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“A holistic approach to addressing marine plastics pollution in East Asia: A comparison of prevention, mitigation, removing and behaviour-changing measures to curb marine plastic pollution from land-based sources in China, Indonesia, The Philippines, Vietnam, Thailand and Malaysia.”

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Abbreviations

3Rs	Reduce, Reuse, Recycle
APEC	Asia-Pacific Economic Cooperation
CBD	Convention on Biological Diversity
CDL	Container Deposit Legislation
COBSEA	Coordinating Body on the Seas of East Asia
DENR	Department of Environment and Natural Resources (The Philippines)
EPR	Extended Producer Responsibility
ENGO	Environmental Non-Governmental Organization
GESAMP	The Group of Experts on the Scientific Aspects of Marine Pollution
GPA	Global Programme of Action for the Protection of the Marine Environment from Land-based Activities
GPML	Global Partnership on Marine Litter
IOC	Intergovernmental Oceanographic Commission
IUCN	International Union or Conservation of Nature
LGUs	Local Government Units (The Philippines)
MEF	Ministry of Environment and Forestry (Indonesia)
Microplastics	Plastics particles smaller than 5mm found in the marine environment
Macroplastics	Plastics particles larger than 5mm found in the marine environment
NPC	National People's Congress (China)
Nanoplastics	Plastic particles smaller than 100nm found in the marine environment
NGO	Non-Governmental Organization
NOWPAP	Northwest Pacific Action Plan
MARPOL	The International Convention for the Prevention of Pollution from Ships
MMT	Million Metric Tones
MSW	Municipal Solid Waste
OECD	Organisation for Economic Cooperation and Development
PBB	Plastic Bag Bill
SCOR	Scientific Committee of Oceanic Research
RSCAPs	Regional Seas Conventions and Action Plans
SDG	Sustainable Development Goals
SOA	State Oceanic Administration (China)
UNCLOS	United Nations Convention on the Law of the Seas
UNEA	United Nations Environment Assembly
UNEP	United Nations Environmental Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNGA	United Nations General Assembly
WtE	Waste-to-Energy

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1 Introduction

Covering approximately 71% of earth's surface and containing 97% of earth's water, oceans are important for all life on earth (Oceanic Institute, n.d.). Playing an important role in human history and development, oceans have provided humans with the tools to both sustain our food needs, and to perform economic exchanges for millennia (Costanza, 1999). The sheer vastness of the ocean also meant that humans have believed that it was big enough to cope with human inputs without ever showing evidence of negative impacts (Andrady, 2003; Clark, 2001). The ocean simply seemed too large and too resilient to take any harm from human inputs. This belief, however, has radically changed over the past couple of decades. Surveillance and monitoring of oceans the past fifty years have shown an increasingly worrying trend: The oceans are not as resilient to our inputs as human first believed (Biello, 2008; Laist, 1997). Studies from recent decades show that manmade marine pollution has left negative impacts on marine ecology, ocean resources, the marine wildlife, and ultimately human health (Clark, 2001; Bergmann et. al., 2015; Gall and Thompson, 2015; Laist, 1997; UNEP, 2016). Fish and other marine animals are important staple foods in most countries with a coastline, and marine pollution is rapidly reducing, and directly affecting, the stocks of such resources (Laist, 1997; Laist, 1987; Andrady, 2003; UNEP, 2016). This is largely because human economic activities on oceans and land have evolved drastically the past century, which in turn shifts the way, the pace and the magnitude of how the marine environment has been affected (Clark, 2001).

The most rampant manmade material found in the oceans is plastics. Plastics account for almost 80% of all the solid waste leaking into the ocean from land-based sources every year (UNEP, 2016; Jambeck et. al., 2015; Andrady, 2003). The main problem with plastic is that it does not naturally biodegrade in the marine environment, but it dissolves into smaller and smaller pieces (microplastics) that, once small enough, find their way into the food chain through ingestion (Andrady, 2003; Bergmann et. al., 2015; Thompson, 2004). Particularly single-use plastics such as plastic bags, straws, bottles and packaging foil have proven to pollute the marine environment on an unprecedented scale (Wallum, 2017; Naturvernforbundet, 2018). News stories such as the revelation of the "Great Pacific Garbage Patch" – a floating island of trash the size of Texas in the Pacific Ocean have been an eye opener for the negative effects of single-use plastics to the public and has consequently put pressure on governments to deal with the issue (Loehr et. al., 2017). It is estimated that at the current rate of input of plastics into the oceans, there will be more plastics particles than fish in the ocean by 2050 (Loehr et. al., 2017; Cressey, 2016; Thompson, 2004; Browne et. al., 2011; Wallum, 2018).

