcomes, regardless of costs (Vedung, 1997, p.83). The primary goal of implementing environmental policies, and evaluating them is to demonstrate the degree to which the achieved outcomes correspond to the intended goals of the policy instrument (Mickwitz, 2003; Vedung, 1997).

### 2.3.4 Political Feasibility Criteria

Political feasibility relate to the political acceptability of implementing a policy, and the subsequent issues that arise which can facilitate or impede the acceptance of the policy, or the implementation process (Larrue, (1995), defines political acceptability as the formalization of economic rules for the implementation of policies, and the consequent support, or lack of support for the formalization process by various institutional actors or target groups in a society. Furthermore, the "attitudes and values" of various interest groups involved in the system can drastically influence the design of the deposit refund system, and affect the interrelating factors such as the design of the collection system, and the design of the retrieval station (Backman, 1984).

The final design of the instrument, and the entry of the economic policies are affected by political decision-making, and the configuration of political forces (Andersen & Sprenger, 2000).Thereby, what is implemented in practice is oftentimes different than what environmental economists advocate (Andersen & Sprenger, 2000). Moreover, political support and opposition is often dependant not only upon stakeholders' perspectives, but also on how much influence and power they can wield in the policy making arena (Roberts et al., 2002). Moreover, political feasibility for policy innovations is also shaped by the support and influence of other policy makers and stakeholders, and key interest groups (Hahn & Stavins,(1991); Roberts et al., 2002; (Bardach, 2012; Managi, 2015. This is because interest groups influence key decision makers such as elected officials and civil servants, who consequently structure policy instruments to meet their political objectives, and gain political support from those interest groups (Hahn, 1999). Due to this sensitive connection between interest groups and policy makers, politicians often prefer environmental policies which entail minimal costs to industry, oftentimes gaining more political support when stricter rules are imposed on newer firms, and more lenient rules are given to the older firms (Andersen & Sprenger, 2000). Nevertheless, in the case where there is a lack of democratic consolidation in a country, which results in uneven distribution of power, and weak interest groups, political decision making is often dominated by policy elites, due to structural and ideological reasons (Grindle & Thomas, 1991).

Ideally, a policy such as deposit refund system, which is hailed to be highly environmentally effective to reduce litter and increase recycling of packaging waste through its collection, should garner political support. In this way, political feasibility is often dependent upon other criteria, such as environmental effectiveness. Economic efficiency is also often claimed to be a requirement for political feasibility (Managi, 2015). However, according to Andersen & Sprenger (2000) cost effectiveness, or cost efficiency alone is not a primary concern for policy makers when choosing instruments for implementation. Rather, other criteria such as electoral results, distribution costs, such as which groups are burdened with the costs of the policy, as well as flexibility of the instruments, and budget concerns can matter more (Andersen & Sprenger, 2000). Another recurrent theme in the political feasibility of implementing economic incentives for environmental policy is the use of revenues. In an analysis of environmental policies in the Pacific, it was demonstrated that increased awareness, consultation campaigns, gradual implementation policies, as well as explanation of how revenues are used, can increase the political feasibility (United Nations Economic and Social Commission for Asia and the Pacific, 2004)

## 2.4 Analytical Framework for the Research

This thesis applies theory-based evaluation (intervention theory) as the main framework of analysis, to answer the research questions that pertain to the *expost* and *exante* policy evaluation of deposit refund systems in Kiribati, Palau, and the Maldives

The system model adapted to the evaluation of government interventions **(refer to Figure 5** has the following scope and limitation. It is used to structure the data collection, and *expost* analyses of *inputs*, *outputs*, and *outcomes* relevant to the deposit refund policy intervention in Kiribati and Palau. The analysis of the inputs, and design of the output, or intervention (i.e. study of the material and financial flows, and allocation of roles and responsibilities) as well as the outcomes of the deposit refund system in Kiribati and Palau answers **Research Question 1,** which pertains to policy evaluation**.** The analysis of the allocation of roles and responsibilities is based on the adaptation of the Tojo (2004) framework, as presented in **Table 3.** The outcomes are assessed using environmental effectiveness a criterion. The focus of analysis is on immediate the outcomes, which is the achievement of high collection rates, and consequent reduction of litter, and PET from the general waste stream. The logic behind choosing the goal achievement, or environmental effectiveness as a criterion may seem self-evident, but it will demonstrate how well the deposit refund systems implemented in Kiribati and Palau, in a SIDS context, have achieved the goals of the policy, and contribute to the achievement of the ultimate outcome, which is reduction of marine and coastal litter.

For the case study of the Maldives, political feasibility is used as evaluation criteria. The assessment of political feasibility using the Stakeholder Analysis method answers **Research Question 3**, and pertains to the *exante* analysis of the "conversion", or intervention development process, in the input-output system model adapted to evaluation of government interventions, provided in **Figure 4** above. Political feasibility is an important aspect to consider, because while they are popular in the Pacific as compared to other environmental policies (United Nations Economic and Social Commission for Asia and the Pacific, 2004). Opschoor and Turner (1994) state that with the exception of hazardous materials such as oil and batteries, there is low acceptability of deposit refund systems in certain institutional and industrial circles Furthermore, Mrozek, (2000) states that net accrual of revenues for the government in the implementation of a deposit refund system can hinder the political feasibility of the policy. Most importantly, assessment of political feasibility with regards to the potential introduction of the deposit refund system in the Maldives is necessary. As mentioned above in literature, the lack of democratic consolidation, the disenfranchisement of interest groups, and uneven distribution of power, result in a situation where public policies are mostly introduced by political elites (Grindle & Thomas, 1991). This is the case in the Maldives, where the political landscape is rife with the polarisation depending on political views. Hence, stakeholders' power and interest is a prerequisite in the potential introduction of the policy.

To summarise this chapter, deposit refund systems are effective in the reduction of litter, via the achievement of high collection of products (Dinan 1993; Walls 1996; Sigman 1995; Spiegelman, 2005). There are significant variations in the application of the deposit refund system in different contexts, as illustrated via the deposit refund system in Sweden, and the Pacific context. However, it is unclear how the implementation works in a SIDS context, and whether the deposit refund system policy can achieve the goals of the policy. The review of environmental policy evaluation criteria reveals that environmental effectiveness, and political feasibility are appropriate to answer the questions pertaining to policy evaluation in this research. Environmental criteria is the most dominant criteria to assess the achievement of goals (Vedung, 1997), and political feasibility is a requirement to understand the potential design and configuration of environmental policies (Managi, 2005) especially in a democratically challenged context (Grindle & Thomas, 1991), such as the Maldives.

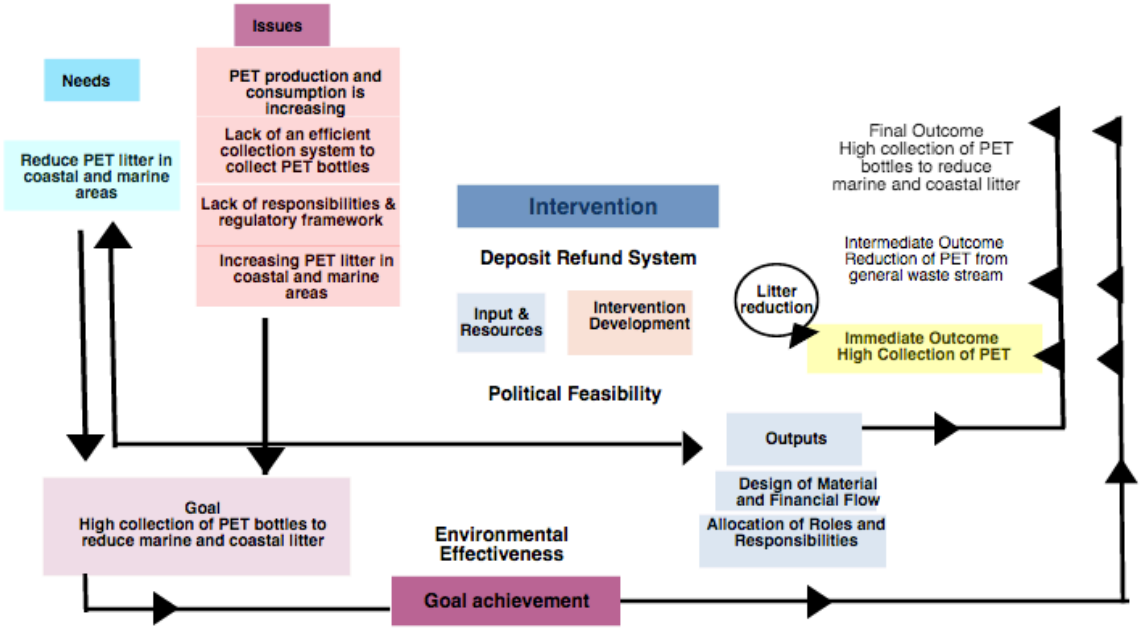


*Figure 5 Illustration of the overview of methodology*

| Types of Responsibilities | Main Activities of a Deposit Refund System in SIDS | | | | | | |
|---|---|---|---|---|---|---|---|
| | | Payment of Deposit | | Collection of deposit | | Collection and returning of bottles | Receiving bottles and issuing refunds | Exporting |
| | | Upon import | Upon purchase | Upon import | Upon purchase | | | |
| | **Economic** | Identifies the actor economically responsible for paying the deposit upon import or purchase of the PET bottles | | Identifies the actor economically responsible for collection of the deposit upon import or purchase of the PET bottles | | Identifies the stakeholder who is economically responsible for the collection and returning of bottles | Identifies the actor economically responsible for receiving bottles and issuing refunds | Identifies the actor economically responsible for exporting the bottles for recycling |
| | **Physical** | Identifies the actor responsible for physically paying the deposit | | Identifies the actor responsible for physically collecting the deposit fee upon import or purchase of the PET bottles | | Identifies the actor responsible for physically collecting PET bottles, and returning them to a redemption Center | Identifies the actor responsible for physically receiving bottles and issuing refunds | Identifies the actor physically responsible for exporting the bottles for recycling |
| | **Informative** | Identifies the actor responsible for the creation of awareness, and providing information relevant to all the activities of the deposit refund system | | | | | | |
| | **Monitoring & Enforcement** | Identifies the actor relevant to the monitoring and enforcement aspects of all the activities in the deposit refund system | | | | | | |

*Table 3 Modification of the Tojo Analytical Framework to identify roles and responsibilities in the deposit refund system of SIDS*

# 3 Methodology

This chapter describes the methodology used during the research, and explains the methods used for data collection, and data analysis, and the limitations.

The overall research methodology is framed by policy evaluation using intervention theory, which is used in three case studies, as mentioned in **Section 1.4.** This is in accordance with Dunn's (1981) definition of policy evaluation as the "applied social science discipline, which uses multiple methods of inquiry and argument to produce and transform policy-relevant information that may be utilized in political settings to resolve policy problems". The definition is employed both for the *expost* of the deposit refund systems in Kiribati and Palau, to assess the environmental effectiveness i.e. the outcome of the programme, as well as the *exante* analysis of cost efficiency, and political feasibility of implementing the deposit refund system in the Maldives.

Vedung (1997) describes a five step approach to policy evaluation, which is: 1) the reconstruction of the policy evaluation; 2) data collection; 3) data analysis according to the framework; and 4) conclusions. This five step approach has been closely followed in the evaluation of the implementation mechanisms, and analysis of environmental effectiveness of the deposit refund system in Kiribati, and Palau, and the *exante* analysis political feasibility, and economic viability, in the potential introduction of the deposit refund system in the Maldives.

The illustration below captures the overall research methodology, including the multiple methods and tools used for data collection, and data analysis used for this research.

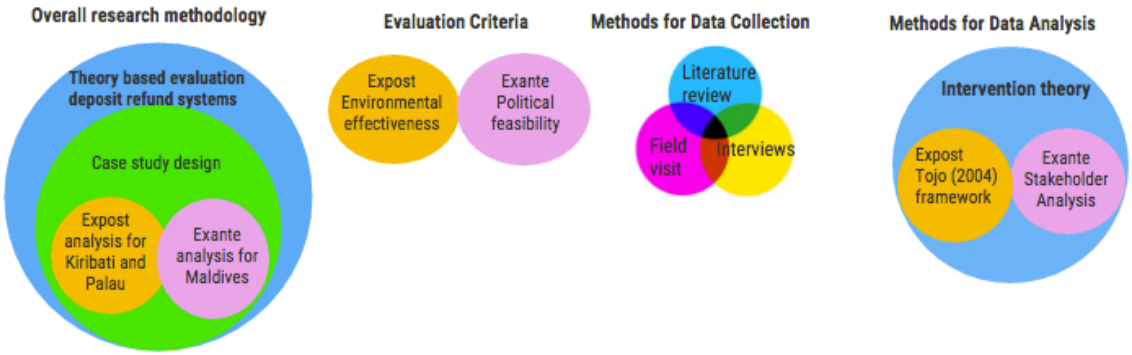


*Figure 6 Illustration of the overview of methodology*

## 3.1 Methodological Approach

### 3.1.1 Case Study Design

To complete the case studies of Kiribati and Palau, three major tasks were undertaken. The first two steps involved identifying *outputs* or implementation mechanisms, (i.e. the design of the material and financial flows, and the allocation of roles and responsibilities). Secondly, the environmental effectiveness of the system is analysed by assessing the immediate outcome , which is high collection of PET bottle. Data was collected data from annual reports, interviews, as well as export figures.

For the case study of the Maldives, an exploratory journey was first undertaken to investigate existing baseline data for the import data for PET, investigate the actors i.e. addressees or targets of a deposit refund policy, who are the PET producers and their roles, analyse the current waste management practices in Male' region, the atolls, and tourist resorts, as well as the regulatory framework which they are operating under. Furthermore, recycling entities operating as a private business, Secure Bag Pvt.Ltd, and an NGO called Biodiversity Environment Awareness Maldives (BEAM) was identified. Information provided by private recycling entities such as Secure Bag and BEAM were used to calculate the economic costs and income that will be incurred by the Waste Management Corporation (WAMCO), and political feasibility was assessed using Stakeholder Analysis method.

There were some limitations to using the case study approach. Prolonged or intense exposure to the phenomenon under study within the context is required, as well establishment of good rapport with participants Krefting, (1991);Baxter & Jack, 2008).However, for this research, there was no physical exposure or field visits for the Pacific cases under study. Furthermore, there were few contacts established, and this made it difficult to get information via emails, or phone interviews. In addition, it was not possible to arrange interviews with stakeholders to study the Palau deposit refund system, and information was gained via documents exchanged via email correspondences. Thereby, that was an additional hindrance to analyse the case of Palau. However, for the case study of the Maldives, being a native of the country gave an advantage to the author in gaining access to stakeholders, being familiar with the language, and general context. Data was collected via on-site qualitative interviews from June 4$^{th}$ till August 3$^{rd}$ 2016. However, despite these positive aspects, data availability and disclosure of crucial data for PET production was a challenge.

## 3.2 Methods for Data Collection

This section briefly describes the variety of methods used to gather data. The primary methods for data collection in this research were through literature review, and interviews with stakeholders.

### 3.2.1 Literature Review

Background information about deposit refund systems, and EPR schemes, as well as country profiles on Kiribati, Palau, and the Maldives is collected via literature analysis of peer reviewed journals, articles, and books, as well as from online sources.

For the expost evaluation of the deposit refund systems in Kiribati, and Palau, existing information about the deposit refund systems in Kiribati and Palau were obtained via primary government documents, legislation, grey literature, annual reports about the deposit refund systems published by state authorities, articles and journals provided by the Asian Development Bank (ADB), from the Secretariat of the Pacific Regional Environmental Programme (SPREP), as well as from Japan International Cooperation Agency (JICA). Further information about the Palau system was obtained by establishing contact with Mr. Makoto Tsujiki, the Coordinator of the Japanese Technical Cooperation Project for Promotion of Regional Initiative on Solid Waste Management in Pacific Island Countries, (J-PRISM), which is conducted by JICA, and Ms. Ayako Yoshida, the Project Formulation Advisor for Palau, Federated States of Micronesia (FSM), and the Republic of Marshall Islands (RMI). Furthermore, additional information was obtained from websites belonging to the abovementioned organisations, as well as other web publications. However, there is a lack of studies that provide quantifiable series of data for collection and recycling rates, as well as waste stream analysis since the implementation of the deposit refund systems in the two countries.

For the ex-ante evaluation of implementing the deposit refund system in the Maldives, literature analysis of government documents, and consultancy reports, and web sources were consulted to analyse the current waste context, and regulatory framework of the country regarding waste management. Furthermore, statistics provided by Maldives Customs Service regarding the import of PET bottles were used to analyse the import data for PET in to the country.

### 3.2.2 Interviews with Stakeholders

There were many stakeholders interviewed for this research. For the expost evaluation of deposit refund systems in Kiribati and Palau, Mr. Stewart Williams, the PAC Waste Manager of the Secretariat of the Pacific Regional Environment Programme (SPREP) was interviewed via a telephone conversation, and email interviews were conducted with Ms. Alice Leney, who was one of the main contributors to the design of the system for Kiribati, and Mr. Ross Craven, the Development Project Coordinator who works for the Urban Development Program in Kiribati. The interview questions were constructed to find information regarding the 1) material and financial flows within the system; 2) the allocation of roles and responsibilities; and 3) the collection, and recycling rates, as well reduction of PET in general waste stream.

For the *exante* evaluation for implementing the system in the Maldives, key actors involved in policymaking, PET production, and waste management were identified. The initial stakeholders among the government officials interviewed are the Ministry of Environment and Energy, the Environmental Protection Agency, and the Maldives Customs Service. The snowballing technique was utilised after initial interviews with these two stakeholders to recruit and identify more potential stakeholders. The questions were focused on identifying roles and responsibilities of stakeholders involved in waste management and policy making, finding out the current waste management context, current waste management practices in the Male' region, the atolls, and tourist resorts, as well as identifying the PET producers in the country.

The interviews were semi-structured, but formal. They were conducted with experts and top management positions in each stakeholder sector, which was useful as it helped to manifest quality information. For instance, an audience was attained from Mr. Ibrahim Shujau, a Parliament member from the current governing party People's Progressive Party (PPM), Ms. Eva Abdulla, a Parliament member from the largest opposition party, the Maldivian Democratic Party (MDP), Mr. Ali Amir, the Deputy Minister of the Ministry of Environment and Energy, as well as Mr. Ismail Abdulla, the Vice Chancellor of the Maldives Customs Authority, and Ms. Fathimath Mohamed, the Chief Superintendent of the Maldives Customs Service. Furthermore, the Chief Engineer of the state owned production company, Male' Water and Sewerage Company (MWSC) was interviewed, as well as the General Sales Manager, Mr. Srikanth Gundemoni of the Coca Cola Company in the Maldives. In addition, the Director of Operations, Ms. Fathimath Shamveela was interviewed, from the Waste Management Corporation (WAMCO). The two parties involved in exporting PET bottles from the country, Secure Bag Pvt.Ltd, and the Non-Governmental Organisations (NGO) Biodiversity Environment Awareness Maldives (BEAM) was also interviewed.

The interviews were used to further guide subsequent interviews, gain further information, and identify key literature and existing documents regarding the topic. While the interviews were not transcribed, all except two interviews (second interview with Coca Cola Company, and phone interview with Mr. Ibrahim Shujau) were recorded after obtaining permission from the interviewees. The time used for interviews ranged between 40 minutes to one hour. In total, 20 interviewees are interviewed for this research, with 14 face-to-face interviews, 3

phone interviews, two email interviews, and one Skype interview. The interviews provided an opportunity to triangulate information from the literature, as well as from the information obtained from the different interviewees. The interviews were useful in the calculation of potential economic costs, and income for implementing the system by the Waste Management Corporation (WAMCO), as well as to assess the political feasibility of implementing the system.

It is noteworthy that warm enthusiasm, interest and support was gained by government authorities and related waste management entities for this research. Nevertheless, some of the information was considered confidential by beverage companies, such as production and sales data of PET bottles, and were not disclosed. However, the Maldives Customs Service provided a data sheet of PET imports into the Maldives for the last five years (2011-2015). This will be discussed later in the relevant chapter. **Table 4** below illustrates the list of key stakeholders interviewed for this research, and the type of organisations they are associated with, and a detailed list of interviewees are provided in Appendix **1 and 2**, with the general interview guides provided in **Appendix 3.**

| Stakeholders | Type of Organisation |
|---|---|
| Ministry of Environment and Energy (Maldives) | Government |
| Environment Protection Agency (Maldives) | Government |
| Maldives Customs Service (Maldives) | Government |
| Maafushi Island Council (Maldives) | Local government |
| Maldives Water and Sewerage Company (MWSC) | Public-private company (Producer) |
| Coca Cola (Maldives) | Private company (Producer) |
| Waste Management Corporation (WAMCO) Maldives | State owned company (Waste Management) |
| Secure Bag Pvt. Ltd (Maldives) | Private recycling company |
| Biodiversity Environment Awareness Maldives (BEAM) | Non-Government Organisation (NGO) involved in PET recycling |
| Secretariat of the Pacific Regional Environment Programme (SPREP) | International organisation |

*Table 4 List of key stakeholders and organisations*

### 3.2.3 Field Visits and Observations

For this research, a field visit was undertaken to the island of Maafushi, the first locally inhabited island to initiate the local guesthouse business. Maafushi island is taken as a special "case" within the overall case specific context of the Maldives, to document the effects of littering in a locally inhabited island outside of the capital Male' region, but still burdened with heavy issues with PET waste due to their unique situation as a major tourist hub.