The full spectre of consequences that marine plastics have on biodiversity, marine ecology, as well as humans are unclear, but it's widely agreed upon that the issue needs to be dealt with urgently (UNEP, 2016; European Commission, 2018). As an important step for international cooperation, Norway tabled a resolution on plastics in oceans in the United Nations Environment Programme in Nairobi, December 2017. Close to 200 member states signed and approved the resolution, which might be the beginning of increased international efforts in combatting the issue of plastics in oceans (UNEP, 2017a). Marine plastics pollution is a

global issue, but needs to be dealt with domestically in each country through policy and practical measures (UNEP, 2016; Bergmann et. al., 2015; Chen, 2015).

Recent estimates on the global sources of marine plastics pollution suggest that it is only a few of the world's countries that account for most of the plastics leaked from land into the marine environment (Jambeck et. al., 2015; Tibbetts, 2015; Lebreton et. al., 2017). Out of the 10 largest sources of marine plastics pollution from land-based sources, six are found in East Asia, namely: The Peoples Republic of China (hereafter China), The Republic of Indonesia (hereafter Indonesia), Republic of the Philippines (hereafter The Philippines), The Socialist Republic of Vietnam (hereafter Vietnam), Kingdom of Thailand (hereafter Thailand), and Malaysia.

The author seeks to analyse the domestic government efforts established in these six East Asian countries in their combat against marine plastics pollution from land-based sources. This thesis aims at identifying, discussing and comparing what kind of policies and tools the six countries have chosen to respond to this increasingly important issue through analysing their respective domestic measures. The author seeks to compare the six countries' domestic measures through looking at their efforts through a holistic lens, where an integrated government approach on curbing the outflow of the most pressing sources of marine plastics pollution from land-based sources will be studied.

To provide the reader with a better understanding of the broader topic of marine pollution, part two of this paper will define marine pollution, introduce its sources, and explain how marine plastics pollution is connected to the broader topic of marine pollution.

Part two will introduce the research questions of this paper.

Part four will discuss the relevance of the topic of this paper. This part will discuss why the paper has chosen to study domestic efforts to combat marine plastics pollution, and provide evidence for why the six Asian countries are chosen as case studies.

Part five will discuss the state of the art of this topic and look at how the topic has changed in academia since it first was explored in the early 1960s. The findings from the state of the art will also lay the foundation for the analytical framework the author has chosen to employ in the sixth part.

Part six will present the analytical framework, which outlines an eclectic analytical framework chosen to analyse government efforts in the six Asian countries. The author will present each criterion, argue why the criterion is important, and provide the sub-criteria chosen to make an analytical analysis.

Part seven will apply the analytical framework to the six case studies of China, Indonesia, the Philippines, Vietnam, Thailand, and Malaysia.

The last part will discuss and compare the findings of the six case studies, provide a discussion on the possible reasons behind the findings, as well as answer the research questions of this paper.

2 Defining Marine Pollution

2.1 What is marine pollution?

The issue of pollution in the marine environment first came into the spotlight of researchers and governments in the late 1950s, when they recognised that the leakage of man-made pollutants into the ocean could pose a threat to marine wildlife and biodiversity (Clark, 2001; Everett et al., 2010; Evans, 2012). In the decades that followed this revelation, the global community tried to act on specific issues connected to this broader issue of marine pollution through the establishment of several international conventions and policymaking bodies, each set up to tackle specific issues separately (Chen, 2015; Tomczak, 1984). In the process of agreeing upon specific measures and tools to tackle the environmental issues in question, these international efforts also tried to come up with a definition of marine pollution. The first commonly agreed upon definition of marine pollution came in 1958 through the *Geneva Convention on the Continental Shelf*, which in Article 5 defines marine pollution as: “Unjustifiable interference with navigation, fishing or the conservation of the living resources of the sea, as a possible result of exploration and exploitation of natural resources which must be avoided” (Tomczak, 1984, p. 314). Thus, early conversations on marine pollution were based around a term that defined the issue as a bi-product of human activities on the sea – thereby neglecting land-based sources to the issue, which we now know account for the biggest share of human inputs into the marine environment (Haward, 2018; Routley, 2018, Chen, 2015; Lebreton et. al., 2017; Tibbetts, 2015). The reason why the earliest definitions of marine pollution defined the term as human direct inputs into the sea only, was most likely because the international community strived to target and combat very specific inputs into the marine environment, such as for example the disposal of oils and other waste fluids from ships at harbour (Tomczak, 1984). Moreover, a few early international efforts to combat what we now define as marine pollution also omitted defining the term marine pollution altogether. For example, both the 1972 *Oslo Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft* and the 1972 *London Convention of the Prevention of Marine Pollution by Dumping of Wastes and Other Matters* failed to define the term marine pollution, although recognizing that man-made inputs into the sea are harmful to the marine environment (Tomczak, 1984).

Although not formally introduced before 1982, the most elaborate and encompassing definition of marine pollution to this date was drafted in 1966 by an ad-hoc working group called the *Scientific Committee of Oceanic Research (SCOR)* at the request of the *Intergovernmental Oceanographic Commission (IOC)* of UNESCO (Tomczak, 1984). The *Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP)* formally introduced and highlighted this definition as a component of the basic framework of the 1982 UN Convention on the Law of the Sea (UNCLOS) (Tomczak, 1984). GESAMP defined marine pollution as:

“...The introduction by man, directly or indirectly of substances or energy to the marine environment resulting in deleterious effects such as: hazard to human health; hindrance of marine activities, including fishing; impairment of the quality for the use of seawater, and reduction of amenities” in Article 1.4 (Clark, 2001, p.9).

GESAMP’s definition is not only in line with the general definition of pollution, which reads: “The presence in or introduction into the environment of a substance which has harmful or poisonous effects” (The Oxford dictionaries, n.d), but also opens the definition to encompass

all man-made substances released into the marine environment. This means that both land-based and sea-based sources are included, broadening the definition to encompass practically any material that could pose a threat to the marine environment once released into the ocean. The 1982 GESAMP definition has been recognised as the leading definition of marine pollution, and is currently widely used by scientists, international organizations, governments, and civil society when discussing issues connected to human impact on the marine environment (Tomczak, 1984; Chen, 2015; Bergmann et. al., 2015). The importance of GESAMP's encompassing definition of marine pollution is that it highlights the human factor in the issue and omits natural inputs that also could harm the marine environment, thereby clarifying that efforts to hinder marine pollution should focus on curbing the outflow of man-made inputs (Clark, 2001). In other words, any items or substances reaching the ocean anywhere along the lifecycle of production and consumption of man-made goods, foods, and services, are to be considered marine pollution if it harms the natural marine environment (Bergmann et al., 2015; Wang et. al., 2017).

This text will, based on its recognition and popularity both within academia and politics, take note of GESAMP's definition of marine pollution as a man-made issue when discussing the sources and consequences of marine plastics pollution in the next chapters.

2.2 Sources of marine pollution

As defined above, marine pollution consists of all man-made substances that are released or introduced into the oceans from both land and sea. This, however, does not necessarily mean that all substances released are harmful, or that they are released directly into the ocean intentionally (Wang et. al., 2017; Bergmann et al., 2017; Clark, 2001). Man-made inputs could also be released or introduced indirectly and without intention through other channels, such as for example through waterways, coastal developments, and sewage systems (Clark, 2001; Bergmann et. al., 2016; WWF, n.d). There are thus a multitude of man-made substances released into the marine environment through an even larger multitude of sources. To effectively create policies to curb or reduce the introduction of substances into the marine environment, it is imminent to know which substance to target from which source. Efforts to categorise sources of marine pollution are plentiful, but the author of this text has particularly taken note of Clark's (2001) simplified systematization of sources of marine pollution into two main categories, each with two sub-categories; *land-based sources* and *sea-based sources*:

1. Land-based sources of marine pollution

Direct Outfalls

Includes all inputs that are released directly into the marine environment through human activities in coastal settlements, cities and industries. Examples include urban and industrial waste and litter discharge, untreated sewage discharge, and coastal agriculture installations such as fish farms (Clark, 2001; Tibbetts, 2015). Urban waste is most commonly termed "Municipal Solid Waste" (MSW) (Clark, 2001).