Maafushi is a unique island because it exists on the unique precipice, both as a locally inhabited island, but also as the island with the largest proliferation of guesthouse tourist business. Thereby, it occupies a unique space in the Maldives as an island that lies on the intersection both as an inhabited local island but with significant tourist facilities. The Vice President of the Maafushi Council, Ms. Majda Ibrahim, claims that the Maldivian Inland Revenue Authority (MIRA) receives approximately 2% of its annual tax income solely from the island, and thereby signifies the extent of the flourishing tourism business, and contribution to the economy. Thereby, Maafushi was chosen because it truly captures the state of a small island's struggle with waste management, which is exacerbated by the recent introduction of the tourist facilities in inhabited islands, and recent socio economic developments.

## 3.3 Methods for Policy Analysis

This section describes the methods used for policy analysis of the deposit refund systems in Kiribati, and Palau, as well as the potential introduction of the deposit refund system in the Maldives. The research uses a number of methods to analyse the collected data.

The analytical framework presented in **Section 2.42.4** is used as a guiding framework for policy analysis in this research. The analytical framework reconstructs the major inputs, which led to the development of the intervention in Kiribati, and Palau, such as the financial, human, and physical resources, and the goals, and motivations, which led to the development of the intervention in the two cases. Furthermore, the outputs are assessed, which is the implementation mechanisms, such as the design of the material and financial flows, as well as the allocation of roles and responsibilities.

For the *expost* evaluation of the deposit refund system in Kiribati and Palau, the deductive approach of the intervention theory is used, using the substance based evaluation model, which is focused on goals and outcomes. Environmental effectiveness is used as evaluation criterion, to assess how closely the outcomes correspond with one of the major environmental goals of an EPR policy evaluation i.e. high collection on bottles to reduce litter (Lindhqvist & van Rossem, 2005). The focus of analysis is on the immediate outcome, which is defined by the achievement of high collection of PET bottles.

The analytical framework is also used for the case study of the Maldives, and an *ex-ante* visualisation of the output mechanism (design of material and financial flow) is presented. Furthermore, the procedural evaluation method is used to conduct an an-ex-ante analysis of political feasibility in relation to the achievement of the assumed outcomes. The Stakeholder Analysis method is used to assess political feasibility.

### 3.3.1 Tojo (2004) Framework to Analyse Outputs: Identify Roles and Responsibilities

The adaptation of the Tojo (2004), which is presented in **Section 2.4** is used to distinguish the different responsibilities that are relevant to the Pacific islands context. The different responsibilities such as economic, physical, and informative are defined using Thomas Lindhqvist's definitions as mentioned in **Section 2.1.3.**Moreover, "monitoring and enforcement" is used as a responsibility, as opposed to an activity as stated in the original Tojo framework of 2004. This is because as illustrated in literature review of deposit refund systems in the Pacific context, monitoring is not an activity, but an actual government responsibility.

### 3.3.2 Assessment of Outcomes

The research focuses on the analysis of the immediate outcome, using environmental effectiveness as a criterion. The amount of PET bottles that are collected, is used as a proxy to assess the immediate outcomes because it is the most central factor, which determines the goals of the policy, such as reduction of litter (Backman, 1984). Thereby, data is obtained regarding the number of PET bottles that were redeemed in the Redemption Center in Kiribati and Palau, to assess the environmental effectiveness of the system. Furthermore, additional information such as data of the number of bottles exported, or the weight of PET bottles exported in kilograms are used, to assume the amount of collection. Furthermore, phone and email interviews, grey literature, photo evidence provided by stakeholders, documents from international organisations such as the Asian Development Bank (ADB), Japan International Cooperation Agency (JICA) and Secretariat of the Pacific Regional Environment Programme (SPREP), as well as information from a government PowerPoint presentation, Ministry of Environment Land and Development (MELAD is used to assess the

collection rate, in case where there is a lack of quantifiable series of data for collection rates. For the Kiribati case, photo evidence, and anecdotal evidence are provided, as well as export volume of PET bottles, while for the Palau case, the data is tabulated using the collection rates, and weight of export of PET bottles from project implementation till 2015.

### 3.3.3 Assessment of Political Feasibility: Stakeholder Analysis Method

A basic building block in designing political strategies for reform is to perform a stakeholder analysis (Reich, 1996). The analysis calls for the mapping for major groups with an interest in the formulation, implementation, and outcomes of the policy. A stakeholder in a policy evaluation is an actor with a particular interest in a policy emergence, execution result of the programme, and its evaluation (Vedung, 1997). In this research, the Stakeholder Analysis consists of three stages: 1) identify the stakeholders; 2) assess their roles and responsibilities in the political structure, to determine their relative power and influence in relation to a potential deposit refund system; 3) evaluate their current position on the proposed policy (including the level of their commitment) and their underlying interests (Reich, 1996). As mentioned in **Section 1.5**, stakeholders are selected based on their potential roles in hypothetical deposit refund system in the Maldives, which is based on the Kiribati, and Palau models, and based on the Maldivian context. Retailers are consumers therefore not included in this analysis. Furthermore, emphasis is put on selecting stakeholders that are policy elites in the country, due to the challenges with democratic consolidation, and existence of weak interest groups in society, as mentioned in **Section 2.3.4.**

Semi-structured interviews were used to guide the stakeholder analysis, to identify roles and responsibilities, as well as analyse their power and influence. The interest for implementing a deposit refund system in the Maldives is assessed by asking stakeholders to rank their level of interest from "high", "medium" or "low", and it is presented as a power-interest matrix.

### 3.3.4 Assessment of Economic Viability

The economic viability of implementing the deposit refund system by the Waste Management Corporation (WAMCO), in the capital city of Male' is assessed in this research. The economic costs, or expenses, and economic income, is based on a similar analysis designed by Ms. Alice Leney, for the feasibility study for implementing the deposit refund system for the Federated States of Micronesia in 2005.[2] Furthermore, the monetary figures are obtained from information gathered via interviews. Secure Bag, a private recycling company that has been exporting recyclables since 2004, and Biodiversity Environment Awareness Maldives (BEAM) a Maldivian NGO dedicated to eliminating plastic waste from the Maldives Cost and incomes are tabulated for the different potential activities in the hypothetical system.

### 3.3.5 Limitations

The lack of established contacts and lack of interviews with stakeholders from the Pacific cases result in a challenging policy analysis of the deposit refund systems in Kiribati and Palau. Furthermore, there is a lack of quantifiable data series for the Kiribati case, and the some of the information obtained for collection rates are more than 5 years old. Due to this reason, environmental effectiveness have been assessed using information obtained via semi-

For the case study of the Maldives, the major challenge was gaining full access to policymakers and decision makers due to bureaucracy, and confidentiality issues.

[2] Leney (2005). A Fresh Start to Recycling in the Pacific.

# 4 How Does DRS look like When Implemented in other SIDS? Case Studies of two Pacific Islands

This chapter presents the findings, and analysis for the case studies of the deposit refund systems in Kiribati, and Palau. The outputs, in terms of the material and financial flows, and the allocation of roles and responsibilities in the systems are presented. Furthermore, the environmental effectiveness of the two systems is assessed, with an overall analysis of how effective the two systems are.

In order to complete this section, annual reports, and government documents are consulted, and information is gained via interviews with stakeholders in the Pacific system, unless otherwise cited from international reports.

## 4.1 Kiribati Case Study

Kiribati is an island nation in the central Pacific Ocean consisting of three main island groups, the Gilbert Islands, Phoenix Islands, and the Line Islands. There are 33 islands scattered over an area of 811 square kilometres , with an estimated population of 104,000 people (United Nations Economic and Social Commission for Asia and the Pacific, 2014). Most of the population lives in the Gilbert Islands, in South Tarawa, which is the capital city, and it is home to 44,000 people. The country has a GDP per capita of US$ 1745 (United Nations Economic and Social Commission for Asia and the Pacific, 2014)

Kiribati is the first country in the Pacific to introduce the deposit refund system. It has been hailed as a success in the Pacific, and the Kiribati system has been used as a blueprint to design the deposit refund system in other Pacific countries.

### 4.1.1 Motivations and Resources Leading to Development of the Deposit Refund System Intervention:

The motivation behind implementing the deposit refund system in Kiribati was to provide a creative solution to the issue of widespread littering of the land and waters in South Tarawa island in Kiribati (SPREP, n.d; Leney, 2006). The major impetus for implementing the deposit refund system came from the findings from a feasibility study in 2002 by the Foundation for the Peoples of the South Pacific Kiribati (FSPK), a Non-Government Organisation (NGO), with grants from the Canada Fund (Leney, 2006). The study designed a self-financing recycling system for beverage containers, and revealed that a deposit refund system, with a built in handling fee of one USD cent per aluminium can, or PET bottle, had the potential to collect and export a large quantity of recyclable materials, to reduce the litter in the island (Leney, 2006).

There are various financial, human, and physical resources, or inputs, which contributed to the development of the intervention. Various financial resources from the initial feasibility study were used to conduct awareness campaigns, and train local project officers in waste separation. Furthermore, a pilot project was launched with the help of 500 locals, to monitor waste separation systems, and set up recycling collection points around South Tarawa Island. At the same time, a local business was also hired to collect, crush, and pack recyclable items for export. The pilot project was further developed with the financial, and physical input of a coalition of local organisations, such as the Community Development and Sustainable Participation Project (CDSP), funded by the Asian Development Bank (ADB) and the local International Waters Program (IWP), which focused on reducing waste. A Project Officer was also hired from the Women's Organisation AMAK to promote projects within the women's community, which was funded by New Zealand Aid for International Development

(NZAID). Furthermore, stakeholder consultations with the Customs Service, local importers, the Chamber of Commerce, and an existing aluminium recycler further contributed to the intervention development process. In early 2004, the project secured funding from Australian Aid for International Development (AusAID), and NZAID, and on March 31st 2004, the Government of Kiribati signed a tripartite agreement with UNDP, and the Foundation for the Peoples of the South Pacific Kiribati (FSPK). This was the major input, which led to the intervention i.e. Waste Recovery (Special Fund) Act.

Before implementation, the government also provided other financial and physical resources. For instance, the Cabinet provided a yard area next to the port of one of the main municipalities, Betio, to set up a Materials Recovery Facility, with the land, and capital expenditure owned by the Government. From 2004 to 2005, the United Nations Development Programme (UNDP) also provided financial input, by funding the deposit refund system under the Kaoki Maange recycling programme (Leney, 2006). The system was further executed by the Ministry of Commerce, and implemented by the Foundation for the Peoples of the South Pacific Kiribati (FSPK).

### 4.1.2 Design of the Material and Financial Flow

The Waste Recovery (Special Act Fund) was passed on December 2004, as an intervention, and assented by the President on 3rd February 2005 (Leney, 2006). The Act set up a framework for the Ministry of Environment to charge a deposit on the materials when they are imported, with the deposits to be accrued to a Special Fund at the Ministry of Finance, which are to be used for refunding the consumers. The Act also allows the Minister to make regulations determining how the deposits are paid back to the people when the materials are returned for recycling. Furthermore, the Act allows the Special Fund to use any excess funds that are unclaimed for other Waste Management purposes, or for capital expenditure requirements to replace recycling equipment. The Act furthermore comes with a set of regulations which detail the times that require the deposits to be paid, when, and how much they should be paid, to whom, and the rate of refund of those deposits. The Regulations also contain the provisions for the government to appoint a Waste Recovery Operator to operate the system. Following the Act, and the Regulations, a Deposits Order was also passed in 2005, which set the deposits for different materials upon import.

Based on this Act, importers pay the deposit for every PET bottle that is imported, and the Kiribati Customs Service collects 5 cents at First Entry from importers. This money is transferred into the Special Fund, set up under the Waste Recovery Act of 2004. The money in the Fund is only for refunding the items, which a deposit was paid for, or for associated recycling and waste management activities. The importer pays 5 cents deposit per item, and he must pass the 5 cents on to the stores. The stores also pass the 5 cents extra on top of the original price of the bottle, which the consumer must pay. Once the consumer returns the bottle to the collection points, he is refunded 4 cents only, and the 1-cent per item is used to help finance the crushing and export of PET bottles for recycling.

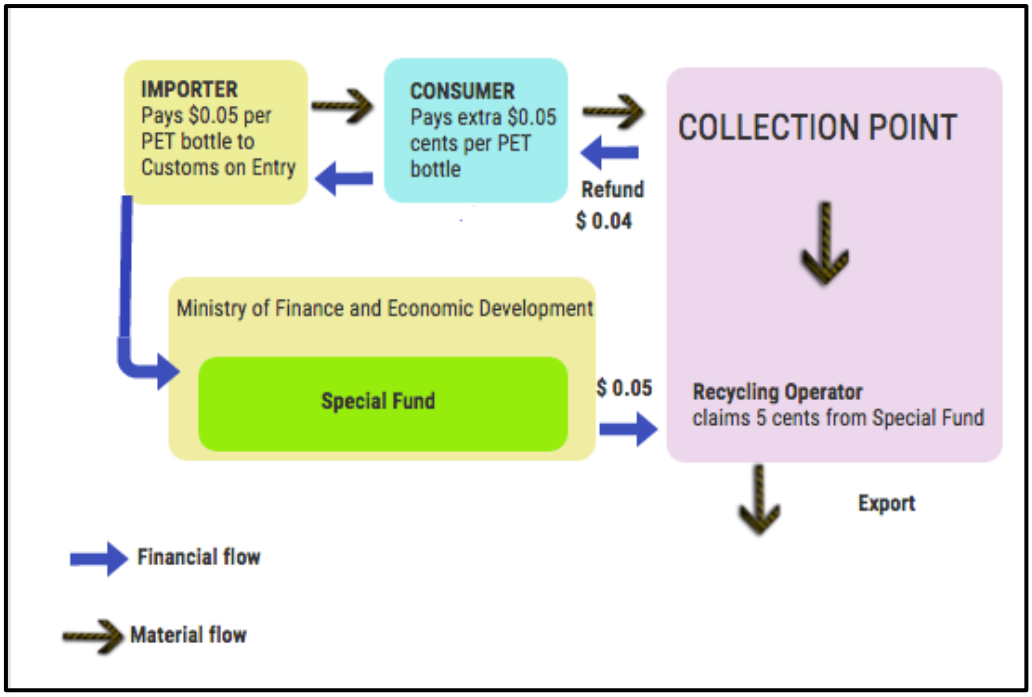


*Figure 7 Schematic Diagram depicting material and financial flows of the Kiribati deposit refund system (Source: Adapted from Leney, 2006)*

### 4.1.3 Allocation of Roles and Responsibilities

As analysis of the output, with regards to the allocation of roles and responsibilities demonstrate there is a high level of government involvement. These findings also confirm the literature concerning deposit refund systems in the Pacific, in **Section 2.2.2.** The direct economic and physical responsibility of the producers i.e. importers are very low in Kiribati. This is contrary to the EPR's aim of shifting the major physical and economic burden from public authorities to the private sector. The major direct economic responsibility of the importers is to pay the deposit for the PET bottles upon entry at Kiribati Customs. The deposit is transferred to the Special Fund, created under the auspices of the Waste Recovery Act of 2004, and is administered by the Ministry of Finance and Economic Development (MFED). The physical, and economic responsibility of the collection of PET bottles is also not borne by the importer, as consumers return the empty PET bottles to the Recycling Operator, called One Stop Tarawa, a private entity hired by the Government on a tender basis.

Furthermore, the importers have no physical responsibility for operating the Recycling Facility, or exporting the PET bottles for recycling. According to information provided by Alice Leney in an email interview, the government covers the expenditure costs, and provides the infrastructure. The Recycling Operator is only physically responsible for crushing the PET bottles, and exporting it for recycling. The PET bottles are stockpiled in the Recycling Facility, until the market is favourable for PET bottles. However, the importers bear an implicit economic responsibility in the export of PET bottles for recycling, as the Recycling Operator makes a claim from the Special Fund every month to cover the export and shipping costs. Furthermore, the consumer is also indirectly responsible economically, as the consumer pays a 5-cent deposit on top of the original price of the product when purchasing PET bottles, but is only refunded four cents, of which one cent is used to cover the export and shipping

expenses. While the Recycling Operator can retain a profit from the export of PET bottles, its primary obligation is to export the PET bottles that is collected and returned by consumers.

| Main Activities of the Deposit Refund System in Kiribati | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Responsibilities** | **Payment of Deposit** | | **Collection of deposit** | | **Collection and returning of bottles** | **Issuing Refunds** | **Exporting** |
| | **Upon import** | **Upon purchase** | **Upon import** | **Upon purchase** | | | |
| **Economic** | Importers pay 5 cents per bottle | Consumer pays 5 cents extra per PET bottle | Kiribati Customs | Retailers | N/A | Importer via Special Fund | Importer and Consumer |
| **Physical** | N/A | Consumer | Kiribati Customs | Retailers | Consumers | Recycling Operator | Recycling Operator crushes and exports PET |
| **Informative** | Ministry of Environment Land and Agricultural Development (MELAD) | | | | | | |
| **Monitoring & Enforcement** | Kiribati Customs | Ministry of Finance and Economic Development (MFED) monitors the Special Fund and MELAD | MFED | MFED | N/A | MELAD | MELAD |

*Table 5 Allocation of roles and responsibilities in the Kiribati System*

### 4.1.4 Analysing Outcomes: Environmental Effectiveness of the Kiribati System

With regards to the immediate outcome, which is high collection of PET bottles, there is no quantifiable data set from the time of implementation, till the current date. Thereby, collection rates by itself cannot be used to assess immediate outcome, with regards to environmental effectiveness. However, other proxies such as export data, anecdotal evidence, photo evidence, as well as information via interviews, and reports published by international organisations are used to assess the environmental effectiveness. While there is no data to assess the collection rates of PET bottles over the years, the Kiribati Solid Waste Management Project in its 2004 annual report claim that 100,000 PET bottles were collected and crushed in the first year of implementation, in 2004 (Kiribati Solid Waste Management Project, 2004). This figure had increased to one million PET bottles by the end of August 2005, according to a Ministry of Environment, Land and Agriculture (MELAD) presentation provided by Ross Craven, who works for the Urban Development Program in Kiribati. This indicates that at the beginning of the program, the collection rate was increasing. However, since it was not possible to obtain the data for collection rate after this point, it is hard to present a verdict with regards to the effectiveness based only on collection rates. Thereby, the recycling data is obtained to assess the immediate outcome as well. Initial case studies from the implementing phase demonstrate 90% of the PET bottles were exported for recycling in 2006 (SPREP, n.d.). Moreover, a statement from ADB's 2014 report, claims that a 20-foot container including PET bottles and lead-acid batteries are exported to Hong Kong, China every 7 weeks (Woodruff, 2014). However, this is not indicative of how many PET bottles have been specifically collected, and exported for recycling, as the data includes lead-acid batteries as well. The most recent figure for the number of PET bottles exported is obtained from Ross

Craven who indicated in the email questionnaire that 40 tonnes of PET were exported in 2013/2014. It is difficult to compare the data provided in the ADB report, and the figures provided by Craven, because it is difficult to extrapolate the amount of bottles that were exported in the 20 foot container, and in the 40 tonne shipment, mentioned by Craven. This is because it is unclear whether they were 0.5 litre, 1 litre, or 5 litre bottles. Moreover, it is difficult to assess how much of the PET put on the market has been collected, since this information was not obtained despite various attempts to contact the Kiribati Customs Service, and the Recycling Operator. Thus, it is hard to make an assessment of the environmental effectiveness of the system based on these data.

While it is difficult to assess the outcomes of the deposit refund system based quantifiable data, there is several anecdotal, and photo evidence available which demonstrates the effectiveness of the system in achieving high collection, and reduction of litter. According to Mr. Ross Craven, who works for the Urban Development Program in Kiribati, "there are hardly any PET bottles or aluminium cans lying around on the streets". He claims that this is because "people snatch them up, stockpile them until they have a decent number of them (200-300 bottles) and then take them to recycling". According to Craven, one of the reasons for such success is that the collection responsibility is upon the consumers, and, most consumers are poor, and returning the bottles to get refunded is a great incentive to generate income. Moreover, Stewart Williams from the Secretariat of the Pacific Regional Environment Programme state that the system is very effective for reducing litter of beverage containers, as they are "too valuable" to be left as litter, and "little kids in Kiribati follow you to get the drinks containers" in order to collect them and redeem them. Hence, it seems that that the deposit refund system is an environmentally effective system for reducing litter of beverage containers such as PET, in Kiribati based on their claims. Furthermore, the most compelling evidence for the environmental effectiveness is the statement from the 2004 report by the Asian Development Bank (ADB), states that PET has been "almost entirely eliminated from the waste stream" due to successful recycling initiatives (Woodruff, 2014).

While the analysis of the intermediate outcome is not within the scope of this paper, information was gained regarding the reduction of PET from the general waste stream. In 2005, one year after the implementation of the system, there was a 10% reduction of PET and aluminium from the landfill, by volume (Kiribati Solid Waste Management Project, 2005). However, since this figure includes aluminium, it is hard to assess exactly how much PET was reduced specifically. Nevertheless, based on the abovementioned analysis, it is highly likely that PET has also been reduced from the general waste stream since the intervention, as there are collection and recycling efforts after 2004, which prior to that there was none.