River Inputs

Includes all inputs that are collected in an entire river catchment area and eventually being discharged into the sea through the river. A river catchment area usually covers a rather massive area, both inland and on the coast, which means that man-made inputs can enter the ocean from far within the land through being washed off by rainfall into a river or a stream (Clark, 2001). Examples include organic waste such as sewage, pesticides and

fertilizers from agriculture, as well as petroleum, plastics, oil, and litter (deriving from MSW) washed off from roads and landfills (Clark, 2001; Oosterhuis et al., 2014; Jambeck et. al., 2015).

2. Sea-based sources of marine pollution

Shipping

Includes all the inputs resulting from direct discharges of litter and ballast water, accidents, and shipwrecks. Examples include plastic waste thrown at open water, discharge of litter and waste, fluids and chemicals, discharge of contaminated ballast water, and accidents where oil leaks from the sunken ship (Clark, 2001).

Offshore Inputs

Includes all inputs directly released into the marine environment at sea. Examples include dredging spill, offshore industrial activities such as oilrigs and deep-water mining, sewage sludge, fly ash from onshore power stations, and radioactive waste (Clark, 2001)

Note that the harmfulness or level of negative impact on the environment per substance is not considered or ranked in this categorization. Land-based sources of marine pollution make up as much as 80% of the manmade inputs into the oceans, and thus pose the biggest threat to the marine environment (Tanaka, 2017). One certain type of land-based marine pollutant has proven to be particularly endemic in the marine environment, namely marine litter (Tanaka, 2017; Wang et. al., 2017; Bergmann et. al., 2017). Marine litter is a collective term describing all man-made solid wastes that have found its way into the marine environment (Tanaka, 2017; Bergmann et. al., 2015). Marine litter is either intentionally released into the marine environment through for example dumping garbage directly into the sea from a ship or released to the sea unintentionally through being washed off the land into rivers and waterways, and thereby being transported into the sea (Wang et. al., 2017; Bergmann et. al., 2015). As much as 80% of marine litter comes from land-based sources through River Inputs and Direct Outfalls, and only 20% originates from sea-based sources such as shipping or offshore inputs (Oosterhuis et al., 2014; Aute et. al., 2017; Chen, 2015; Haward, 2018). The reason why marine litter is more problematic than for example liquid pollutants that reach the marine environment, such as chemicals, oil, or fertilizers, is that marine litter in most cases does not dilute in the ocean. Instead, marine litter either floats on top of the water, or sinks to the bottom (Wang et. al., 2017; Bergmann et. al., 2015). Moreover, considering the catchment area of rivers and streams, as well as how densely populated some coastal economies are, an effective combat on marine litter makes for an extremely difficult task (Chen, 2015; Aute et. al., 2017; Routley, 2018). Policy makers need to address the issue through combatting the most pressing issue first. As this text will explain in detail in part four on the relevance of this paper, the most pressing issue of marine pollution right now is **plastics** (Jambeck et. al., 2015; Tibbetts et. al., 2015; Ryan, 2015; Kuhn et. al., 2015; Galgani et. al., 2015; Thompson, 2004; Aute et.al., 2017; Gall and Thompson, 2015; Walnum, 2018).

3 Research question of the thesis

The research question of this thesis seeks to compare domestic government efforts in addressing the issue of marine plastics pollution in the six countries analysed. The research question seeks to create a full understanding of what kind of government measures the six countries have employed in the combat against marine plastics pollution, and whether they differ from country to country. The research question of this thesis reads as follows:

How do domestic government efforts to control marine plastics pollution from land-based sources differ between China, Indonesia, the Philippines, Vietnam, Thailand and Malaysia?