### 4.1.5 Other Findings

### 4.1.6 Post-Collection Challenges

Kiribati has had challenges with regards to exporting the PET for recycling. The most obvious reason is that Kiribati being a SIDS does not have an on-site recycling facility, and instead has to export the bottles for recycling. According to Stewart Williams, the PacWaste Project Manager for the Secretariat for the Pacific Regional Environment Programme (SPREP), PET bottles have been stockpiled in the Recycling Operator's yard since October 2015, because the market for PET is currently highly unfavourable, as the price of the PET is linked to the price of oil. Reports from 2015 by the Ministry of Environment Land and Agriculture (MELAD) provided by Craven also reveal that PET export is pending, and despite the Recycling Operator having offered PET for free to a recycling company in China, there has still not been a positive response from them (MELAD, 2015). Thus, endogenous factors such as the lack of recycling infrastructure on site, and exogenous factors such as the price of PET, and

the price of oil in the international market create challenges for the operation of the deposit refund system in Kiribati. To address this issue, Williams state that are discussions underway with the government, private sector, and the Secretariat of the Pacific Regional Environment Programme (SPREP) to initiate Reverse Logistics method, where products are returned back to the original producers for reuse, recycling, or recovery. Thereby, system model is bound to change in case it is addressed.

*Figure 8 PET bales stockpiled outside the Recycling Operator's Yard in Kiribati (Source: Ross Craven, 2016)*

### 4.1.7 Economic Challenges

While the government has been very successful in securing a private operator to run the system, thereby minimising the physical and financial burden of the state in collection and recycling, there are some challenges, which undermine the economic sustainability of the programme. According to Ross Craven, even though the system is "nearly 100% self-sustaining" there are problems when capital expenditure items (such as trucks, balers, sheds etc.) are needed. Currently, the Recycling Operator waits for the government of Kiribati to supply new equipment as per their contract. However, it is important to note that capital expenditure financing does not come from the state budget, but is dependent on external funding from donors. For instance, the New Zealand Programme procured the new PET baler, for NZD 28,000 (roughly equivalent to US$ 20,678) Craven stated. According to Craven, the Recycling Operator should withdraw funds from the Special Fund for the purpose of replacing capital expenditure, especially from accrued unclaimed refunds. Nevertheless, it is unclear whether importer's deposit fees can be increased to facilitate enough income in the Special Fund to extract for capital expenditure. Williams state that SIDS, that has a high tourism base such Palau, can increase the deposit fee using tourist taxes. However, Kiribati does not have a large tourist industry, and the shipping cost is also a financial challenge for the Recycling Operator. Thus, there are concerns as to the financial sustainability of the project. According to Stewart Williams of SPREP, financial sustainability is often an issue for SIDS because infrastructure and technical projects are highly dependent on exogenous funding. Once the funding runs out, even highly successful projects have to be terminated. Thus, economic viability is a critical concern for any SIDS willing to undertake such a system with PET bottles.

### 4.1.8 Analysis

While it was not possible to obtain data for collection rates from 2004-2016, information gathered via interviews, reveal that the deposit refund system scores well on environmental effectiveness criteria in Kiribati, based on the assessment of the outcomes. Since the implementation of the programme, collection rates have reduced of litter on the streets, and reduced PET from the waste stream. This can be attributed to the refund which incentivises children, and others in the community which may be financially motivated to return the bottles.

However, Kiribati faces challenges in exporting the PET to private buyers. This is because endogenous factors such as the atoll nation context, and lack of critical recycling infrastructure compel Kiribati to export the bottles for recycling. Furthermore, exogenous factors such as the price and value of PET in the international market affect the ability to export PET out of the country. Whereas the export and consequent recycling of other products such as aluminium cans covered in the Kiribati system has a high export volume because of its value, PET bottles have relatively low values dependent on exogenous factors such as the price of oil (MELAD, 2016). Furthermore, Kiribati being in the Pacific does not lie on major sea trade routes, which further reduces the possibilities for willing recycling partners. The value of PET bottles also depends on the cleanliness of the bottles, and according to Williams, the longer that the bottle are stockpiled, as is with the current situation, the more dust it accumulates, lowering the price even further. Moreover, the longer it is stockpiled, it also encroaches on valuable land space that is lacking in SIDS. Hence, reverse logistics, or another solution can be introduced in order to address this issue of PET waste that has been collected, without being exported for recycling, due to exogenous factors.

Thus, while the deposit refund system provides a good collection system for PET bottles, the SIDS context challenges the operation of the deposit refund system, from collection to recycling. Thereby, a holistic approach, taking in the perspective of post-collection challenges, as well as economic viability is required to enhance the implementation of the deposit refund system. SIDS are lacking in crucial space for storage and infrastructure, and therefore collection, and baling of PET alone does not provide a sustainable solution to the issue of PET waste, especially due to the proximity of land to vulnerable marine ecosystems. Thus, the lessons from Kiribati reveal that post collection challenges, and economic viability must be taken into account.

## 4.2 Palau Case Study

Palau is an archipelago of approximately 250 islands, in the western Pacific Ocean, spread over 459 square kilometres. It has a population of 21256 people (CIA, 2016b), with most of the population in the previous capital city of the country Koror, of 19,000 people. The new capital is Melekeok, with only 1000 people. Palau's GDP per capita is 10,271 (United Nations Economic and Social Commission for Asia and the Pacific, 2014), and is one of the highest in the Pacific region. The economy is highly dependent on tourism, with 56% of the GDP attributed tourism (United Nations Economic and Social Commission for Asia and the Pacific, 2014).

### 4.2.1 Motivations and Resources Leading to the Development of the Deposit Refund System Intervention

The main motivation for implementing the deposit refund system in Palau was to tackle the issue of litter from beverage containers. Litter from beverage containers is identified as one of the main visible impacts from tourism, as Palau's landfill sites are limited, and the landfills are filled to their capacity (MPIIC, 2014).This led to the creation of a recycling law. A recycling

fund accompanied to initiate a sustainable financial mechanism for solid waste management, as there was a shortage of funds for the management of solid waste. Furthermore, the lack of a nationwide recycling system was seen as a burden to the growth of the tourism industry, as well as to the protection of the environment (MPIIC, 2014).

One of the major inputs that led to the development of the intervention was the proposal of the deposit refund system by the Senate on Committee on Youth Affairs and Social Welfare. They proposed the Recycling Act to the Palau National Congress. The "Republic of Palau Public Law" (RPPL No. 7-24) was approved by the President on October 22, 2006.The Act stipulates the establishment of a deposit for beverage containers, the creation of a recycling fund, and allocates the responsibilities for the operation of the system on two Ministries of the National Government, the Ministry of Public Infrastructure, Industries and Commerce (MPIIC), and the Ministry of Finance (MOF). Moreover, a Beverage Container Recycling Regulations was passed in 2009, which assigns the same respective responsibilities of the functions of the deposit refund system to Ministry of Public Infrastructure, Industries and Commerce (MPIIC), and the Ministry of Finance (MOF). The Koror State Government (KSG) is also given the responsibility to operate the redemption centre under the directives of Ministry of Public Infrastructure, Industries and Commerce (MPIIC). In addition, a Memorandum of Understanding (MOU) between Ministry of Public Infrastructure, Industries & Commerce (MPIIC), Ministry of Finance (MOF), and Koror State Government (KSG) stipulates that the Ministry of Finance (MOF) will advance funds to Koror State Government (KSG) to provide refunds to consumers for returning the beverage containers, while retaining the $0.025 of the refund, per container redeemed, as compensation. Furthermore, the memorandum of understanding stipulates that Koror State Government (KSG) will submit proof of refunds paid to the Ministry of Finance (MOF) before the exhaustion of funds (MPIIC, 2014).

There were also other inputs, which led to the implementation of the intervention, such as stakeholder contributions, staff training, and financial input. For instance, the Japan International Cooperation Agency (JICA) trained staff from the Koror Solid Waste Office, since they were in the middle of a three-year project to improve solid waste management in Palau. This was because the solid waste management office, which is under the Bureau of the Public Works national government, lacked capacity and human resources to implement the programme. During this time, the Koror State also contributed with financial input, such as with the construction of a recycling facility, which became the initial collection centre for the recycling program. Furthermore, before the implementation of the program in 2011, all the stakeholders were consulted to review the law. These stakeholders were the Customs Office, the Attorney General's Office, and the Ministry of Public Infrastructure, Industries and Commerce (MPIIC), as well as major importers of beverage containers (MPIIC, 2014).

### 4.2.2 Design of the Material and Financial Flow of the Palau Deposit Refund System

In accordance of the Act, the output is designed such that, for every PET bottle that is imported, Palau Customs Service collects $ 0.10 per container from importers. This money is transferred into the Recycling Fund, which is managed, and monitored by the Ministry of Finance (MOF). Consumers in this system also pay $ 0.10 per container upon purchase. Once the consumer returns the bottle at the Koror State Redemption Center, which is operated by the Koror State Government (KSG), they receive a receipt from the Redemption Center. The consumer must present the receipt to the Ministry of Finance (MOF) in order to be refunded with $ 0.05. The refund money is withdraw from the Recycling Fund, and $ 0.025 from every deposit fee paid by the importer is kept by the Ministry of Finance, as compensation, and

another $ 0.025 is used to cover operation costs in the Redemption Center. According to Calvin Ikesiil, the Solid Waste Management Officer, the products that are collected are exported by the Palau Waste Collection Company, to Taiwan, and proceeds also go to the exporter as profit. **Figure 9** below illustrates the material and financial flows of the deposit refund system in Palau.

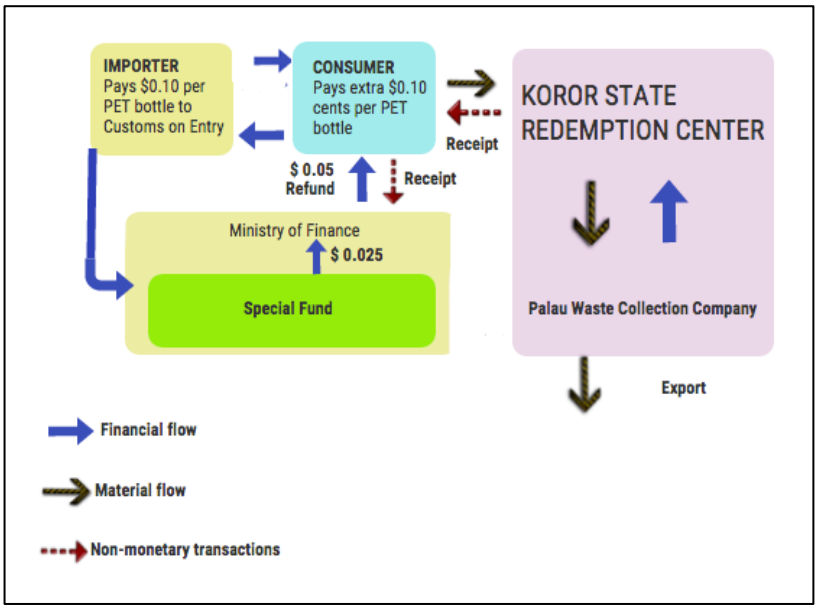


*Figure 9 Schematic diagram depicting the material and financial flows of the deposit refund system in Palau (Source: Adapted from MPIIC, 2014)*

### 4.2.3 Analysing Outputs: Allocation of Roles and Responsibilities

The allocation of roles and responsibilities in the deposit refund system in Palau is quite similar to that of Kiribati, where the importers of beverage containers bear minimal direct physical, economic, and informative responsibility in the organisation of collection, and recycling activities. The importer's direct economic and physical responsibility ends after the payment of the deposit at Customs. However, the importers are economically responsible indirectly, for the collection of bottles, as they refund the consumers, who return the bottles because of the incentives of a refund. They deposits from the importer are also used to finance the operation costs of the Redemption Center, as $0.025 per container is claimed from the Ministry of Finance. Once there are enough bottles, the bottles are sold to the Palau Waste Collection Company, a private operator. The difference between the Kiribati system and the Palau system is that in Palau, the Recycling Operator is responsible for the economic and physical responsibility of exporting the bottles, and they do not make a claim from the deposit fund, as the Recycling Operator in Kiribati does. In general, government responsibility is high for all types of responsibilities. **Table 6** illustrates the allocation of roles and responsibilities in the Palau system.

| Main Activities of the Deposit Refund System in Palau | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Responsibilities** | **Payment of Deposit** | | **Collection of deposit** | | **Collection & returning of bottles** | **Issuing Refunds** | **Exporting** |
| | **Upon import** | **Upon purchase** | **Upon import** | **Upon purchase** | | | |
| **Economic** | Importer pays $0.10 per bottle | Consumer pays $0.10 extra per PET bottle | Customs | Retailers | N/A | Importer and Consumer via deposits | Palau Waste Collection Company gets redeemed containers from the government and exports |
| **Physical** | N/A | Consumer | Customs | Retailers | Consumers | Finance State of Koror claims money from the Fund and issues refunds | Recycling Operator crushes and exports PET |
| **Informative** | Koror State Solid Waste Management Office | | | | | | MPIIC export or find ways to export redeemed containers & |
| **Monitoring & Enforcement** | Customs | Ministry of Public Infrastructure, Industries and Commerce (MPIIC) | Ministry of Finance monitors the collection fee and the deposit fund | | Koror State Redemption Center receives and monitors rate of bottles | MPIIC monitors Redemption Center | Ministry of Finance monitors the sales proceeds from exporting |

*Table 6 Allocation of Roles and Responsibilities in the deposit refund system of Palau*

### 4.2.4 Analysing Outcomes: Environmental Effectiveness of the Palau

With regards to the immediate outcome, which is high collection rate, the J-PRISM Project Completion report in 2016 reports that the average redemption rate for all containers covered in the deposit refund system from 2011-2015 is 89% (JICA, 2016), which is a high number. Hence, it can be assumed that the collection rate for PET is also high. There are other similar figures which indicate the collection rate, where in 2014, the Annual Report for the Beverage Recycling Programme in Palau states that the redemption rate of beverage containers, versus the amount of beverage containers imported into the country is 93% (MPIIC, 2014). Another report by the Asian Development Bank (ADB) states that the collection rate for recyclables in Palau is 98% (Woodruff, 2014). Despite the fact that these figures include other products, it indicates that there is a high collection rate for beverage containers covered under the deposit refund system. Furthermore, the weight of the containers that were collected at the Redemption Center, and consequently sold to the Recycling Operator **(Table 7)** also demonstrates that the weight of PET bottles collected increased from 2012-2014, with a slight decrease in 2015. Nevertheless, it still demonstrates that the deposit refund system is able to achieve solid collection rates. Thus, this conveys the environmental effectiveness of the deposit refund system in Palau, to achieve

the immediate outcome of high collection rates. Furthermore, Calvin Ikesiil, the Solid Waste Management Officer of the Ministry of Public Infrastructure, Industries and Commerce (MPIIC) claim that PET has been significantly reduced from the waste stream as well, even though that is out of the scope of this paper.

| FY | PET bottles (kg) |
|---|---|
| 2011 | - |
| 2012 | 66,660.50 |
| 2013 | 88,370.94 |
| 2014 | 89,636.50 |
| 2015 | 83,128.50 |
| Total | 327,796.44 |

*Table 7 Weight of PET collected under the deposit refund system of Palau from 2011-2015*

### 4.2.5 Other Findings

There is a lack of information regarding the Palau case, as compared with Kiribati, due to lack of established contacts, and interviews. However, information gathered from the Annual Report of 2014, revealed that there are some issues with finding buyers of recycled material, highlighting post-collection issues related to exporting for recycling. However, the system by itself has been claimed to be fully self-financing (Woodruff, 2014), and furthermore, the high deposit rate allows the government to refund, operate, and save extra money at the Recycling Fund, to cover the expenses of waste management activities (SPREP, 2013).Thus, there do not seem to be issues related to economic viability with the Palau system.

### 4.2.6 Analysis

The available data for this research reveals that the deposit refund system is environmentally effective in achieving reduction of litter, via high collection of beverage containers. Furthermore, according to Mr. Stewart Williams of the SPREP programme, there is a high participation rate in the Palau system, since the deposit per container is $0.10, and therefore relatively high. Furthermore, according to the information published on the SPREP website in 2013, this ensures that the consumer is given enough incentive to receive 50% of the deposit a refund, and achieve the desired outcomes.

## 4.3 Reflections from the Pacific Case Studies

The case studies of the deposit refund systems in Kiribati and Palau reveal that the deposit refund system is an environmentally effective intervention to reduce the problem of littering. The case studies revealed that the program was able to achieve the immediate outcome, which is high collection of PET bottles to reduce litter.

In terms of how the material and financial flows are arranged, both systems are quite similar, with the difference that in Kiribati, the consumer gets refunded at the Redemption Center, while in Palau, the consumer has to go to the Ministry of Finance to get a refund, thus creating an additional step. This can be a time burden, as well as an inconvenience factor. However, it does not seem to have affected the collection rate, and this might be because the deposit is relatively high to encourage consumers to return the bottles as a refund. Moreover, in Kiribati, the Recycling Operator runs the Redemption Center, and they also export the containers directly. However, in Palau, the State runs the Redemption Center, and gives the PET bottles for free to

the Recycling Operator, to export it, on the condition that they are sold aluminium, and steel for a very low price. Nevertheless, despite these differences, there is a high level of government involvement in the two systems, as State authorities are given a high level of responsibility in system implementation, monitoring, and enforcement. As we can recall from the Swedish case study in **Section 2.2.1** this is considerably different than how the Swedish system is organized, in an OECD context.

There are also issues of economic viability, and post-collection challenges, due to the SIDS context. This is more visible in Kiribati, as they are lacking in funds, and have a poorer economic capacity than Palau to look for private buyers, as well as fund for capital expenditure. Palau, on the other hand, have a strong tourism base, and furthermore, can raise the deposit high enough so that the remaining funds are used for operational costs, and capital expenditure. Thus, these challenges must be taken into account when developing the intervention mechanism in a SIDS context.

# 5 Maldives Case Study: Context Analysis

This chapter introduces the general waste management context of the Maldives, provides an overview of the general waste composition in the Maldives, the import data of PET bottles into the country, the major actors in the system i.e. PET importers, who are the addressees or targets of a deposit refund policy in the Maldives, and the main agencies involved in introducing and implementing the policy. Furthermore, the chapter describes the general waste management practices in the country, and the main regulatory framework for waste management. The main data for this Chapter is collected via interviews with several stakeholders such as the Ministry of Environment and Energy, Waste Management Corporation (WAMCO), Maldives Customs Service, PET producers, and PET recyclers.

## 5.1 Brief Country Profile

The Republic of Maldives is an archipelago of 1,190 islands separated into a chain of 26 coral atolls, in the Indian Ocean, in South Asia. In 2015, total population was 393,253 people dispersed over an area of 298 square kilometres (CIA, 2016a).The country is the flattest country on earth, with a mean elevation of 1.8 meters above sea level, with over 98% of the territory compromised of ocean. Only 188 of the total number of islands are inhabited, and another 180 islands are designated as tourist resorts (Ministry of Finance and Treasury, 2015). Male' is the capital city, and the political and financial centre of the country, with a population of 125,969 people (Ministry of Finance and Treasury, 2015). The economy depends heavily on tourism, as it contributes to roughly more than 30% of the Gross Domestic Product (GDP). The GDP per capita at 2014 was US$ 4,521 (Ministry of Finance and Treasury, 2015). The country is a Presidential Republic since 26th July 1965. Prior to that it was a British Protectorate from 1887, and until 1953, the Maldives had a reigning Sultanate for more than 800 years. Figure x shows the location of the Maldives on the world map, in relation to other countries in Asia, and Figure x illustrates the map of the Maldives, showing the administrative atolls.


*Figure 10 Location of the Maldives on the World Map Yard in Kiribati (Source: World Atlas, 2016)*

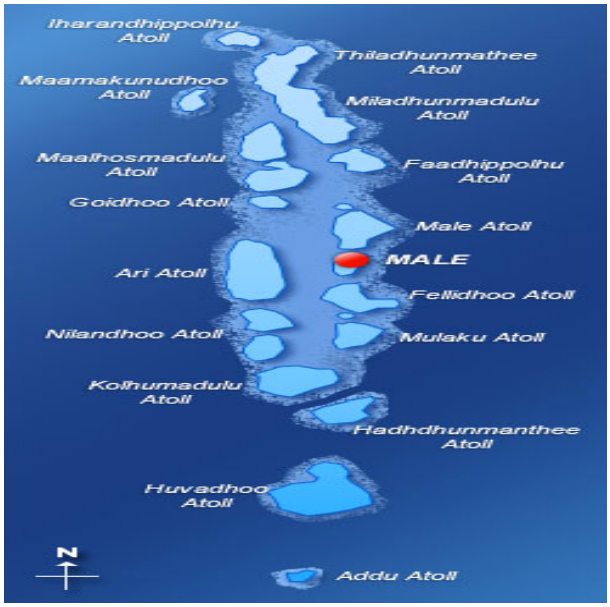


*Figure 11 Map of the Maldives (Source: Leisure Destination)*

## 5.2 Waste Analysis Overview

There has been a significant increase in waste management problems in the Maldives in recent decades, due to various factors. A 2010 report by GreenTech Consultancy Pvt.Ltd in collaboration with Riyan Pvt.Ltd, and CDE Pvt Ltd, identified some of the factors for increasing solid waste in the Maldives, such as the rapid growth in population, changing consumption habits, uneven distribution of population over dispersed islands, as well as the transportation challenges associated with geographical dispersal of the island.

According to the Waste Management Policy Booklet released by the Ministry of Environment and Energy, (2015), the rate of waste generation is increasing by 4% every year in the Maldives. The same policy document reveals that the per capita waste generation in Male' the capital island is 1.7 kg per capita, waste generation for outer atolls is 0.8 kg per capita, and for tourist facilities is 3.5 kg per capita. Furthermore, according to 2013 data, 860 metric tons per day (mtpd) of solid waste is discarded in the Maldives (Peterson, 2013). Out of this amount, the National Bureau of Statistics state that 30% of the waste that goes to Thilafushi, (an artificial island created in the 1970's to reduce the burden of the waste disposal issue in Male') is from tourist resorts (Ministry of Finance and Treasury, 2015). Furthermore, the waste that was sent from Male' to Thilafushi increased by 21% in 2014, compared to 2013 (Ministry of Finance and Treasury 2015). While there are no studies conducted on amount of waste generated in the south of the country, a 2011 study conducted by Maldives Environment Management Project (MEMP) revealed that 52 tons of waste are generated per day in the four Northern atolls of the Maldives alone, which includes inhabited islands, high-end tourist resorts, and industrial fish processing facilities (SENES Consultants Limited & CDE Pvt. Ltd, 2011) There is a severe lack of waste management infrastructure, and disposal due to budget constraints for waste management infrastructure. A report by the Ministry of Home Affairs and Environment (2004) reveal some regional landfill sites were established in Hithadhoo in the southernmost atoll, and Hdh. atoll in the north of the country. However, in all of these situations, the disposal sites were located too close to the shoreline, and leachates were not managed properly. However, the first Regional Waste Management Center has opened September 2016, in Raa Atoll, in Vandhoo island, which will be used as a waste management, treatment, and disposal centre for the four

northern atolls including Noonu, Raa, Baa, Lhaviyani, which includes domestic waste, waste from tourist resorts, as well as industrial processing facilities. The plan is that recyclables and non-compostable waste will be collected for treatment (baling, shredding, incineration) or disposal in the island.

In terms of recyclable waste, a 2009 study by JICA revealed that the total recyclable content in the waste stream amounts to 20.56%, out of which PET constituted only 0.14% by volume (Maldives in Fourth Regional 3R Forum in Asia, 2013).However, it is important to note that this figure is more six years old, and moreover, despite the small percentage of PET, the visible effects of littering from PET waste in a small atoll nation with limited land space exacerbates the issue, and furthermore threatens the image of the Maldives as a pristine tourist destination with unspoiled nature. A comprehensive breakdown of the composition of wastes in the Maldives is presented in **Appendix 4.**

### 5.2.1 Import Data for PET bottles

The Maldives Customs Service did a variety of data checks to search for import data of PET resin, PET preform, soft drinks and water bottles bottled in PET, for this research. According to the Chief Customs Officer, Ali Zubair, Customs up until recently have not specifically prioritised data analysis for PET raw material or bottles, as there has not been a demand. Furthermore they are not prompted by a regulation or a law to manage the details of PET import data, more than which is required in the Harmonised Commodity Coding and Description System. Customs manages import data and keeps tracking of materials based on the Harmonised System (HS), which systematically categorises products in 97 different chapters. It is used in 200 countries worldwide. Customs Statistics department mostly prioritise the financial value of the products, and data maintenance for priority materials such as oil, construction materials, and basic food items. According to Zubair, Customs have noticed a recent demand in information regarding import of chemicals and plastics, and he deems this as a result of increased environmental concern in the country.

As most water bottling companies import the PET resin, Customs first did a data search for "plastics in primary form", according to the Harmonised System, and then extracted a filter for "PET resin" based on the description. It is important to note that the numbers revealed in the data search for PET resin are only those that were declared as "PET resin" by the importers. Another search was conducted for preforms, based on importer descriptions as well, as there is no separate Harmonised system code for preforms. Preforms are classified in the same heading as empty PET bottles in the Harmonised System.

Customs did another search for "plastic bottles" which is coded as "HS 3923.30" according to the harmonised system. However, only empty plastic bottles are classified under this code. Since this would exclude PET filled with water, soft drinks, and juice, Customs carried out another search for "water and soft drinks "according to the Harmonised System classification. However, there are also a variety of soft drinks packaged in glass bottles, and paper cartons as well. The unit of quantity is maintained in litres or kilograms. Thus, the figures provided in this section are estimates, as Customs import database and tracking does not allow for such fine detail Furthermore, according to Zubair, even chemicals and vinegar are sometimes imported in PET bottles, but as most are imported as glass, it was not searched for. Thereby, the figures provided below are estimates of the amount of plastic bottles imported into the country.

| DESCRIPTION | Unit | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 (JAN-MAY) |
|---|---|---|---|---|---|---|---|
| | | QUANTITY | QUANTITY | QUANTITY | QUANTITY | QUANTITY | QUANTITY |
| Import under HS 3923.30 (carboys, bottles, flasks, and similar articles) | NOS | 53,730,796.00 | 45,940,742.00 | 34,746,930.00 | 41,073,359.00 | 18,040,625.00 | 6,348,581.00 |
| Preforms of HS 3923.30 * | NOS | 45,606,935.00 | 34,967,608.00 | 29,878,996.00 | 39,568,391.00 | 11,972,683.00 | 2,082,932.00 |
| Water bottles & Soft Drinks | LTR | 6,545,138.77 | 7,436,350.46 | 6,669,534.38 | 8,654,956.14 | 9,228,516.28 | 5,662,924.18 |
| PET Resin | KG | 1,922,200.00 | 1,341,088.00 | 628,192.50 | 1,716,233.50 | 2,338,940.00 | 1,361,000.00 |
| **Total import of PET** | | **107,805,069.77** | **89,685,788.46** | **71,923,652.88** | **91,012,939.64** | **41,580,764.28** | **15,455,437.18** |

*Table 8 Import data for PET products (Source: Maldives Customs Service, 2016)*

As found from these statistics, there seems to be overall decreasing trend for preform, soft and other plastics imported under HS.3923.30. This maybe due to the fact that all the major bottling companies shifted from using preform, and started producing the bottles directly from the resin. Moreover, many resorts are moving away from using single use PET bottles, and using glass bottles instead, which will be discussed in **Section 5.5.4.** Furthermore, many tourist facilities in agreement with Coca Cola have started using fountains, or refillable 20 litre bottles instead, as explained in **Section 5.3.2** as well.

However, the data for PET resin, and soft drinks and water bottled in PET, clearly shows the imports are increasing, with the exception of 2013. Moreover, it is important to note that the data from Customs alone cannot capture the absolute production and sales volume, and consequently the consumption and disposal of plastic bottles in the country. The bottling companies did not share their production and sales volume, due to claims of market sensitivity. Furthermore the number of PET bottles that can be manufactured from a kilo of PET need to be established to make these analyses. For instance, according to various sources on the Internet, 1 kilogram of PET resin can roughly make 30 PET bottles (Laboski, 2016). The website does not provide the litre capacity of the bottles. However, if the same assumption is applied to the case of the Maldives, then at least 40, 830,000 PET bottles can be produced from the imported PET resin, and potentially put on the market.

## 5.3 Major PET Producers in the Maldives

This section introduces the PET producing, and bottling companies in the Maldives. The information was obtained via interviews. The producers did not share the production and sales volume of the PET bottles due to claims of market sensitive information and confidentiality.

### 5.3.1 Male' Water and Sewerage Company (MWSC)

Male' Water and Sewerage Company (MWSC) is a public-private institution that pioneered desalination of water, and wastewater management in the Maldives. It is one of the largest utility companies in the Maldives, providing water, booster, electricity, wastewater services, and waste services. The company produces desalinated water through reverse osmosis, which is provided to the Male' region (Male', Hulhumale' and Villingilli), which is accessible through running taps. In 2007, the company started the production of "Taza" brand bottled

water in PET bottles. They produce and bottle water in PET bottles of 0.5 litres, 1.5 litres, and 5-litre capacity. According to the Manufacturing Engineer, Mr. Hassan Saeed, the role of MWSC is to import the PET resin, create the preforms, mould the PET bottles, mineralise the desalinated water, produce the water and bottle them. The distribution and sales of the bottles are via a sister company called the International Beverage Maldives (IBM) Company. According to Saeed, the demand for water bottles is increasing year by year.

MWSC currently has no producer responsibility scheme to take back its water bottles. According to Ali Shaheem, Chief Manufacturing Engineer, MWSC does however conduct awareness programs for consumers regarding returning of empty bottles, and collects it without a charge. Furthermore, they have trained their delivery staff (as water bottles are delivered to households and retailers) on how to remove the PET bottles without damaging the plastic wrapping, so empty water bottles, either from a retailer or a household can be put back in the same plastic wrapping and collected. They also have a contract with a private recycling company called Secure Bag, and they sell the empty bottles that are returned by customers or retailers to them.

### 5.3.2 Coca Cola Company

Coca Cola has been operating for 25 years in the Maldives. Their main business segment is soft drinks, but to meet the rising demand for bottled water in the Maldives, they also started producing the "Bonaqua" water brand. Coca Cola imports raw PET resin and produces the bottles themselves as well. According to Srikanth Gundemoni, the General Sales Manager, in order to minimise littering of 0.5, 1.5, and 5 litre bottles, as they are easier to throw away, Coca Cola has started to produce 20 litre refillable PET bottles, to 1000 households in Male', The bottles can be refilled up to 20 times, and the company provides a refund of US $40 if the bottles are returned, or if the consumers want to stop the service. This is to incentivise the returning of bottles instead of it being littered or thrown away, Gundemoni stated. Furthermore, the company has also started providing water in glass bottles to resorts and other consumers, and water dispensing units, or fountains to around 60 tourist facilities in the country, in its effort to minimise PET consumption. Nevertheless, the company currently has no take back scheme for 0.5 litre or 1.5 litre bottles. Coca Cola is currently partnering with an NGO called Biodiversity Environment Awareness Maldives (BEAM), and the International Union for Conservation of Nature and Natural Resources (IUCN) to organise a model for collection and recycling of PET bottles.

### 5.3.3 Happy Market Pvt.Ltd

This is a private company that started producing and distributing "Life" brand water bottles in 0.5 litres, 1.5 litres, and 5 litres in the Maldives. The company provided no information for this research, and it was not possible to have an interview with the personnel of the company.

## 5.4 Policies and Regulations for Waste Management

This section describes the regulatory framework of the Maldives concerning waste management. Data is obtained for this section via interviews, consultation of government documents, policy reports, and environmental laws and regulations.

Historically, concerns regarding waste management was embedded in other environmental laws and regulations. There was no special legislation or law specifically created for waste management. This is due to the fact that waste creation and management was not seen as an issue until after the full development of tourism, and the consequent socio-economic

development. Thereby, the first reference to waste was in the 1993 Environment Protection and Preservation Act, which was also the first environmental law in the Maldives. In the Act, there is only one clause, which discusses waste management. In clause 7(a) of the Act, it explicitly states that no waste, oil, or toxic gases harmful to the environment must be disposed in any area of the Maldives. However, Clause (b) states that in the case where items mentioned in Clause (a) needs to be disposed of, it must be done so with government permission in designated areas, and that it should be done in a way that is not injurious to human health.

In 2005, a "Barriers Report" was developed, which was the first to recognise that the Maldives required a standalone and consolidated national policy for waste management. Taking heed of this report, the first standalone National Waste Management Policy document was released in 2008, with broad ranging policy objectives formulated in line with major international principles. For instance, the document endorsed various policies and strategies such as the allocation of roles and responsibilities for waste management, development of frameworks for the Polluter Pays Principle, User Pays Principle, and the Extended Producer Responsibility (EPR) principle. The policy also explicitly stated the need to allocate administrative functions, and delegate powers to island, regional, and national levels. Strategy 2 also clearly expressed the need for producers' responsibility to manage the waste, and clearly listed the responsibility of commercial enterprises, producers, importers, and retailers' responsibility in the development of waste management practises for their sectors. Furthermore, Policy 6 of the document stated that a financially viable waste management system needs to be established, and stated the need to create a dedicated fund to support waste management initiatives, and establish a framework for implementing the Extended Producer Responsibility (EPR) principle. Policy 9 also stated the need to provide financial incentives and disincentives to pursue good waste management practices (Environment Research Centre, 2008).

The most recent National Waste Management Policy, which was released in 2015, also endorses similar principles. The purpose of the policy has been framed as to protect the Maldivian seas and reefs, and the coastal zones from the negative impacts of waste (Ministry of Environment and Energy, 2015). Furthermore, the Policy explicitly states that it is based on international waste management principles, such as the European Union (EU) waste hierarchy pyramid of prevention, reduction, reuse, recycle, waste to energy, and disposal. The policy is compromised of 16 strategies. Of those, the most relevant strategies that endorse international principles for waste management include the utilisation of the 3R concept (reduce, reuse, recycle) in the overall development of waste management policies and management. It is important to note that this waste policy of 2015 has been endorsed in the Cabinet level, after it was proposed by the Ministry of Environment and Energy, and work is currently underway on how to implement the different strategies mentioned in the policy, according to the Deputy Minister of the Environment, Mr. Amir Ali. Thereby, the future development of waste management activities in the country will be oriented according to the following strategies in the policy document:

- Strategy 1.2 states the need to encourage the development and regulation of the *re-use and recycling industry, and provide incentives* for those industries to develop as a business.
- Strategy 3 discusses the allocation of main waste management *responsibilities* and administration duties to the Ministry of Environment and Energy, and the development of a monitoring system for waste management for all Maldivian inhabited islands.
- Strategy 5 states the need to develop a national *legislation for waste management*

- Strategy 6 states the need to develop a national database for waste management. Strategy 7 specifically calls for the utilisation of the Polluter Pays Principle in waste management implementation and developing a system for extracting fees from polluters.
- Strategy 9 emphasises the need for context specific waste management, and calls for the development of criteria to categorise islands depending on context (land area, population size, and level of industrial activity) and development of a waste management strategy for them and provide technical assistance and infrastructure.
- Strategy 12 calls for the categorisation of the Maldives into 7 regional segments, and develop regional waste management centres in those regions.
- Strategy 14 calls for research into the latest technologies for waste management.
- Strategy 16 calls for developing a *waste management fund,* especially to develop a policy paper and legislation, develop a national implementation plan on how to conduct *Extended Producer Responsibility schemes*, develop guidelines for trust fund and open a trust fund account.

The highlighted words in "italics" demonstrate an interesting trend, that the nation's policies can oriented the nation towards the possible introduction of the deposit refund system. Strategies **1.2, 5, 16, and 17**, are especially important, and can potentially lead the nation towards the implementation of a deposit refund system, through the use of incentives, establishment of a recycling industry, creation of a waste legislation, and waste fund, all elements which exist in Kiribati, and Palau.

However, as of now, there are no demarcated roles and responsibilities for producers, or individuals, stated in environmental law or regulations. Even if the Policy above emphasises the need to allocate responsibilities. Historically, and now, the current perception of society is that waste management is a service that should be borne by the government as a public service. While individual households always had to transfer the wastes to a designated disposal site, this is where the role of the consumer and household ends, and the final disposal or treatment of wastes was seen as the responsibility of the government. The role of producers and retailers, in the production and selling of polluting products was not taken into account in the management of waste. However, it is important to note that the waste management of tourist facilities, especially tourist resorts and vessels, fall under the mandate of the Ministry of Tourism, and tourist facilities are required to follow the Regulation on the Protection and Conservation of Environment in the Tourism Industry. More information about the requirements of this regulation will be provided in **Section 5.5.4.** Otherwise, there are 16 environmental laws and 21 environmental regulations in the country (EPA Republic of Maldives, 2016).Apart from the abovementioned 1993 Environment Protection and Preservation Act, there is a 2010 law on extraction of fines for committing environmental damage, which includes littering, and implicitly includes fining for damage to underground water sources, the ocean, sea, and soil (Ministry of Housing and Environment, 2011). Concerning the regulations, there is a waste incineration guideline developed in 2013, and updated in 2016. Apart from these laws and regulations, including the tourism regulation, which specifies waste management for those facilities, the abovementioned laws and regulations sum up the legal mandate for the governance of environmental issues in the country.

### 5.4.1 Policies and Regulations Specifically for PET

There is currently a 20% import duty on PET bottles or PET resin, imposed by the Maldives Customs Authority for producers and importers, in consultation with the Ministry of

Environment and Energy. Otherwise, there are no specific environmental rules, regulations or laws regarding the production, selling, use, or disposal of plastic bottles in the country.

## 5.5 General Waste Management Practices

This section describes the general waste management practices that exist in the capital city Male', other atolls and islands, and finally in the tourist resorts, which are established in individual islands. Data is collected from interviews with Ms. Fathimath Shamveela, the Director of Operations for the Waste Management Corporation (WAMCO), Ms. Aishath Rashfa, the Assistant Director of the Ministry of Environment and Energy, and Ms. Majda Ibrahim, the Vice President of the Island Council. Consultancy reports have also been reviewed for this section.

### 5.5.1 Male' Region

Currently, the collection of household waste in Male' is arranged by private households. Most households pay a fee ranging between US $6.50- 13.00 per month to foreign labourers, to collect, and transfer the waste. The collection fee is not dependent upon per unit or per kilo price, but rather it is a monthly fee for the collection service for the labourer. These labourers' main work is not that of waste collection, but they are mostly manual labourers who are engaged in domestic and construction work, and are from neighbouring India or Bangladesh and merely engage in waste collection to supplement other jobs. The labourers transfer the waste to two vessels, by two harbour points in Male', one for non-compostable waste, such as construction waste, and the other for compostable or household waste. All of these wastes are transported to Thilafushi, an artificial island designed as a municipal landfill to solve the waste problem of the capital city.

However, because household waste is not segregated, PET bottles are also included in the household waste. Households provide the waste usually in plastic bags, and the labourers transport by bicycle, usually carrying many other plastic bags full of waste from other households as well. This has led to increased littering of the streets as the plastic bags are not secure, and the bicycles are not a stable source of transportation. Once the waste arrives in Thilafushi, they are all mixed, piled up, and burned openly (Shamveela, 2016). In the past two years, the Male' City Council had provided red and blue collection dustbins on some of the major streets for recyclable and non-recyclable items. However, once taken to Thilafushi, they were all still mixed and burnt openly as well (Shamveela, 2016), which has led to the criticism of many groups in society. Thilafushi, which was once a lagoon of 7000 meters and a width of 200 meters, is often described as an apocalyptic island by many journalistic sources due to the toxic wastes in the site, and because of the open burning of mixed waste, including hazardous waste. Thilafushi is under the responsibility of the Thilafushi Corporation, which is a state owned entity.

### 5.5.2 Atolls

In islands outside of the capital region, households undertake the collection, and transfer of waste. Individual households may segregate waste according to combustible and non-combustible waste. However, some households may hire a contractor or informal person to take the waste to the designated disposal site in the island, and few have a fee collection and transfer system established in some of the atolls (GreenTech Consultant Pvt.Ltd, Riyan Pvt.Ltd, & CDE Pvt. Ltd, 2010).The disposal area, and waste management facilities are governed by the island council. While every island has a designated waste disposal site, random littering occurs due to lack of efficient and affordable collection systems, distance from household to the disposal site, as well as lack of enforcement of laws and regulations

for littering. Hence, most of the waste is usually disposed through illegal dumping, burning or burying (GreenTech Consultant Pvt.Ltd et al., 2010).

Nevertheless, new initiatives have sprung from certain islands such as composting, and segregating waste for recyclables, and continue to uphold international waste management principles to the best of their ability. For instance, functioning solid waste management systems exists in four atolls, operated by Women's committees and involve segregation of waste into combustible and non-combustible waste. Each household is allocated an area in the waste management site, where they can burn their household waste, after burning the ash is used as a soil conditioner (GreenTech Consultant Pvt.Ltd et al., 2010), while non-combustibles such as metal and cans are disposed to the sea or transferred to Thilafushi. According to GreenTech Consultant Pvt. Ltd. et al (2010), waste disposal is a serious issue in the atolls due to the minimal provision of waste management services.

### 5.5.3 Zooming the lens on Maafushi- a brief case study of waste management in the islands

Among other islands, Maafushi Island in Kaafu atoll is a special case because it lies on the unique intersection as a locally inhabited residential island, as well as an island that boasts the largest guesthouse population in the nation. Unsurprisingly, the waste problem is exacerbated in Maafushi than for other locally inhabited islands, due to the tourist facilities, which are now over 50, in the small island measuring 1.2 kilometres in length, and 0.2 kilometres in width. According to the Vice President of the Maafushi Island Council, Ms. Majda Ibrahim, it is estimated that Maafushi contributes to roughly 2% to the Maldives Inland Revenue Authority (MIRA) solely from the tourist taxes. Maafushi has a population of roughly 5000 people.

A phone interview with Ms. Ibrahim revealed that while the island councils are given the responsibility to manage the waste, they are not given full authority to exercise that responsibility, as council initiatives and waste management needs to be authorised at every step by the central government agencies, such as Ministry of Housing, Ministry of Environment, and the Environment Protection Agency. Furthermore, there is a lack of budget specifically for waste management, which Ibrahim believes should not be the case, since waste management is a high priority, and consumes so much of the council budget.