4 Relevance of the thesis

4.1 The importance of plastics in contemporary human, industrial and economic development

When the first fully synthesised plastics was invented in the early 20th century no one could have foreseen how impactful the material would be on how we live our lives, and how big of a role the material would have in modern technological progress (Andrady, 2003; Johnson, 2017). By the middle of the 20th century, manufacturers, producers and designers started to understand that the cost-to-durability ratio and the versatility of plastics created a seemingly endless number of application areas of the material (Geyer et. al., 2017; Andrady, 2003; Johnson, 2017). From the 1950s on, the level of global plastics production has exploded from a mere production of only 1.7 million tonnes of plastics in 1950, to a global output of 299 million tonnes in 2014 (Auta et. al., 2017; Bergmann et. al., 2016; Gall and Thompson, 2015). Plastics production passed steel production in terms of volume per year already in 1989 (Plastics Europe, 2016). Everything from ballpoint pens, bottles and packaging to personal electronics, home appliances, and cars are now fully or partly made of plastics (Johnson, 2017). Daily, however, we probably notice the significance of plastics when we do our grocery shopping. Yoghurt, sparkling water, sodas, meat, salads, soap bottles, toothpaste, candy, and fruits are just examples of daily products that you usually find wrapped in some degree of plastics today (Cressey, 2016). Many of these food items have received a much longer shelf life when wrapped in plastics and filled with gasses to reduce the decomposition period, making our food fresher, more convenient, more accessible, and cheaper (Andrady, 2003). Plastic has thus become an indispensable property of modern life (Andrady, 2003; Johnson, 2017).

Unfortunately, plastic has also become the most prevalent pollutant in the marine environment, with estimates showing that as much as 10% of all the plastic produced every year ends up in the ocean as marine plastics pollution (Jambeck et. al., 2015; Jovanovi, 2017; Andrady, 2003; Walnum, 2018).

4.2 The difficulty of recycling much of the plastics we produce

Out of all the 8,3 billion metric tonnes of plastic produced between 1950 and 2015, an astonishing 5,8 billion tonnes (70%) were used only once (Geyer et. al., 2017). Out of the plastics used once, only 0,5 billion tonnes (8.6%) were recycled and 0,7 billion tonnes (12%) were incinerated (Geyer et. al., 2017). This means that around 80% of the plastics that have been used once have been disregarded straight away (Geyer et. al., 2017). Figure 1 below is a graphical representation of how much of the total plastics produced have been disregarded, incinerated and recycled from 1950 to 2015:

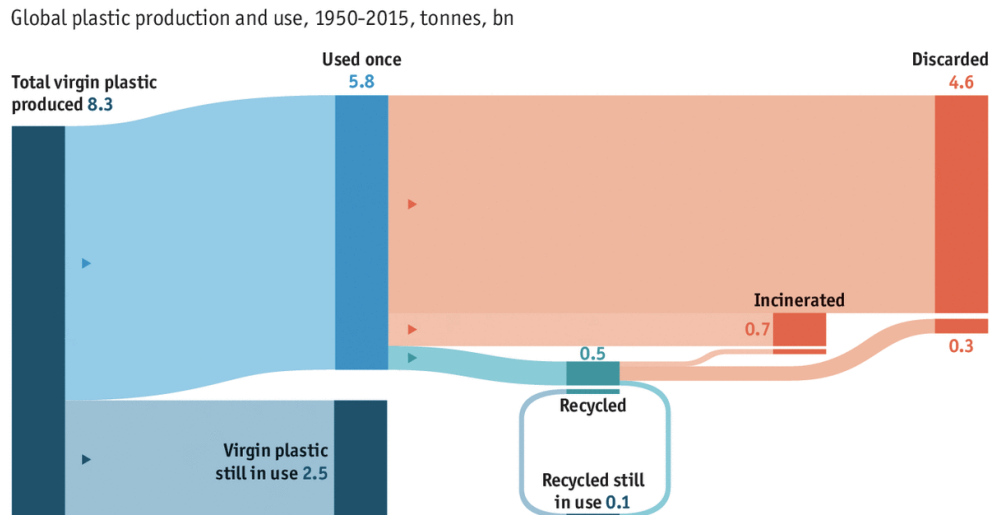


Figure 1 – The fate of all plastics produced from 1950 to 2015
Source: *The Economist*, 2018

The recycling rate of plastics lays at approximately 9% on a global level, with most plastic ending up as solid waste on landfills, or in the environment. Anthony Andrady points out in his book *Plastics and the Environment* that: “unfortunately, the very properties of plastics that modern societies find so desirable has ensured their proliferation in the marine milieu, and they have become the dominant component of recently recorded marine debris” (Andrady, 2003, p. 2003).