The management of solid waste in the island is now by the Maafushi island council in partnership with two guesthouses called Kaani Hotel and Arena Beach. The guesthouses, under Corporate Social Responsibility (CSR) principles, have hired three staff, and provided vehicles to collect waste from households, and guesthouses (for a fee of approximately US$ 10 each), and transfer the waste to the designated waste disposal site on the island. Previously, households had segregated waste such as recyclables and separated them. However, because the island has no infrastructure to shred or compact the bottles, or an incinerator, during the rainy monsoons, water accumulated in tins and bottles, and there was a Chikungunya virus outbreak from mosquitoes in 2006, where around 75% of the population got affected. After that incident, Ibrahim states, waste is mixed and burnt, including recyclables. However, food waste is still collected in rubbish bins by the disposal site, and dumped in the sea. Ibrahim justified the burning of the waste since the one-time transportation cost, to transfer the waste to the Thilafushi disposal site cost 300,000 MVR (US $ 15,000) from the central government budget, and it is too large a cost to be incurred on islands. Furthermore, leaving the waste without burning also poses health hazards. Concerning the PET waste issue, Ibrahim states that the consumption of PET bottles is increasing day by day as there is increased demand for fresh water. Previously the island's

source of fresh water was rainwater during the rainy monsoon, which was harvested in rain tanks for the drier, sunny monsoon. However, the councils have been discouraging the use of drinking rainwater due to the mosquito breeding outbreaks. According to Ibrahim, roughly 25-30% of residents consume water from PET bottles. Furthermore, roughly all tourist facilities use bottled water for their services; there are roughly 1000 tourists in the island, out of the population of 5000 people.

Currently, the council, together with the guesthouse staff clean the harbour and seaside three times a week, and collect PET bottles and other plastic, and 15 women are hired from the council to sweep the island every day. Maafushi council has moreover submitted a letter to the Local Government Authority (LGA), and the Ministry of Housing and Infrastructure, in order to get permission so that the guesthouses that are using the public land for their tourist services can be charged, and those funds can be used to fund the waste management activities of the island. Ibrahim hopes to get an incinerator using those funds. However, she states that the Maafushi island council is still waiting for the approval from the Local Government Authority (LGA) even if they have received approval from the Ministry of Housing and Infrastructure.

### 5.5.4 Resorts

There are currently more than 190 tourist resort facilities in the Maldives. In 2013, 21% of the 860 metric tons per day (mtpd) of waste discarded in the Maldives was attributed to tourist resorts (Petersen, 2013), while this figure increased to 30% in 2014 (Ministry of Finance and Treasury, 2015). Recyclables such as plastic only account for 5% of the waste, with the majority of the waste being from food waste (40%), garden, and landscaping waste (38%) (Petersen, 2013). All resorts are required, under their operational licence, to have a waste treatment equipment such as bottle crusher, metal compactor, and incinerator according to the Tourism Regulations mentioned in **Section 5.5.4.** However, the incinerators are not optimal in most resorts, and there is insufficient capacity to deal with the volume of waste in some larger resorts (Ministry of Home Affairs and Environment, 2004). Furthermore, recyclable items are transported by a boat to Thilafushi, and disposed for a charge, depending on the size of the boat. Recycling is not considered a cost effective option, considering the small fraction of recyclables in the waste stream, the logistics, and transportation costs in the Maldives (Petersen, 2013). However, many resorts have undertaken sorting at source, composting, and reusing practices on site, as well as banning of PET bottles and using only glass bottles.

## 5.6 Actors Involved in PET Waste Management in the Maldives

This section identifies the main actors who manage PET waste in the country. Data is obtained via interviews with Ms. Fathimath Shamveela, the Director of Operations for the Waste Management Corporation (WAMCO), Ms. Shaahina Ali the Chairperson for the NGO called Biodiversity Environment Awareness Maldives (BEAM), and Mr. Ibrahim Shareef, the Managing Director of Secure Bag Pvt. Ltd.

### 5.6.1 Waste Management Corporation (WAMCO)

WAMCO was officially created in 2009 by the government, but was not functional until its revival in in 2015. The company's objectives have been listed on their official website as, to provide "practical and environmentally responsible and sustainable solid waste collection service for Maldivian communities", to operate a cost effective waste transportation system between designated waste collection points and waste processing/disposal facilities, to promote and create awareness on best practices in waste management that can be adapted in

Maldivian communities, and to assess and develop environmentally accountable and economically viable waste recycling, processing, treatment and disposal systems"(WAMCO, 2016).Thus, according to the objectives of the company, WAMCO has asserted the physical responsibility for the collection, transportation, and disposal of waste in the Maldives. However, the company is state-owned, so the government largely funds the economic responsibility for those activities. WAMCO has started operationalizing since January 2016, when the Ministry of Environment and Energy officially handed over the responsibility to manage the waste of Male' region. The main responsibility of WAMCO now is to transfer the waste from two waste dhonis (boats) from Male', and from Villingilli island, to Thilafushi. Thus, the responsibility of WAMCO ends once the dhonis (boats) transport the waste to Thilafushi. While the geographical scope for WAMCO is currently only for the Male' region, the waste management of the entire Maldives will be eventually handed over to the company.

Since January 2016, WAMCO has conducted various surveys to understand how much waste is brought to the waste sites in Male' from households, how much people are already paying trash collectors to take away their trash, and feasibility studies for the best way to conduct collection services. WAMCO is currently also searching for options on how to organize collection. One approach, according to Ms. Fathimath Shamveela, the Board member of WAMCO, is to tap into the existing system of door-to-door collection, however using WAMCO contract staff and using more stable and closed vehicles instead of bicycles, as current trash collectors do. According to WAMCO, they have discussed how to incorporate the already existing large labour force of migrant workers who do the waste collection, but the problem is that oftentimes the workers do not possess legal work permits, and as they are often engaged in other jobs, and they cannot have two jobs at the same time. Another option they are considering is to use centrally placed dustbins in apartment buildings to facilitate easier collection. Regarding segregation of waste, Shamveela says that dustbins will initially provide segregation of materials for plastic, cardboard, and metals, but will eventually become more detailed.

WAMCO is also in charge of the newly opened Regional Waste Management Center in Vandhoo Island, in Raa Atoll, as mentioned in the beginning of this Chapter. Once the facility begins operating in September 2016, WAMCO will be in charge of transporting the waste (except food, and organic waste which will be composted) from the locally inhabited islands and tourist resorts from the four northern atolls, Noonu, Raa, Lhaviyani, and Baa, from vessels to the facility and will start incinerating the waste. WAMCO will also be in charge of compacting, shredding, and baling some recyclable materials in the near future once the facilities and machines are ready, and feasibility studies are underway for the recycling of plastics, cardboard and metal.

### 5.6.2 Secure Bag Pvt.Ltd.

Secure Bag is a private business engaged in the exportation of reusable, and recyclable materials since 2004. Their main business segment is exporting scrap metals, such as copper, aluminium, brass, and batteries. Plastics are only a small portion of the business, which the owner says is done out of Corporate Social Responsibility (CSR). The company can be said to be the largest private buyer and collector of PET bottles in the Maldives. They mainly buy PET bottles from the second hand "Neelan" shop in the Maldives, from Maldives Water and Sewerage Company (MWSC), tourist resorts, and other islands. The official contract however exists only with MWSC, and buying is otherwise based on informal agreements with tourist resorts and island councils. According to Shareef, the Director of the Company, they may buy one kilo of PET for less than a dollar (0.025 Rufiya-1 Rufiya) depending on whether it is

shredded or not, and can sell one ton of PET for maximum US $350, to private buyers in India. They export some 20-30 tons of PET every three to six months. In 2014, Secure Bag exported 55 tons of PET.

The company has a total of 63 staff, but not all are involved in the collection. The staff is not allocated a separate salary for collection, but they do the collection services as part of their overall job duties. In the beginning, the company went personally door-to door to collect PET bottles, but now there is a lot of demand such that Secure Bag cannot handle all of the demand for buying and collecting. Therefore, they do not market themselves anymore, but buys if someone comes up to them first, and is willing to sell. The company collects PET from Maldives Water and Sewerage Company (MWSC) three times a month, based on a contract with them. Secure Bag says that the price of PET has become low due to the low prices of oil in the international market.

### 5.6.3 Biodiversity Environment Awareness Maldives (BEAM)

Biodiversity Education and Awareness Maldives (BEAM) is an NGO dedicated to creating environmental awareness and education for youth, and island communities. Their goal is to reduce, and intercept the waste that end up in the oceans, by empowering the youth, and partnering with corporate and international assistance to protect the environment of the Maldives, especially the ocean. BEAM is currently in collaborative effort with Parley Ocean School to implement the Avoid. Intercept. Redesign (AIR) strategy. The partnership with Parley allows BEAM to fund the exportation of plastic out of the Maldives. According to Ms. Shaahina Ali, the chairperson of BEAM, they have set up collection points in two schools in Male', where they are able to collect 75,000-80,000 5 litre PET bottles every day, Furthermore, only by intercepting the PET bottles that are going to Thilafushi, they have now exported 3 million 5-litre PET bottles since December 2015, to an Adidas manufacturing facility in Taiwan; where they are being remade into fashion, or sport wear. Every four to seven days, 40 ft. containers full of PET are exported to this facility.

### 5.6.4 Informal Sector

In general, foreign migrant workers manually sort waste that is transported to Thilafushi. Some of the PET and recyclable metals are stockpiled, where private companies who have been given scavenging rights periodically crush and export the stockpiled recyclable wastes (GreenTech Consultant Pvt.Ltd et al., 2010).

# 6 Design of Potential Outputs for the Deposit Refund System in Male'

This section explains the how a potential deposit refund system i.e. output can be designed for implementation, in the capital city Male'. The blueprint is based on the deposit refund system of Kiribati and Palau, and takes into consideration the information obtained via interviews in researching the Maldivian context. The material and financial flows are also designed based on the best information provided by the beverage companies, Ministry of Environment, Maldives Customs Service, and WAMCO, and adjusted to the context of Male' city. As previously mentioned, Male' is chosen because it is the capital city with the largest population in the Maldives.

### 6.1.1 Potential Material and Financial Flow

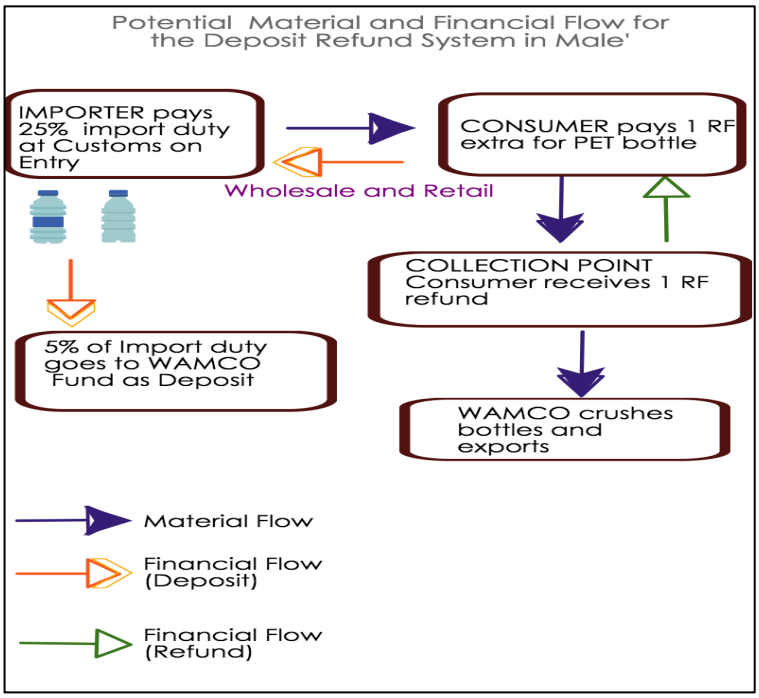


*Figure 12 Hypothetical Deposit Refund System to be implemented in Male' (Source: Own)*

Currently, all producers and importers of PET material, including bottled water, water, soft drinks, empty PET bottles, and PET resin, are subject to paying a 20% import duty at Customs. Under the proposed deposit refund system, the duty fee will increase to 25%, so that 5% of it can go to a separate WAMCO fund, which can be managed and monitored by a state agency, or by Customs. These funds can be used issue to refunds, pay salaries, pay rent for collection centre, storage facilities, capital expenditure costs, as well as shipping and export costs. Furthermore, it can be used to supplement the state budget for WAMCO for the general waste collection, transfer and treatment of other wastes in Male', and in the Regional Waste Management Centres.

The reason why increasing the duty fee, is proposed, rather than imposing a separate deposit fee is to reduce bureaucratic burden for Customs, and making use of the existing system. Furthermore, increasing the duty fee whilst using the existing system, is proposed, rather

than introducing a new concept of a deposit, as it may be met with more resistance from the producers, as they are used to the concept of duties and tariffs.

Similar to the Kiribati and Palau case, importers of beverage containers must pay a deposit of 1 RF ($ 0.06) for every PET bottle imported. This also ensures that all producers and importers of PET material into the country will have the economic responsibility for the management of PET waste, as well as implicitly being physically responsible for the economic costs of the collection, and exporting of PET waste. The deposits will go to Waste Management Corporation (WAMCO) budget, where the arrangement should be made under a legal mandate. Consumers in this system have to pay 1 RF ($ 0.06) deposit upon purchase as well. This 1 RF will be refunded to them by WAMCO in a collection centre, once consumers return the empty bottles, and this ensures that consumers have the physical responsibility of collecting the bottles, and returning them. WAMCO can decide how many redemption centres there will be, but a minimum of three or four in Male' will suffice, and make it convenient for consumers to return the bottles, as Male' city is a mere 2 kilometres.

Usually in the Maldives, the wholesale distribution of PET bottled beverages is also via the same production company, or sister company. For an instance, Bonaqua is produced by the Coca Cola Company, and is also distributed through them. ). Likewise, "Life" water bottles are produced and distributed via Happy Market Pvt.Ltd Company On the other hand, Maldives Water and Sewerage Company (MWSC) produces Taza, but the sales and distribution are via its sister company, the Island Beverages Maldives (IBM. However, there also exist many retailers of various economic capacities, and physical sizes. To adjust the system internally, wholesale distributors of PET can increase the price for every PET bottle by 1 RF ($0.06) when selling to retailers, to compensate for the increased duty fee, and retailers get to keep the additional deposits that consumers pay for every additional bottle.

If the mechanism is implemented, and kicks off in the islands, WAMCO can transfer money from the "Special Fund" to island councils, where Waste Management Centres in islands can then issue refunds to consumers once they drop off the bottles. In this way, separately collected PET bottles in island waste management centres can be transported by the WAMCO vessel transfer system to the Regional Waste Management Centres in the atolls, where plans are already in place to either shred or bale recyclables for exporting. Moreover, if the costs to transfer from the atolls to Male' for shipping are too high, or there lacks a private buyer, they can be incinerated.

# 7 Assessment of Political Feasibility

This chapter presents the findings, and analysis of the political feasibility of implementing the deposit refund system in the Maldives, using the Stakeholder Analysis method. The Stakeholder analysis method involves identification of stakeholders, and their functions, and assessment of the power and interest they have in implementing a deposit refund system. Data is collected via interviews to complete this section.

## 7.1 Identification of Key Stakeholders

For this task, stakeholders are identified based on three criteria: 1) stakeholders who have the power to propose, and influence policies and laws in the Maldives; 2) key entities involved in waste policy, management and implementation in the Maldives; and, 3) stakeholders who have roles in the hypothetical deposit refund system, as illustrated in **Chapter 6.** Stakeholders for this research are identified using the snowballing technique, using initial interviews with the Ministry of Environment to gain information about more stakeholders.

It is important to emphasise that consumers and retailers are excluded in this analysis, as the major focus of analysis in this research is on the political feasibility of the potential introduction of the deposit refund intervention, which is largely determined by policy makers. As mentioned in **Section 1.5** consumers are excluded because access to a wide range of consumer opinions was difficult during the time frame of the research. Another significant aspect to consider, is that laws and policies that have direct consequences to the public are often made without public consultation in the Maldives, and thereby, it is unlikely that the consumer stakeholder group will be taken into account in the potential introduction of a deposit refund system. However, consumer's physical responsibility in returning the bottles to the collection centres is **key** to achieving the desired outcomes, and thereby consumer exclusion from the stakeholder analysis, and the potential impacts on the findings of political feasibility is discussed further in **Section 8.1** in Discussions on Findings and Analysis. However, willingness studies conducted by Waste Management Corporation (WAMCO), estimated that 60% of consumers, or households prefer having a collection service, rather then they themselves returning waste to a designated point. Hence, it can be assumed that consumers are averse to physically return waste, or post-consumer products, due to inconvenience, or time burden. This is also confirmed by literature, as briefly discussed in **Section 2.2.** However, this finding excludes the incentive factor, which exists in a deposit refund system, which can induce consumer behaviour (EEA, 2006). Likewise, as readers can recall, retailers are also excluded, as they do not have a major role in the design of the system. Moreover, most retailers in the Maldivian context are undersized shops that rarely have the economic or political power to be part of the policy making process.

## 7.2 Functions and Responsibilities of Key Stakeholders

This section provides brief descriptions of the selected stakeholders' main functions and responsibilities in relation to waste management, or policy.

### 7.2.1 People's Majlis

The People's Majlis or Parliament, is the supreme legislative authority in the country, and forms one of the three principal organs of the state. The People's Majlis has the power to enact, revise, or amend the constitution. It has currently 85 elected members, from multi-member constituencies, with the number of representatives being determined by the constituency population size: two for the first 5,000 citizens, and one additional representative for every additional 5,000 citizen. Currently, there are 33 members from the

current governing party People's Progressive Party (PPM), 26 members from the opposition Maldivian Democratic Party (MDP), one member from Adhaalath Party, 15 from the Jumhooree Party, and five members from the Maldivian Development Alliance (MDA) which are pro government, and 5 more independent members. The term of the elected members of the Majlis is 5 years, though they can be re-elected for a total of two terms of 10 years.

### 7.2.2 Attorney General's Office

The Attorney General's Office serves as an advisory body, and can draft laws based on requests and proposals from members of the Majlis, the President or Cabinet Members. The Cabinet Members are appointed by the President under Article 129 of the Constitution, (Ibrahim & Karim, 2013) and compromises of the Vice Minister, Ministers of the different Ministries in the Maldives, and the Attorney General.

### 7.2.3 Ministry of Environment and Energy

Ministry of Environment creates policies and regulations, and standards that are required for the implementation of legislation related to environment, climate change, energy, water, sanitation, sewerage, and meteorology (Ministry of Environment and Energy, 2016). Listed among its mandate is also the requirement to protect the environment of the Maldives, develop Strategic Action Plans (SAP's) to promote sustainable development and implementation of aspects of energy, water, sewerage and meteorology, as well as to develop projects and concepts related to those environmental areas, and acquire funding from related institutions and international collaboration. Specifically with regards to waste management, the ministry has a mandate to ensure the appropriate management of solid waste management mechanisms, and formulate laws and regulations, as well as the establishment of comprehensive facilities to dispose solid waste throughout the Maldives, and provide assistance to the local councils in establishing viable solid waste management systems at island levels.

### 7.2.4 Environment Protection Agency

The Environmental Protection Agency is an independent regulatory body for environmental protection and conservation in the Maldives. It is affiliated to the Ministry of Environment and Energy, and operates under the guidance of a governing board. The EPA is the enforcing body, and ensures the compliance of those regulations, and fines or charges according to those violations. The organisation is in charge of implementing the Maldives Environment Law, to declare and manage protected areas and species in accordance to the provisions of the law, and formulate guidelines and standards of the Environmental Impact Assessment (EIA) that is required before the implementation of any project that may have an impact on the environment of the Maldives.

Specifically with regards to waste management, the EPA is required to formulate and implement guidelines and standards for environmentally safe procedures for waste management, set standards for the location of waste management centres, make rules for who can be in charge of managing waste in the islands, and ensures that these guidelines and standards are met by those operating waste management. According to Ms. Aminath Nizar, Engineer, and Ms. Aminath Mohamed, Environmental Analyst of the EPA, there are regulations and standards for every stage of waste from disposal, collection, and treatment. For an example, anyone who undertakes any waste related work must register with the EPA, and comply with their regulations, as EPA issues licenses for the management of solid waste and sewerage. EPA also formulates standards for fee-charging private providers of solid

waste management and disposal, and issues permits for such charges, and evaluates the submissions of the users of the services

As of April 2016, EPA approved 4 waste management plans for locally inhabited islands, out of the 70 that were proposed. However, the EPA is not an independent body in reality, while on paper it is. According to Nizar, and Mohamed, it functions under the Ministry of Environment and Energy, and the staff has no regulatory authority or power to act independently of other government institutions.

### 7.2.5 Local Government Authority

Local Government Authority (LGA) is constituted in accordance with the 2010 Decentralisation Act. The LGA has the responsibility for local governments. The LGA advises island, and atoll councils on the formulation of regulations and laws. They also possess arbitration powers, in the case of a dispute between two councils. Local government are either unitary or two-tier. The unitary councils are the city councils, and the two-tier councils comprise of the lower level island councils which are accountable to an atoll council (Commonwealth Local Government Forum, 2015).