An estimated 6,4 million to 12 million metric tonnes (MMT) of plastics is dumped in the oceans every year (Routley, 2018). Plastics used for packaging is particularly to blame, because of its sheer abundance and difficulty to recycle (Geyer et. al., 2017). Out of all the marine litter that ends up in the ocean globally every year, an estimated 70 to 85% of it is non-degradable plastics (Auta et al., 2017; Plastics Europe, 2015; Bergmann et al., 2017; WWF, n.d.). Newman et. al. (2015) calls the low rate of recycling a market failure, since the price of plastic products fail to reflect the true cost of the disposal. The cost of recycling and disposal of plastic products are borne by the society, as opposed to by the producer or consumer (Newman et. al., 2015). According to GRIDA (2018a), this “flaw in our system allows for the production and consumption of large amounts of plastic at a very low ‘symbolic’ price. Waste management is done ‘out of sight’ from the consumer, hindering awareness of the actual cost of a product throughout its life” (GRIDa, 2018a, para.1)

Particularly problematic in terms of recycling and disposal are single-use plastics. As opposed to many other applications of plastics, single use-plastic, such as plastic shopping bags, plastic straws, plastic wrapping, plastic bottles, and plastic cutlery is used only for minutes (or even seconds) before being thrown away (Routley, 2018; Naturvernforbundet, 2018). Out of all the plastics we use every year, almost half of it is used once only (Routley, 2018). For example, an estimated 500,000,000,000 (that is 500 billion) plastic shopping bags are consumed every year, which equals around 1 million plastic bags being used every minute, or 150 bags yearly per capita globally (Routley, 2018). Each of these plastic bags has an average lifespan of just 15 minutes (Routley, 2018). The sheer scale of how much single-usage plastics are being used every day, and the turnover of the plastics globally makes the probability of some of it being mismanaged considerably larger compared to other types of plastic applications with longer timespans, such as for example car parts, electronics parts, and furniture (Geyer et. al., 2017).

4.3 East Asia: favourable conditions for input of plastic into the oceans from land-based sources

Growing urban areas, especially those by the coast, higher purchasing power, and higher consumption of plastics relate to leakage of marine plastics pollution from land (Tibbetts, 2015). All these conditions have made it very difficult for governments to cope with the rapidness and volume in which they must develop and build the infrastructure they need to stop plastic leaking into the marine environment (Ocean Conservancy, 2017). The six countries analysed in this text all have a mixture of traits favourable for the input of plastics into the ocean from land-based sources: They 1) are geographically close to the ocean, 2) have experienced strong urbanization over the past decades 3) have experienced high economic growth over the past decades, and 4) have a growing appetite for plastic consumption.

Geography: Coastlines

Marine plastics pollution from land-based sources in most cases constitute that a country has a coastline. Tibbetts (2015) observes that “the top spots (on sources of marine plastics pollution) are filled by several rapidly developing countries with expanding populations near coastlines and poor systems of waste management, including China, Indonesia, and the Philippines” (Tibbetts, 2015, p. A91). He continues to argue that: “a nation’s population density within 50 kilometres of the coast is the primary determinant of its land-based contribution to marine pollution. For instance, about 74% of Indonesia’s population and 83% of the Philippines’ population live in coastal regions. The combination of rapid economic growth and the number and size of urban settlements by and around the coast correlates with the output of marine plastics pollution (UNEP, 2008). A coastline allows for the release of plastics into the oceans both directly (*direct outfall*) and from the inland into the ocean through waterways (*river inputs*) (Clark, 2001). Although differing in size, all the countries analysed in this paper have a considerably long coastline. Table 1 below shows that Indonesia, Philippines and China are in the top ten list of longest coastlines in the world. Indonesia has the longest of the ones analysed in this paper, and is ranked number three in the world after Canada and Norway.