**City Councils:** There are two city councils, (Male' City Council, and Addu City Council), with between them a total of 17 councillors. City councils must have a population of more than 25,000 people, and the necessary capacity to deliver capacity to deliver the appropriate services and a minimum level of gross productivity as specified by central government from time to time.

**Atoll Councils:** There are 19 atoll councils, and they are mandated to oversee administrative and development work, and coordinate and monitor the activities and functioning of the island councils. An atoll council comprises members elected for a three-year term from the electoral constituencies of the administrative divisions within its boundaries. The president and the vice-president of the atoll council are indirectly elected by a secret ballot of the elected members of the council.

**Island councils:** These are established in every inhabited island, except where city councils exist. Currently there are 188 island councils, which are governed by an elected island council. The island councils comprise of elected members from the particular island, and together with women's development committees, they creates various initiatives in the island level ranging from health, waste management, and education. The island council's major role is to prepare island development plans in consultation with the community, and submit them to the atoll council for approval.

### 7.2.6 Ministry of Tourism

Ministry of Tourism Controls creates, monitors and enforces environmental laws related to tourist facilities. For instance, the Tourism Act, and the Regulations of Waste Management governs the waste management of tourist facilities, where waste management is specifically addressed.

### 7.2.7 Ministry of Economic Development

Ministry of Economic Development is entrusted with the mandate to develop and promote inclusive and sustainable economic growth to Maldives, through prudent policies and favourable business climate. It is the objective of the Ministry to create opportunities for the growth of enterprises and individuals. It also formulates laws and policies favourable for

trade, investment and economic growth in the Maldives. Further, it issues import registrations, and develops the Import Export Act (31/79), which is passed by the Parliament, and enforced largely by the Maldives Customs Service.

### 7.2.8 Maldives Customs Service

Maldives Customs Service enforces rules and regulations regarding the control the movement of passengers, goods, and conveyances arriving and departing the Maldives, usually in consultation with other government authorities. It also administers all functions relating to import and export, assesses and collects import and export duties, and compiles and maintains imports and export statistics (Maldives Customs Service, 2016).With regards to the import of goods that can potentially harm the environment, enforces import duties proposed by other entities. For instance, Customs enforces the 400% import duty on plastic bags, and the 20% import duty on PET, which was proposed by the EPA, and passed by the Parliament. However, some products are exempted from duty, based on the rights given to the President.

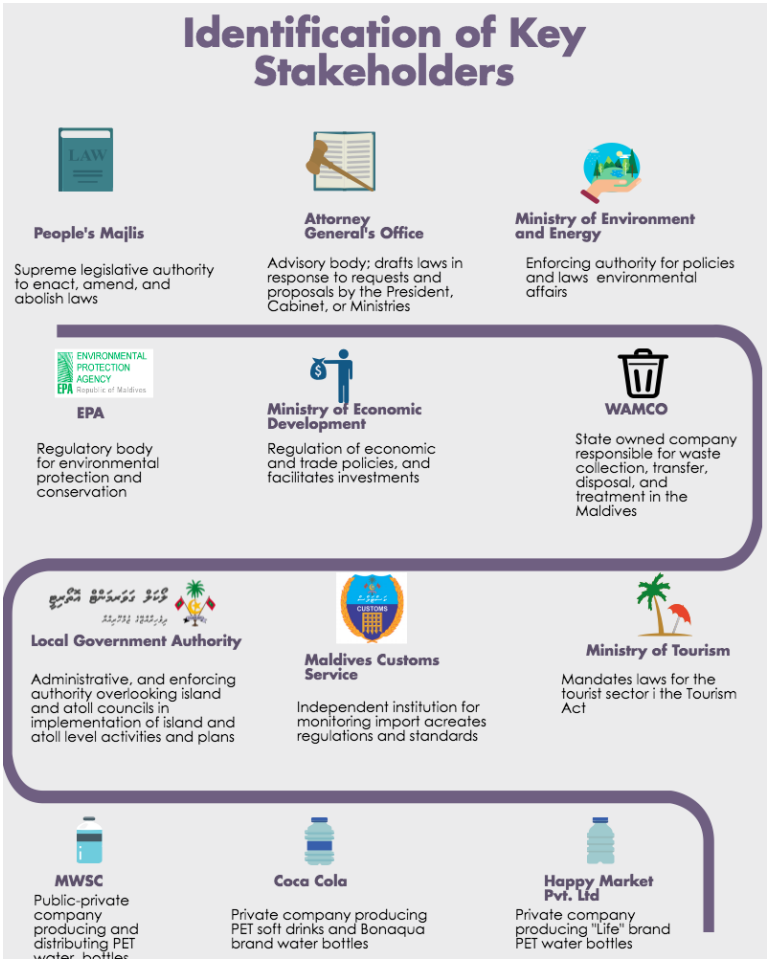


*Figure Key Stakeholders for implementing the potential deposit refund system in the Maldives (Source: Own)*

## 7.3 Analysis of Political Feasibility: Stakeholder Power and Interest to Implement Deposit Refund System

For this section, stakeholders were screened according to the roles they will potentially have in the hypothetical deposit refund system envisioned in Chapter 6. The stakeholders are screened according to: 1) their role in the Maldivian society to propose and implement

legislation; 2) their role in the hypothetical deposit refund system presented in **Chapter 6.** The stakeholders' power was assessed using interviews, and their interest levels are assessed by asking the stakeholders to rank their interest levels from high, medium, or low.

**As previously mentioned in Section 7.1,** retailers and consumers are excluded from the power and interest analysis. Retailers are excluded because apart from the selling or distribution of PET bottles, they have no administrative role in the hypothetical deposit refund system presented in Chapter 6, and furthermore they do not handle financial transaction. Retailers also have no influence in the design of trade and economic policies, but rather they would comply with the rules and policies imposed on them by rules from the Ministry of Economic Development. Consumers are excluded because of lack of access to their views, and because they lack power in in the policy making process. However, their participation is crucial for to achieve desired outcomes in a deposit refund system, so the effect of consumer exclusion from this analysis is discussed in **Section 8.1.**

### 7.3.1 Party Views in the Parliament (Agencies)

The Majlis power and influence to propose legislation is analysed based on interviews with two Parliament members. Mr. Ibrahim Shujau of the Baarashu Constituency spoke on behalf of the ruling party, People's Progressive Party (PPM), and Ms. Eva Abdulla of the Galolhu Constituency spoke on behalf of the Maldivian Democratic Party (MDP), which is the largest opposition party to the current government. Parliament views are necessary because all the major

**People's Progressive Party (PPM):** According to Mr. Shujau, the establishment of a sustainable waste management system is high priority for the current government, so there is a great level of political interest in environmental policies for waste management in general. Concerning the deposit refund system, Shujau believes that increasing the duty fee for importers, where a percentage of it goes to WAMCO to organise collection and exporting of recyclables such as PET, as proposed in **Chapter 6**, is politically feasible, and demonstrated personal interest. He also believes that this will reduce the state budget, as currently WAMCO budget is tied to the budget of the Ministry of Environment and Energy, which is already burdened with the enforcement of environmental management in the entire country. Furthermore, higher duties are also likely to reduce the amount of imports (Shujau, 2016). However, Shujau claims that the political interest maybe undermined, as members of the Parliament Group of the People's Progressive Party (PPM) also need to be interested in the policy, and they need to be provided with more knowledge first.

With regards to the power of PPM in implementing policies, Shujau says that PPM members have the power, and obligation to pass bills, which come from the current government. Moreover, Shujau says that there is greater possibility of the deposit refund system being implemented, if the current government proposes the bill, or a member from the same party proposes the bill. Therefore, if the current government proposes the deposit refund system policy, PPM members in the Parliament are required to pass the law, and furthermore, if a PPM Parliament member is interested, then it is more likely that other PPM members of the Parliament will also vote in favour of that specific bill. However, according to Mr. Shujau, the bills will not be passed immediately, but it will have to be passed through initial consultation, and oftentimes amendment. Shujau also noted that the opposition members often vote down bills proposed by PPM, thereby indicating that voting in the Parliament is members are affected by party loyalties, and may hinder the power in enacting and implementing laws.

**Maldivian Democratic Party (MDP):** With regards to MDP's interest, Ms. Abdulla, states that MDP would be highly in favour of any environmental policy such as the deposit refund system, which will help reduce litter on the streets, and protect the marine and coastal environments. Ms. Abdulla believes that a deposit refund system will provide incentives for people, including herself, to return the bottle. Moreover, she believes that some people can use the refunds so that they can use it to purchase food items; referring to the high food prices in the country i.e. the refunds provide incentive for consumers to return the bottles. Moreover, her view is that a deposit refund system will be effective, even for individuals not motivated by the monetary incentives, because people who believe in recycling will return it, if there is an existing system in place.

However, despite the interest, in terms of the power and influence to implement the policy, she states that Parliament Members from MDP are powerless to propose any bills that have any budgetary implications i.e. since changes to the Majlis Rules of Procedure since 2015. Thereby, they do not possess the power to propose the legislation. However, Ms. Abdulla believes that everyone takes the issue of waste seriously, and she believes it should be neutral issue uninfluenced by party loyalties for members to come to an agreement. Nevertheless, Ms. Abdulla states the crucial importance of establishing credibility, accountability, and transparency in how the "Special Fund" is managed, in the potential introduction of a similar system such as in the Pacific, where the deposit monies are accrued. This is in reference to the Green Tax, imposed pursuant to the Sixth Amendment of the Maldives Tourism Act on 2015. She pointed out that while a rate of US$ 6 is charged for per tourist, there is a lack of transparency in how the revenues are being used by the government, and there is lack of evidence whether the revenues are used for environmental purposes. This confirms the literature regarding the use of revenues by the government, and how it is an important factor for establishing political feasibility.

### 7.3.2 State Entities (Agencies)

For this section, the Ministry of Environment and Energy, and Waste Management Corporation (WAMCO) are included. The Ministry of Environment and Energy is chosen because it is the major state agency responsible for the creation of rules and regulations in the country with regards to waste management, and it is in charge of implementing national waste management projects. The Waste Management Corporation (WAMCO) is included because they are the entity entrusted with the waste management activities of the entire country. Thereby, the assessment of their power and interest in relation of the implementation of a deposit refund system is crucial for this analysis.

**Ministry of Environment and Energy:** According to Mr. Ali Amir the Deputy Minister of the Ministry of Environment and Energy, there is a high political will for waste management policies in the Maldives. He stated that as of 2016, the largest ever contribution to waste management from the state budget has been secured. However, Amir stated that the Ministry lacks power in implementing EPR policies, unless there is clear- cut allocation of legal responsibilities starting from the consumer level, to the state, in the form of an Act. Thus, he states that the legal framework has to come first. Furthermore, according to Amir, since EPR schemes such as the deposit refund system is a new concept, apart from legal provisions, there also need to be heightened awareness creation, and furthermore convincing the producers will be challenging.

Regarding the interest of the Ministry to implement a deposit refund system, Amir stated that a self-financing system as in the Pacific may not be economically feasible in the Maldives, and that state subsidies are needed for WAMCO to operate, implying that there is not a

major interest to shift to a deposit refund system where producers take the full economic responsibility of waste management. Furthermore, he stated that it is safer to keep subsidising WAMCO, so that it operates the waste management from within, such as composting, or incinerating waste in Regional Waste Management Centres rather than depending on international markets to export recyclables, as there is such a low volume of recyclable waste generated in the Maldives. In case that a deposit refund system is legislated, he expressed interest, and mentioned interest in waste-to-energy scenarios, to circumvent the challenge of exporting recyclables due to the SIDS context.

**Customs Service:** According to the Vice Chancellor of the Customs Authority, Mr. Ismail Abdulla, and Ms. Fathimath Mohamed the Chief Superintendent, Customs is highly interested in a policy such as the deposit refund system if it promises to address the issues of litter and waste in the Maldives. Furthermore, Customs will willingly collaborate, and is highly interested in any mechanism that will help to address the issue of litter in the Maldives, and they claim that adding any additional feature in import screening, and adding an additional deposit, or increasing the duty fee and having a percentage of it go to a Special Fund is not an issue, and they already have existing infrastructure, and technical systems. However, they are dependant on the policies of other ministries and government institutions, and taking a decision to increase duty fees for PET bottles might also require consultation from other state ministries. Thereby, they are lacking in power to propose implement a deposit refund system policy, but they have sufficient power to enact the implementation process, and a high level of interest.

**Waste Management Corporation (WAMCO):** With regards to the stakeholder power in implementing the system, WAMCO can propose the policy to the Parliament via a member, and they have a great deal of power, as the mandate of waste management activities fall under them. In terms of interest, WAMCO is already exploring options on how to reduce the state burden as much as possible, and is thinking of attempting to operate on a business scale, by using collection fees from households (Shamveela, 2016). However, according to Shamveela, it will be challenging to implement the deposit refund system, because issuing refunds can be time consuming, and will incur additional costs, on top of the normal operational costs for collecting the waste. However, she noted that the government is reclaiming land in Male', to create an "industrial village" and WAMCO will be allocated a plot of land for waste management activities, which can be used as a potential redemption centre, to receive bottles in certain amounts. Furthermore she notes that unless there is legislation for the provision of a system requiring segregation of waste, and issuing of refunds, 60% of people will choose to have PET collected by WAMCO, as part of the routine collection services, rather than drop off the bottles at the collection point. According to Shamveela, these figures are estimated from willingness surveys that WAMCO conducted, where only 20-30% are usually engaged in dropping off their own waste to transfer points in Male. Thus, while WAMCO is interested in a deposit refund policy, they are concerned with issues of economic viability, and believe that legal provisions must be secured before the system takes off.

### 7.3.3 Producers: Addressees or Targets of the Policy

For the producers, only Coca Cola and MWSC is included, since interviews could not be had with the Happy Market Pvt.Ltd. Company, which produces "Life" brand water bottles.

**Coca Cola:** According to Mr. Srikanth Gundemoni, the General Sales Manager of Coca Cola deposit refund system is enough to incentivize the consumers to return the bottles, as he believes that the average Maldivian will not be incentivised to return an empty bottle for a

refund of less than one dollar. Moreover, he believes that consumers should adopt anti-littering behaviour not because of monetary incentives, but because of awareness, and dedication to the environment. From the information he provided, it seems that Coca Cola is more interested to do private CSR activities, rather than be part of an overall system, especially when it entails paying extra deposits, or duty fees upon import, similar to the Pacific system. The interviews revealed that there is a general aversion to the concept of a deposit, which goes to a "Special Fund". Moreover, Mr. Gundemoni expressed the need for a Special Fund to be accountable, and transparent, and mentioned the "Green Tax" as an example of a tax, which has been imposed, but viewed as unaccountable by the general public. However, he said that if government legislates such an environmental policy, they would cooperate. Moreover, when asked if he would rather prefer being part of a Producer Responsibility Organisation (PRO), as in the Swedish context, with other PET producers and importers, to take the equal responsibility of collection, and recycling, he said that this also depends on whether it is a requirement by law, and that if costs are equally covered among all the producers. Despite this low interest, Coca Cola has significant power in the implementation of a deposit refund system, as they are one of the largest beverage producing companies.

**Male' Water and Sewerage Company (MWSC):** According to Mr. Ali Shaheem, the Head Manufacturing Engineer, MWSC has already done technical feasibility studies on the recyclability of PET produced in the Maldives, so believes that such a policy can be implemented, without having to export materials abroad. However, he is not convinced about the deposits, or duty fees that need to be paid at import. This is because according to him, there are no profit margins made when selling bottles, as water bottles are seen as a necessary good in the Maldives, and therefore he is concerned about the additional costs imposed upon the producer. However, he believes that there is also a possibility for MWSC to provide WAMCO space for shredding/baling, if such a policy is put in place, so that the producer can also contribute to other responsibilities.

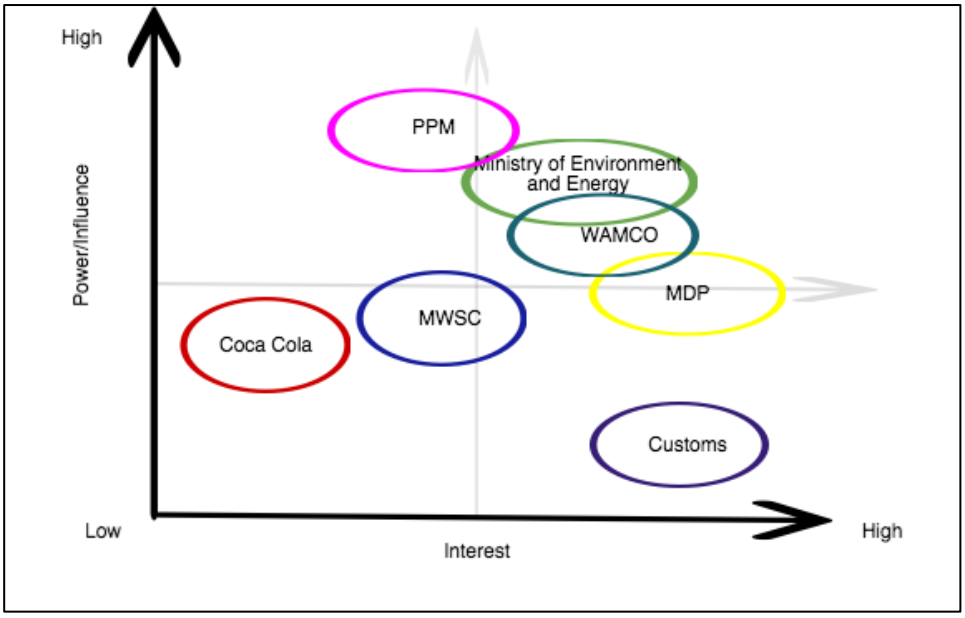


*Figure 13 Assessment of Stakeholder Power and Interest (Source: Own)*

To summarise, there is a moderate level of interest by the key policy makers, but limited interest from producers.

## 7.4 Assessment of Economic Viability

This section assesses the economic viability of introducing the deposit refund system in Male' city, by WAMCO. This step is conducted in this research, due to the concerns of the Ministry of Environment and Energy, as well as WAMCO about the economic viability of implementing a deposit refund system**.** This means that WAMCO will not collect PET bottles on their routine door-to-door collection system, but will rather receive the bottles in the redemption centre run by WAMCO, when consumers return the empty bottles to get a refund. This section aims to increase the political feasibility of introducing the deposit refund system in the Maldives. The expenses are based on information provided by Secure Bag, and Parley, as they are already involved with the collection, and transportation of recyclables for export. The calculation of income is based on a similar calculation conducted by Alice Leney, for the feasibility study of implementing the deposit refund system in Kosrae, in the Pacific. This section hopes to further strengthen the political feasibility of introducing the deposit refund system, for Maldivian policy makers who read this thesis.

**Table 9** illustrates the potential costs incurred, by WAMCO to operate a deposit refund system, similar to that of Kiribati, and Palau, for one month, using two Redemption centres, and provides the total potential annual cost that can be incurred. It is assumed that two redemption centres will suffice, at least initially to kick-start the implementation in Male', as it is only a city of two kilometres.

| Costs | Activities | Amount | Price (USD) |
|---|---|---|---|
| Wages | Collection point supervisor | 2 | 550 |
| | Collection point cashier and data entry | 6 | 400 |
| | Shredding/Baling | 6 | 350 |
| **Total Wages** | | **5600** | |
| Machinery | Counting machines | 2 | 32500 |
| | Balers | 4 | 27000 |
| **Total machinery** | | **173000** | |
| Operational Overheads | Machine maintenance | 4 | 500 |
| | Computers | 6 | 700 |
| | Land rent for 2000 sq. feet | 2 | 3200 |
| | Site maintenance | 2 | 500 |
| | Books/ledge books | 2 | 50 |
| | Electricity and water | 2 | 300 |
| | Phone | 2 | 200 |
| **Total Operational** | | **14700** | |
| Transport costs | Redemption centre to Jetty | | 10 |
| | Vessel charges Male' to Thilafushi | | 150 |
| | Key wall charges at Thilafushi | | 40 |
| | Storage at Thilafushi | | 468 |
| | Vessel charges Thilafushi to Male' | | 150 |
| | Key wall charges at Male' | | 40 |
| **Total transport costs** | | **858** | |
| Export costs | Export charges per container | 4 | 4,000 |
| | Maldives Ports Limited charges | 4 | 173 |
| **Total Export Costs** | | **16,692** | |
| **Total Costs/month** | | **210,850** | |
| **Total annual costs** | | **2,530,200** | |

*Table 9 Potential Costs incurred by WAMCO*

With regards to the costs, the costs can decrease if storage space is available in Male', and if the baled PET can be exported directly from Male', without having to store first in Thilafushi. Furthermore, the shipping costs have been adjusted, because depending on where it is exported, it can range from US$ 1100 (to ship to India) or US$ 4300 (to ship to Taiwan). Costs are also likely to decrease, as WAMCO is state-owned and may not have to pay for land charges at Thilafushi. Furthermore, as Ms. Shamveela from WAMCO mentioned, WAMCO will be allocated land in the to-be reclaimed Industrial Village in Male', which can potentially have the ability to store baled PET in Male, decreasing the costs considerably.

With regards to the potential income that can be generated by WAMCO for implementing a deposit refund system in Male', **Table 10** below provides the monetary figures for the hypothetical scenario. However, this will only occur if **ALL** producer, importers, and distributors of PET are required to pay the deposit by legislation, without duty exemption for producers, regardless of whether a company is state owned or not. The amount of bottles is estimated using the import data from Customs Authority i.e. on average 15 million PET bottles have been imported into the country between January till May 2016. However, as discussed earlier in Chapter 5, one million kilos of PET resin is potentially able to produce 30 million PET bottles. Thereby, the total amount of bottles put on the market is highly likely to be more than 15 million. For this calculation, it is assumed that that 1.5 million kilos of PET produce roughly 45 million PET bottles, and only this figure is used, excluding the imports of empty PET water bottles, and soft drinks and water bottled in PET. Therefore, net revenues is likely to increase, if other PET imports are included. However, the monetary value for PET on the international market can differ, where it is currently US$ 0.13 per kilo. Hence, income can decrease or decrease depending on the number of exports per month, and value of PET on the market. The market price of PET is US$ 0.13 per kilo based on the information provided by the PET recyclers.

| Income | Activities | Amount | Price (USD) |
|---|---|---|---|
| Deposit from importers of preform, PET resin, and PET bottles | Customs handling | 45 000 000 bottles per year | 0.06*45 |
| Total income from deposits | | | 2700000 |
| Export of PET bottles | Export 4 times month | 30 tons | 3900*4 |
| Total income from export of PET bottles per year | | | 187,200 |
| **Total annual income** | | | **2,887,200** |

*Table 10 Potential Income generated for WAMCO*

Thus, there is a net benefit of **US$ 357,000.** While the net benefit is not an impressive value, it can still be used to contribute to enhance the waste management system and collection services of the country, or to grant small projects in island communities for waste management.

# 8 Discussion

This chapter critically discusses the findings and analysis from Chapters **4,5,6, and 7, and** the implications of those findings and analysis. Furthermore, this chapter critically analyses the research methodology, analytical theory and how they can affect the results of this research.

## 8.1 Discussion on Findings and Analysis

The research reveals that the material and financial flows in Kiribati and Palau are designed so that the government and state authorities have the most responsibility in the implementation mechanism. The government acts as the system operator, as well as the enforcing and monitoring authority. The role of producers is low in Kiribati, and Palau, compared to the Swedish system presented in the literature review in **2.2.12.2.1.** This might be because they are SIDS with weak resource bases, as identified in **Section 1.1,** with few large producers, and many small sized importers or retailers who do not have the economic capacity to take the major responsibilities in the system. While there lacks consistent, and quantifiable data series for the case of study, information obtained via phone and email interviews, as well as consultation from reports show that the deposit refund system is environmentally effective in terms of the achievement of the desired immediate outcome i.e. high collection of PET bottles, and the consequent reduction of litter. Furthermore, the analysis of the Palau system also reveals that there is a high collection of PET. According to stakeholders, the system guarantees, via its effective incentives for consumers to return the PET bottles, an efficient collection system, which consequently reduces litter. This confirms the literature about deposit refund system, that it is effective in achieving high collection and reduces litter. These outcomes can potentially lead to the achievement of the final outcome, which is to secure PET leakages to the coasts and marine ecosystems.

Based on these findings, it can be deduced that a deposit refund system implemented in the Maldives can also achieve high collection rates, and thereby minimize PET litter, as the Maldives has a similar environmental problem, and a similar SIDS context. However, from a holistic perspective, there are other challenges to consider, as the Kiribati case study reveal that there are post-collection challenges of exporting the containers, finding private buyers for the materials, as well as the issue of economic viability in running the system. This is because of the unique endogenous and exogenous factors affecting SIDS, such as lack of recycling infrastructure, small economies of scale, and price of oil in the international market. SIDS in general have to export recyclable items due to lack of critical recycling infrastructure. While there may be no challenges in export of other products such as scrap aluminium, which fetch higher prices, the price of PET on the international market can vary, because it is tied to the price of price of oil. At the moment, the price of oil is low, and affects the operations in Kiribati quite significantly. However, Palau does not face issues of economic viability as much, as they have has a higher deposit rate, which is used to self-finance the system. Furthermore, they have a secure tourism industry, which generates more revenues to the country to fund capital expenditure and other machinery. This provides hope for the Maldives, as the two countries share a similar economic base. Palau's government further secures that the collected PET is sold to a local company, within the country. On the other hand, Kiribati has to find a buyer on the international market.

In terms of the implications of these findings to the potential introduction of the deposit refund system in the Maldives, it is unlikely that the Maldives will face issues in securing private buyers. This is because the Maldives lies on strategic trade routes, and is in close proximity to the Indian subcontinent, which is a large market for recyclable materials.

Furthermore, contrary to the perception by stakeholders that exporting recyclables will not be economically feasible, due to small economies of scale, the Maldives has a larger population sizes, and by implication, higher consumption of PET bottles than Kiribati and Palau. Moreover, the import data reveal that there is a potential volume of PET put on the market, which ends up as waste. Thereby, it is possible for the Maldives to introduce a system that provides incentives to consumers to return the bottles, and export them to get rid of the litter issue in the country. Moreover, using recyclable waste and incorporating them in the production of fashion products is a developing niche market, and is in high demand, as demonstrated by the Parley Ocean School, and Adidas collaboration with the Maldivian NGO, Biodiversity Environment Awareness Maldives (BEAM). In addition, the author's calculations concerning the potential costs, and income which can be generated by the Waste Management Corporation (WAMCO), if it introduces the deposit refund system in Male' City, demonstrate that it is economically viable to operate a deposit refund system based on the Pacific models.

With regards to the political feasibility of introducing the deposit refund system based on the Kiribati and Pacific model, producer interest was generally low. Producers were concerned about the idea of paying deposits for their products upon import, or increasing duties on their products for it to be accumulated in the Waste Management Corporation's budget (WAMCO), as the author proposed. Coca Cola also stressed the risk of introducing a system where importers, and consumers have to pay a fee into a "Special Fund" in the perceived absence of transparency, and accountability. Nevertheless, when producers were asked about their interest to participate in a Producer Responsibility Organisation (PRO), as in a Swedish context, together with the other producers, and importers, they stated that it depends upon legislation, and whether the costs, and responsibilities are allocated equally amongst all the producers Thus, is an interesting implication for the Maldivian policy makers to consider, as producers have a significant power in implementing the deposit refund system, and can relieve the burden on the state. Furthermore, information obtained from the Chief Engineer of the Male' Water and Sewerage Company (MWSC), reveal that the company is looking into the possibility of closing the loop, and establishing recycling infrastructure for their water bottles, so that recycling can be conducted on-site. Hence, this increases the political, and economic feasibility of implementing a deposit refund system, since the future development of such infrastructure means reduction of costs in shipping, and export. Furthermore, this demonstrates the significant power that producers have in the potential implementation of the deposit refund system.

State entities also have a significant power in introducing the deposit refund system. However, they are more interested in a waste-to energy scenario, so that there is less dependence on exporting, and on international markets. The Deputy Minister of the Environment Mr. Ali Amir, state that establishing state-of-the art incinerators in Regional Waste Management Centres, according to the 2015 policy document is part of the government plan, and they are looking into the technical feasibility of a waste-to- energy scenario, which may include PET bottles. The first Regional Center has recently opened in September 2016, as mentioned in **Chapter 5**. Hence, these future developments potentially increase the political feasibility of implementing a deposit refund system in the Maldives, as it means PET bottles collected under a potential deposit refund system will be recovered, rather than recycled, or exported abroad. Such a system will be different than the Swedish, or Pacific model with regards to the fate of the materials collected, but it can still achieve high collection rates, if potentially introduced. Moreover, Waste Management Corporation (WAMCO) stated that they are interested in pursuing for profit-business operations, and they are interested in a deposit refund system as long as it is economically viable.

Hence, while there are concerns about introducing a deposit refund system such as in the Pacific, the interests of the government, such as the waste-to-energy scenario, and the potential development of recycling infrastructure by the largest water bottling producer in the Maldives, provide hopes of the political feasibility of implementing a deposit refund system in the Maldives, based on the unique Maldivian context. Nevertheless, at the time of the research, the most important finding was that, the political feasibility of introducing the deposit refund system, and creating the motion for the implementation of the policy, depends almost entirely on the interest of the Parliament members from the ruling party PPM, which forms the majority of the parliament, and also because the other parties are exempted from proposing bills that have budgetary implications, since the Standing Orders in the Parliament were changed in 2015. Thus, there exists an uneven distribution of power**,** even in key policy circles, depending on party membership. Thus, the finding, and consequent analysis is that political feasibility could be enhanced by increasing knowledge of the policy, and piquing the interest of PPM Parliament members, and other economic, political, and industry representatives leaning towards the ruling party. In case there is a regime change from the ruling party PPM, to the opposition party MDP, increasing knowledge of policy elites are still important, as well as increasing transparency, and accountability of funds.

### 8.1.1 Generalisability of Findings and Analysis

The findings, and the implications derived regarding the implementation mechanisms of deposit refund systems in SIDS (design of material and financial flows, and the allocation of roles and responsibilities), and outcomes can differ, if another SIDS such as Barbados, in the Caribbean was used as a case study. However, it is the authors opinion that the findings from the case studies of Kiribati, and Palau, capture the overwhelming phenomena of how deposit refund systems are implemented in a SIDS context, as most of the SIDS that have implemented the deposit refund system are, in fact, in the Pacific (Fiji, Yap, Chuuk, Kosrae). Thereby, they are illustrative of the overall deposit refund system in SIDS context. Moreover, as mentioned, the rest of the deposit refund systems have been implemented based on the Kiribati model, as it is the first country to implement it in the Pacific.

### 8.1.2 Reliability of Findings and Analysis

The data regarding collection rates of PET bottles in Kiribati are likely to be in error. There lacks a consistent series of quantifiable data for collection rates, which can be verified. Thereby, this can affect the overall findings for the outcomes, and the environmental effectiveness of the system. In terms of the evaluation of political feasibility, the findings can be enhanced by the inclusion of more stakeholder groups. For instance, retailers had to be left out of the scope in analysing political feasibility. This is because there are too many retail stores of varying economic, and physical capacities, and capturing a representative sample was not possible. Nevertheless, keeping them out of the scope is highly unlikely to affect results for political feasibility, as they do not have a major role in the proposed deposit refund system for the Maldives, and moreover do not have the power to influence policies in the Maldives. However, the exclusion of consumers from the research is a weakness of this research, because consumer attitudes, and participation in the system is key to the successful achievement of outcomes in a deposit refund system. Nevertheless, it was difficult to gain a representative sample of consumers to interview for this research, and moreover, it is the author's opinion that consumers lack the power to influence the introduction of public policies, due to disenfranchisement of rights in civil society. Regardless, this is a vital area for future research, to identify consumer willingness to participate in a deposit refund system, and achieve the desired outcomes.

With regards to the estimation of economic viability, it is highly likely that the monetary values for costs and income are in error, even if they are directly taken from values provided by Secure Bag, and BEAM, and figures from the 2014 Palau Annual Report for Beverage Containers, to state the cost for counting machines. Operating a deposit refund system on a large scale is likely to incur unexpected costs for operations, maintenance, construction, and additional capital expenditure. Furthermore, after the review and marking of this paper, one important error was provided by the reviewers, which is the calculation for the refund. This can affect the findings for economic viability, and hence the conclusion for the economic viability of introducing the proposed program. This can also mean that a higher deposit value must be imposed on beverage containers, to break even and gain higher incomes to offset the high costs for maintenance and operation of the system. Regardless, the intention is to provide a template so that the government or WAMCO can conduct an economic feasibility study themselves.

## 8.2 Discussion on Methodology

The overall research methodology for this research is framed by policy evaluation of case studies. Policy evaluation is used to address **Research Question 1**, and **Research Question 3**, for expost and exante evaluations of the deposit refund systems in Kiribati, Palau, and the Maldives. Policy evaluation has been utilised in the assessment of various studies to assess how different policies have been implemented, and to study the outcomes. Hence, it is a well-accepted overarching methodology to analyse implementation mechanisms, and implementation outcomes.

### 8.2.1 Case Study Design

The use of case studies in policy evaluation is also a well renowned strategy, to analyse the diffusions of implementation mechanisms in different places, and illustrate a specific point (European Commission, 2013).In this research, the specific point which needed to be illustrated is *how* the implementation deposit refund systems are significantly different in a SIDS context, than in a context such as Sweden, and *whether* the goals of the policy are achieved. Furthermore, according to the European Commission Sourcebook for Evaluation, cases must be selected based on the criteria of 1) convenience or access, 2) the purpose to which they are to put, and 3) the extent to which they can be considered to provide wider insights beyond the particular case in question. While it was difficult to access information for the two cases, and gain in-depth information from a multitude of perspectives, due to lack of familiarity with the place, and lack of exposure, and established contacts, both cases are illustrative of how deposit refund systems are implemented in a SIDS context, and demonstrate how the policy achieves some success in achieving the desired outcomes. They also reveal wider insights for the Maldives, and other SIDS that are burdened with similar endogenous and exogenous factors, especially related to waste management. Thereby, the use of the case study design, and the selection of the two cases are appropriate for this research

### 8.2.2 Analytical Framework and Choice of Evaluation Criteria

The analytical framework used is the renowned and commonly tested intervention theory, which has been used for policy evaluation. The intervention theory is used to map the intervention, and guide the data collection and analysis, to address the research questions (**RQ 1, and RQ 3**), which pertain to policy evaluation. The choice of policy evaluation criteria, environmental effectiveness, and political feasibility is to fit the scope of the research, and answer the research questions. Environmental effectiveness is the most dominant criteria for assessing the degree to which policy goals are achieved (Vedung, 1997). Furthermore, the criteria is chosen to test the bulk of the literature regarding the

environmental effectiveness of deposit refund systems in achieving high collection rates, and reducing litter(Walls, 1996; Sigman 1995; Spiegelman,2005). Furthermore, political feasibility criteria is chosen because stakeholder interest and power determine the design, and configuration of the implementation mechanisms of an environmental policy (Managi, 2005, Bardach,1995).

Thereby, the framework, and the choice of criteria are highly relevant to fulfil the overarching aim of this research, which is to propose policy makers in the Maldives with the deposit refund policy, which requires a demonstration of how other SIDS have implemented the system, with evidence of the environmental effectiveness of deposit refund systems, as well as an assessment of stakeholder analysis, which can reveal the political feasibility to introduce the policy. Hence, the use of the intervention theory in the *exante* analysis of political feasibility helps to unravel the implicit assumptions of stakeholders, and their perspectives regarding the design of the implementation mechanism, and the achievement of the same desired outcomes.

# 9 Conclusions and Recommendations for Future Research

This chapter provides the major conclusions of the analysis, checks if the research questions are answered and explains the implication of the findings of this research to the potential introduction of the deposit refund system in the Maldives. Recommendations and further questions for future research are presented as well.

The aim of the research is to propose the introduction of the deposit refund system in the Maldives, to address the rampant issue of PET litter. However, the Maldives being a SIDS, it is difficult to assess *how* the implementation mechanism can be designed in a SIDS context, and *whether* the policy can achieve the reduction of PET litter. Moreover, it is necessary to assess the political feasibility, and economic feasibility of implementing such as system, as the Maldives has a weak economic base as a SIDS, and is currently faced with challenges to democratic consolidation, and political polarisation. A summary of answers to the research questions is presented below, to provide concluding remarks for all the research questions, and guide the reader to the conclusions generated from the research.

**RQ1** How does a deposit refund system function when implemented in other SIDS, using the case studies of Kiribati, and Palau in the Pacific?

The implementation mechanism of the deposit refund system differ significantly, than in a developed economy context, such as Sweden, as discussed in **Section 2.2.1.** In Kiribati and Palau, the government plays a crucial role in the implementation of the system, as the main system operator, and in the monitoring and enforcement of the system. Thereby, the economic, and physical responsibilities of the producer are limited, with the informative responsibility largely undertaken by the government as well. In the assessment of the immediate outcome, which is high collection of PET bottles, and consequent reduction of litter, the lack of a quantifiable data series for Kiribati made it difficult to assess the environmental effectiveness. However, anecdotal evidence from key stakeholders, and statements from international reports claims that PET bottles are hardly left as litter, as people find incentives to return them. Furthermore, in Palau, there is also a demonstrated level of high collection rates. These figures can be used to assume that there is reduction of PET litter. Despite the effectiveness in achieving the goals of the policy, Kiribati faces post-collection challenges, and issues of economic viability, as they need to depend on international value of PET on the market, since their SIDS context restrict them from recycling the products within the country, due to, due to lack of recycling infrastructure. To address this issue, Kiribati is discussing ways to introduce a system of reverse logistics, to enhance the function of the system, rather than depending on exports. This reveals significant implications for the Maldives, if it wants to introduce a Pacific deposit refund system model.

**RQ2** What is the situation in the Maldives regarding PET waste? The research reveals that the Maldives consumption, and import of PET is increasing, due to increased demand for bottled PET water, and further dependence on imported goods. There are currently three major PET producers in the Maldives, two specialised in bottled water, and Coca Cola, which provides water, and soft drinks in PET bottles. Nevertheless, in the absence of a rigid regulatory framework, which designates clear-cut roles and responsibilities, producers do not take responsibility for the post-consumer waste of their products. Furthermore, lack of waste segregation, recycling infrastructure, and critical lack of landmass renders rampant littering of PET waste, and burning of PET waste together with other wastes, often in close proximity

to vulnerable marine and coastal environments. Currently, there are few actors involved in PET recycling. This research identifies two such actors, Secure Bag Private Limited, and Biodiversity Environment Awareness Maldives (BEAM), an NGO. Furthermore, a new state entity has been in operation since 2015, where the waste management of the entire country has been entrusted to them, including the implementation of the waste management policies released in 2015, which entails the implementation of EPR principles, and the creation of a "Special Fund".

Thus, keeping in mind the recent development, the research presents a potential blueprint of a hypothetical deposit refund system scenario, based on the Pacific model, where importers' duty fees are increased so that it can accrue to the Waste Management Corporation (WAMCO's) account, created under a legal mandate, and monitored by an overall state authority. Then, in order to assess the feasibility of implementing the deposit refund system in the Maldives, the following questions were asked.

**RQ4** What is the feasibility of implementing the deposit refund system in the Maldives?

The analysis of stakeholders' power, and interest reveals that producers are in general, averse to the introduction of a deposit refund system, which is predicted in literature. Furthermore, concerns related to the transparency, and accountability of a "deposits" fund, as in Kiribati, and Palau were given as reasons for being against such a system. However, producers have significant power in implementing a deposit refund system, especially if Male' Water and Sewerage Company (MWSC) establishes recycling facilities in the near future, which they indicated is a possibility. Nevertheless, the political feasibility of introducing the deposit refund system as a policy intervention depends largely on the interest, and power of Parliamentarians in the ruling party. In the Maldives, only Parliamentarians from ruling parties can propose, or introduce new legislation with taxation, or budgetary implications. Thus, they have considerable power to implement a deposit refund system. This is also due to the uneven distribution of power, based on party membership. Furthermore, concerns regarding the economic viability of the proposed system was assessed, to calculate the potential costs, and income that can be incurred by WAMCO, for operating a similar deposit refund system as in Kiribati, and Palau, for one year, in the capital city of Male'. This reveals that a net income can be generated, based on the volume of PET imports, and potential deposits, which can be levied, despite costs for shipping, and export.

Thus, in conclusion, deposit refund systems similar to that of Kiribati, and Palau can potentially achieve the reduction of litter in the Maldives. Furthermore, it can be potentially economically viable if implemented in the capital city Male', using exante calculation of expenses, and incomes. However, the potential introduction of the policy depends on power of key policy elites, and power of Parliamentarians, as there is an uneven distribution of power, and disenfranchisement of interest groups.

## 9.1 Contributions and Recommendations for Future Research

This research hopes to contribute diversify the existing literature about deposit refund literature. The research also contributes to the literature of environmental policy mechanisms in SIDS. Nevertheless, there were various research gaps. The author recommends these areas for future research.

- **Multi-criteria evaluation of implementing the deposit refund system in the Maldives:** During this research, several issues related to the technical, or institutional feasibility of implementing the deposit refund system in the Maldives, was raised.

Furthermore, the issue of economic viability was raised several times by both producers and government entities. Thereby, a study on the cost efficiency, or cost effectiveness of implementing the research can be done. In general, the author recommends a comprehensive *exante* analysis by evaluating the different dimensions of a policy intervention, such as institutional feasibility, cost efficiency, cost effectiveness, administrative burden, or even equity, to enhance the potential introduction of the deposit refund system in the Maldives, and potentially contribute more to the literature of deposit refund systems.

- **Consumer willingness to participate in a potential deposit refund system in the Maldives-** as mentioned consumer interests were excluded from the scope of this research. However, since consumer participation largely determines the degree of effectiveness in a deposit refund system, a study on consumer perspectives, and willingness can be conducted.

- **Multi-criteria evaluation of deposit refund systems in SIDS** can strengthen the assessment of different outcomes, and the impact of the policy in a SIDS context. This is interesting because despite their small size, SIDS comprise one-sixth of the earth's total area, contributing to diverse, and important marine ecosystems, which sustain the earth's ecological balance. Thereby, the identification, and consequent improvement, or replication of these systems in more SIDS is crucial, because reduction of coastal, and marine litter can indirectly contribute to the natural resilience of SIDS, and moreover reduce the global issue of marine pollution, which, as identified in the introduction of this research. Furthermore, this will also diversify the existing academic literature about deposit refund systems.

# Bibliography


6, P., & Bellamy, C. (2012). *Principles of methodology: research design in social science*. Los Angeles: SAGE.

Allsopp, M., Walters, A., Santillo, D., & Johnston, P. (2006). Plastic debris in the world's oceans.

Andersen, M. S., & Sprenger, R.-U. (Eds.). (2000). *Market- based instruments for environmental management: politics and institutions*. Cheltenham, UK ; Northampton, MA, USA: E. Elgar.

Atasu, A., & Wassenhove, L. V. (2011). *An Operations Perspective on Product Take-Back Legislation for E-Waste: Theory, Practice and Research Needs*. Georgia Institute of Technology, INSEAD. Retrieved from http://www.prism.gatech.edu/~aatasu3/index_files/AV11.pdf

Backman, M. (1984). Recycling of Aluminum Cans- from Voluntary System to Public Intervention. In *Problems in Packaging- the Environmental Issue*. E. Horwood ; Halsted Press.

Barde, J.-P. (1995). Environmental policy and policy instruments. In *Principles of environmental and resource economics* (H. Folmer, H. L.Gabel, H. Opschoor (eds.).). Aldershot: Elgar.

Baxter, P., & Jack, S. (2008). Qualitative case study methodology: Study design and implementation for novice researchers. *The Qualitative Report*, *13*(4), 544–559.

Bemelmans-Videc, M.-L. (1998). Introduction: Policy Instrument Choice and Evaluation. (eds.), (1-18). New Brunswick: Transaction Publishers. In *Carrots, Sticks & Sermons Policy Instruments & Their Evaluation* (M.-L. Bemelmans-Videc, R.C. Rist & E. Vedung, pp. 1–18). New Brunswick: Transaction Publishers.

Bemelmans-Videc, M.-L., Rist, R. ., & Vedung, E. (2003). *Carrots, Sticks, and Sermons: Policy Instruments and Their Evaluation*. Transaction Publishers.

Bickman, L. (1987). The functions of program theory. *New Directions for Program Evaluation*, *1987*(33), 5–18. http://doi.org/10.1002/ev.1443

Bottle Bill Resource Guide. (2016). Beverage Container Deposit Laws Worldwide. Retrieved 2 September 2016, from http://www.bottlebill.org/legislation/world.htm

CDE Consulting. (2015). *Maldives Vistor Survey February 2015*.

Chen, H.-T. (1990). *Theory-Driven Evaluations*. Newbury Park: SAGE Publications.

CIA. (2016a). Maldives.

CIA. (2016b). Palau. Retrieved 8 September 2016, from https://www.cia.gov/library/publications/the-world-factbook/geos/ps.html

Commonwealth Local Government Forum. (2015). Local Government System in the Maldives. In *Commonwealth Local Government Handbook 2015/16*. UK, London.

Container Recycling Institute. (2016). Cutting Beverage Container Waste, A to Z: Deposit/Return Systems. Retrieved 23 August 2016, from http://www.container-recycling.org/index.php/zero-beverage-container-waste/62-issues/zero-waste/338-depositreturn-systems-

Dinan, T. (1993). Economic Efficiency Effects of Alternative Policies for Reducing Waste Disposal. *Journal of Environmental Economics and Management*, *25*, 242–256.

Dunn, W. N. (1981). *Public Policy Analysis: An Introduction*. Englewood Cliffs, N.J: Prentice-Hall.

Dunn, W. N. (1994). *Public policy analysis: an introduction* (2nd ed). Upper Saddle River, NJ: Prentice Hall.

Eisenhardt, K. M. (1989). Building Theories from Case Study Research. *Academy Of Management Review, 14*((4)), 532–550. http://doi.org/10.5465/AMR.1989.4308385

Environment Research Centre. (2008). *National Solid Waste Managment Policy for the Republic of Maldives*. Ministry of Environment, Energy, and Water.

European Commission. (2013). *Evaluation Sourcebook: Methods and Techniques*.

European Environment Agency (Ed.). (2006). *Using the market for cost-effective environment policy: market-based instruments in Europe*. Luxembourg: Office for Official Publications of the European Communities.

Fischer, F. (1995). *Evaluating public policy. Chicago: Nelson-Hall.* Chicago: Nelson-Hall.

Fitzsimons, D., Lee, P., Slater, S., & Beukering, P. van. (2010). *Deposit Refund Systems for Packaging: Applying International Experience to the UK.* Retrieved from http://www.oakdenehollins.co.uk/media/998/Deposit_Returns_2005.pdf

Fullerton, D., & Kinnaman, T. C. (1995). Garbage, Recycling, and Illict Burning or Dumping. *Journal of Environmental Economics and Management*, *29*(1995), 78–91.

Gandy, S., Fry, J., & Downes, J. (2008). Review of Packaging Deposits System for the UK.

Gourmelon, G. (2015, January 28). Global Plastic Production Rises, Recycling Lags | Worldwatch Institute. Retrieved 17 August 2016, from http://www.worldwatch.org/global-plastic-production-rises-recycling-lags-0

GreenTech Consultant Pvt.Ltd, Riyan Pvt.Ltd, & CDE Pvt. Ltd. (2010). *Consultancy on Social Assessment for the Solid Waste Management Component* (International Development Association (IDA) funded Maldives Environmental Management Project (MEMP)).

Grindle, M. S., & Thomas, J. W. (1991). *Public Choices and Policy Change: The Political Economy of Reform in Development Countries*. Baltimore, MD.: John Hopkins University Press.

Hahn, R. W. (1999). The Impact of Economics on Environmental Policy. Retrieved from http://belfercenter.hks.harvard.edu/files/The%20Impact%20of%20Economics%20on%20Environmental%20Policy%20-%20E-99-01.pdf

Hansen, M. B., & Vedung, E. (2010). Theory-Based Stakeholder Evaluation. *American Journal of Evaluation*, *31*(3), 295–313. http://doi.org/10.1177/1098214010366174

Hildén, M., Lepola, J., Mickwitz, P., Mulders, A., Palosaari, M., Similä, J., … Vedung, E. (2002). *J., … Vedung, E. (2002). Evaluation of environmental policy instruments–a case study of the Finnish pulp & paper and chemical industries.* (Monographs of the Boreal Environment Research No. 21). Finnish Environment Institute.

Hogg, D., Elliott, T., Croasdell, S., Ballinger, A., Vergunst, T., Cullen, C., & Bendali, L. (2011). Options and feasibility of a European refund system for metal beverage cans. *Final Report, Eunomia, Brussels, 108pp.* Retrieved from http://www.embopar.pt/folder/documento/98_Options%20and%20Feasibility%20of%20a%20European%20Refund%20System%20for%20Metal%20Beverage%20Cans_Final%20Report.pdf

Ibrahim, M., & Karim, E. (2013, July). Research Guide on Legal System and Research of Maldives - GlobaLex. Retrieved 16 August 2016, from http://www.nyulawglobal.org/globalex/Maldives.html

International Business Publications. (2012). *Maldives Country Study Guide Strategic Information and Developments*. International Business Publications USA.

Jeftic, L., Sheavly, S. B., Adler, E., & Meith, N. (2009). *Marine litter: a global challenge*. Nairobi, Kenya: Regional Seas, United Nations Environment Programme.

JICA. (2016). *The Japanese Technical Cooperation Project for Promotion of Regional Initiative on Solid Waste Management in Pacific Island Countries (J-PRISM). Project Completion Report.* (No. 16–027). Ex Research Institute Ltd. Retrieved from http://open_jicareport.jica.go.jp/pdf/12249637_01.pdf

Jordbruksverket. (2016). Plastflaskor och metallburkar [Jordbruksverket]. Retrieved 2 September 2016, from http://www.jordbruksverket.se/amnesomraden/handelmarknad/bearbetadejordbruksvarorochdrycker/plastflaskorochmetallburkar.4.2ae27f0513e7888ce228000286.html

Kiribati Solid Waste Management Project. (2004). *Kaoki Mange! Project Annual Report 2004*.

Kiribati Solid Waste Management Project. (2005). *Kaoki Mange! Project Annual Report.*

Krefting, L. (1991). Rigor in qualitative research: The assessment of trustworthiness. *American Journal of Occupational Therapy*, *45*, 212–222.

Kunz, N., Atasu, A., Mayers, K., & Van Wassenhove, L. (2014). Extended Producer Responsibility: Stakeholder Concerns and Future Developments. *White Paper, INSEAD Social Innovation Centre, Fontainebleau*. Retrieved from http://www.weee-forum.org/system/files/documents/2013_extended_producer_responsibility_stakeholder_concerns_and_future_developments_insead.pdf

Laboski. (2016). Laboski | PET Plastic Recycling. Retrieved from http://laboski.com/

Larrue, C. (1995). The Political (Un)feasibility of Environmental Economic Instruments. In B. Dente (Ed.), *Environmental Policy in Search of New Instruments* (pp. 37–54). Dordrecht: Springer Netherlands. Retrieved from http://dx.doi.org/10.1007/978-94-015-8504-0_3

Leney, A. (2006). *Kaoki Mange Project Final Report.*

Lindhqvist, T. (1992). Extended Producer Responsibility. In *Lindhqvist, T., Extended Producer Responsibility as a Strategy to Promote Cleaner Products* (pp. 1–5). Lund: Department of Industrial Environmental Economics, Lund University.

Lindhqvist, T. (2000). Extended Producer Responsibility in Cleaner Production: Policy Principle to Promote Environmental Improvements of Product Systems. IIIEE, Lund University.

Lindhqvist, T., & Van Rossem, C. (2005). Evaluation Tool for EPR Programs. *Lund: IIIEE, Lund University*. Retrieved from http://www.productstewardship.us/associations/6596/files/Lindhqvist2005_Eval_Tool_EPRCanada.pdf

Maldives Customs Service. (2016). Vision/Mission. Retrieved 8 September 2016, from http://www.customs.gov.mv/organization/vision_mission

Maldives in Fourth Regional 3R Forum in Asia. (2013). Country Analysis Paper (Draft) Maldives. In *3R's in the Context of Rio+20 Outcomes- The Future We Want*. Ha Noi, Vietnam.

McKinsey Center for Business and Environment, & Ocean Conservancy. (2015). *Stemming the Tide: Land-based strategies for a plastic free ocean.*

MELAD. (2015). *Kaoki Maange Presentation.*

Mickwitz, P. (2003). A framework for evaluating environmental policy instruments context and key concepts. *Evaluation*, *9*(4), 415–436.

Mickwitz, P. (2006). *Environmental policy evaluation: concepts and practice*. Helsinki: Finnish Society of Sciences and Letters.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis. 2d ed. London: Sage.* (Second ed.). London: Sage.

Miller, G. T., & Spoolman, S. E. (2012). *Living in the Environment* (Seventeenth Edition). S.l.: Brooks Cole.

Ministry of Environment and Construction. (2004). *State of the environment, Maldives 2004*.

Ministry of Environment and Energy. (2015). *Kuni Manage Kurumuge Gaumee Siyaasathu-*.

Ministry of Finance and Treasury. (2015). Statistical Pocketbook of Maldives 2015. Retrieved 4 September 2016, from http://webcache.googleusercontent.com/search?q=cache:http://planning.gov.mv/nbs/wp-content/uploads/2015/10/Statistical-Pocketbook-of-Maldives2015.pdf&gws_rd=cr&ei=jdTLV9n_EML_sQGvvbqYAg

Ministry of Home Affairs and Environment. (2004). *Identification of Existing Barriers to the Provision of Effective Solid Waste Management Services within the Maldives and Recommendations for their Removal*. Retrieved from http://www.globalislands.net/userfiles/Maldives6.pdf

Ministry of Housing and Environment. Thimaavettah Dhey Gellunthahkah Joorimanaa Kandaelhumaai Badhalu Hoadhumuge Gavaaidhu, Pub. L. No. 2011/R-9 (2011).

MPIIC. (2014). *Beverage Container Recycling Program: Annual Report FY 2011-2014*.

Mrozek, J. R. (2000). Revenue Neutral Deposit/Refund Systems. *Environmental and Resource Economics*, *17*, 183–193.

OECD. (2001). *Extended Producer Responsibility: A Guidance Manual for Governments*. OECD Publishing, Paris.

Opschoor, J. B., & Turner, R. K. (Eds.). (1994). *Economic incentives and environmental policies: principles and practice*. Dordrecht ; Boston: Kluwer Academic Publishers.

Pacific Institute. (2007, February). Bottled Water and Energy Fact Sheet. Retrieved 29 August 2016, from http://pacinst.org/publication/bottled-water-and-energy-a-fact-sheet/

Pacific Islands Forum Secretariat. (2013, July). Tourism as a Pillar of Economic Growth.

Palmer, K. L., & Walls, M. A. (1996). *Optimal policies for solid waste disposal: taxes, subsidies, and standards* (Vol. 5). Graduate School of Business & Government Management, Victoria University of Wellington.

Patton, M. Q. (1997). *Utilization-Focused Evaluation* (The New Century Text, 3rd revised ). London: SAGE Publications.

Peterson, C. (2013). Assessment of solid waste management practices and its vulnerability to climate risks in Maldives Tourism Sector. *Report Submitted to Ministry of Tourism, Arts and Culture*. Retrieved from http://www.tourism.gov.mv/downloads/tap/2014/Solid_Waste.pdf

PricewaterhouseCoopers, Albrecht, P., Brodersen, J., Horst, D. W., & Scherf, M. (2011). *Reuse and Recycling Systems for Selected Beverage Packaging from a Sustainability Perspective: An analysis of the ecological, economic and social impacts of reuse and recycling sysetms and approaches to solutions for further development*. Retrieved from http://www.duh.de/fileadmin/user_upload/download/Projektinformation/Kreislaufwirtschaft/PwC-Study_reading_version.pdf

Raynaud, J., Richens, J., Russell, A., United Nations Environment Programme, Plastic Disclosure Project, & Trucost (Firm). (2014). *Valuing plastic: the business case for measuring, managing and disclosing plastic use in the consumer goods industry*.

Reich, M. R. (1996). Applied Political Analysis for Health Policy Reform. *Current Issues in Public Health*, *2*, 186–191.

Returpack. (2016). Returpack in English. Retrieved from http://pantamera.nu/om-oss/returpack-in-english/

Richards, E., Haynes, D., & SPREP. (2014, February 25). Container Deposit Legislation (CDL) and Stewardship Programmes in Pacific Island Countries Esther Richards, David Haynes, SPREP. *Fifth*

*Regional 3R Forum in Asia and the Pacific, Surabaya, Indonesia*. Retrieved from http://www.uncrd.or.jp/content/documents/14975-3R_P6-2.pdf

Richter, J. L., & Koppejan, R. (2015). Extended producer responsibility for lamps in Nordic countries: best practices and challenges in closing material loops. *Journal of Cleaner Production*, *123*, 167–179. http://doi.org/10.1016/j.jclepro.2015.06.131

Roberts, M. J., Hsiao, W., Berman, P., & Reich, M. R. (2002). *Getting Health Reform Right*. Oxford University Press. Retrieved from http://www.jointlearningnetwork.org/uploads/files/resources/Getting_Health_Reform_Right.pdf

Schneider, J., Karigl, B., Reisinger, H., Olivia, J., SüBenbacher, E., & Read, B. (2011). A European Refunding Scheme for Drinks Containers. Retrieved from https://www.efta.int/sites/default/files/documents/advisory-bodies/parliamentary-committee/jpc-reports/report-2011-10-26.pdf

SENES Consultants Limited, & CDE Pvt. Ltd. (2011). *Technical and Financial Feasibility Report*.

Sigman, H. A. (1995). A comparison of public policies for lead recycling. *The RAND Journal of Economics*, 452–478.

Spiegelman, J. (2005). Using Economic Incentives to Control Pollution. *Business & the Environment with ISO 14000 Updates*, *16*(4), 4–5.

SPREP. (2013). J-PRISM Regional Training on Promotion of 3R in Palau | J-PRISM News. Retrieved 24 August 2016, from https://www.sprep.org/j-prism-news/j-prism-regional-training-on-promotion-of-3r-in-palau

SPREP. (n.d.). Improved Waste Management in Kiribati. A Case Study. Retrieved from https://www.sprep.org/attachments/CaseStudy/Case-Study-_improved_waste_management_in_Kiribati.pdf

Stavins, R. N. (1998). Market-based environmental policies. *Public Policies for Environmental Protection*, *2*, 31–76.

Tasaki, T., Numata, D., Matsumoto, T., & Tojo, N. (2010). *Reframing the Concept of Collection Systems with Economic Incentives- Based on the Review of Deposit Refund Systems and Point Systems* (No. No.205). Japan: National Institute for Environmental Studies.

Tojo, N. (2011). *Deposit Refund Systems in Sweden* (IIIEE Reports No. 2011:05). International Institute for Industrial Environmental Economics, Lund University.

United Nations Economic and Social Commission for Asia and the Pacific. (2004). *Integrating economic and environmental policies: the case of Pacific island countries*. New York, NY: United Nations.

United Nations Economic and Social Commission for Asia and the Pacific. (2014). *Statistical Yearbook for Asian and the Pacific* (No. ST/ESCAP/2704). United Nations Publication.

United Nations Environment Programme. (2004). *UNEP and small island developing states: 1994-2004 and future perspectives*.

Vedung, E. (1997). *Public policy and program evaluation*. New Bruswick, N.J: Transaction Publishers.

Vedung, E. (2000). *Public policy and program evaluation*. New Bruswick, N.J.: Transaction Publishers.

Walls, M. (2006). The Role of Economics in Extended Producer Responsibility: Making Policy Choices and Setting Policy Goals. . *Resources for the Future Discussion Paper*, 06–08.

Walls, M. (2011). Deposit-refund systems in practice and theory. *Resources for the Future Discussion Paper*, (11–47). Retrieved from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1980142

WAMCO. (2016). ABOUT US. Retrieved from http://wamco.com.mv/about-us/

Woodruff, A. (2014). Solid Waste Management in the Pacific: Kiribati Country Snapshot.

World Economic Forum. (2016). *The New Plastics Economy Rethinking the Future of Plastics*.

World Travel and Tourism Council. (2015). *The Economic Impact of Travel and Tourism 2015 : Maldives*. Retrieved from https://www.wttc.org/-/media/files/reports/economic%20impact%20research/countries%202015/maldives2015.pdf

Yin, R. K. (2003). *Applications of Case Study Research.* (2nd ed.). Thousand Oaks: SAGE Publications.

Zero Waste Europe. (2010). Beverage packaging and Zero Waste. Retrieved from https://www.zerowasteeurope.eu/2010/09/beverage-packaging-and-zero-waste/

# Appendix 1 List of Interviewees

| # | Name | Organisation | Title | Date | Medium |
|---|---|---|---|---|---|
| 1 | Ross Craven | New Zealand Urban Development Program | | 6th March 2016 | Email |
| 2 | Stewart Williams | Secretariat of the Pacific Regional Environment Programme (SPREP) | PAC Waste Manager | 7th March 2016 | Phone |
| 3 | Alice Leney | Pacific Reef Savers Ltd. | Director | 7th March 2016 | Email |
| 4 | Aminath Shaliny | UNDP | | 24th April 2016 | Skype |
| 5 | Amir Ali | Ministry of Environment and Energy | Deputy Minister | 13th June 2016 | Face-to-face |
| 6 | Ibrahim Shareef | Secure Bag Pvt. Ltd. | Managing Director | 13th June 2016 | Face-to-face |
| 7 | Shaahina Ali | BEAM/PARLEY | | 13th June 2016 | Face-to-face |
| 8 | Aishath Rashfa | Ministry of Environment and Energy | Assistant Director | 15th June 2016 | Face-to-face |
| 9 | Srikanth Gundemoni | Coca Cola | General Sales Manager | 16th June and 30th July 2016 | Face-to-face |
| 10 | Ismail Abdulla | Maldives Customs Service | Vice Chancellor | 16th June 2016 | Face-to-face |
| 11 | Fathimath Mohamed | Maldives Customs Service | Chief Superintendent | 16th June 2016 | Face-to-face |
| 12 | Hassan Saeed | Maldives Water and Sewerage Company (MWSC) | Manufacturing Engineer | 20th June 2016 | Face-to-face |
| 13 | Fathimath Shamveela | Waste Management Corporation (WAMCO) | Director of Operations | 20th June 2016 | Face-to-face |
| 14 | Aminath Nizar | Environment Protection Agency | Engineer | 21st June 2016 | Face-to-face |
| 15 | Aminath Mohamed | Environment Protection Agency | Environmental Analyst | 21st June 2016 | Face-to-face |
| 16 | Ahmed Nizam | Maldives Environment Management Project (MEMP) | Specialist Coordinator | 23rd June 2016 | Face-to-face |
| 17 | Majda Ibrahim | Maafushi Island Council | Vice President | 26th June 2016 | Phone |
| 18 | Ibrahim Shaheem | Maldives Water and Sewerage Company (MWSC) | Head of Manufacturing | 31st July 2016 | Face-to-face |
| 19 | Eva Abdulla | Maldivian Democratic Party (MDP) | Parliament Member, Galolhu Constituency | 3rd August 2016 | Face-to-face |
| 20 | Ibrahim Shujau | People's Progressive Party (PPM) | Parliament Member, Baarashu Constituency | 19th August | Phone |