Country	Total length in km	Global rank
Indonesia	54720	3
Philippines	36289	5
China	14500	10
Malaysia	4675	29
Vietnam	3444	33
Thailand	3219	34

Table 1 – Table of Length of coastlines in selected countries in East Asia
Source: The World Factbook, 2018; (table made by the author)

The mere length of a country’s coastline, however, does not necessarily correlate with the amount of plastics released into the ocean from that country. With regards to marine plastics pollution from land-based sources, coastlines are interlinked with other factors, such as how

much overall waste a coastal nation produces on a per-capita basis, the level of urbanization, and GDP per capita, to name a few contributing factors (Tibbetts, 2015).

Population growth and Urbanization

Urbanization and the rapid growth of large urban areas are singled out by Tibbetts (2015) as possible contributing factors to waste generation and neglected waste management, which increases the chances of plastics leaking into the ocean. This is merely because waste management infrastructure struggles to cope with the high pace of people moving into urban areas, as Tibbetts (2015) notes:

“One of the major drivers of this trend in developing countries is the very rapid growth of ‘megacities’, defined as urban areas with populations exceeding 10 million. More than 70% of megacity growth is said to occur outside the formal planning process, and nearly a third of the urban population in developing countries lives in slums or informal settlements that lack city services, including solid-waste disposal” (Tibbetts, 2015, p. A91).

The six countries analysed in this text have all experienced a steady growth of urbanization since the 1960s, when plastics production started booming. The average percentage of the total population that lived in urban areas in these countries was around 20% in 1960 (World Bank, 2018b). 56 year later, this number stood at around 53% on average between the six nations, with Malaysia leading the way with 75% of the total population living in urban areas. In other words, more than half of the population in the six countries studied in this text lived in urban areas in 2016, compared to a fifth in 1960. Moreover, the urban population average in the six countries is just 1% lower than the global average, which stood at 54% in 2016 (United Nations Department of Economic and Social Affairs, 2016). The graph in Figure 2 below shows the growth of the urban population out of the total population from 1960 to 2016 in China, Indonesia, Malaysia, Philippines, Thailand, and Vietnam:

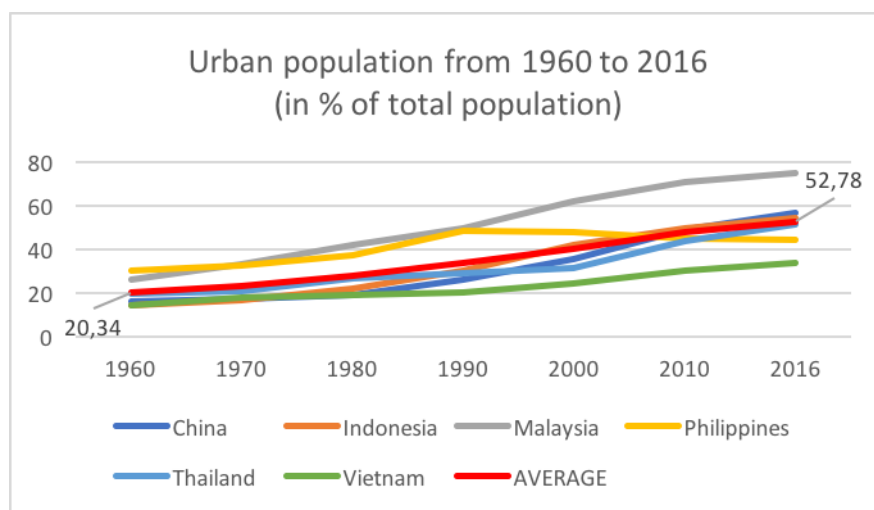


Figure 2 - Graph of percentage of population living in urban areas in East Asia
Source: World Bank, 2018b (Graph made by the author)

Out of the world's 31 cities with more than 10 million people (megacities) in 2016, 8 of them were in three of the six countries analysed in this text (China had 6, Indonesia 1, and the Philippines 1) (United Nations Department of Economic and Social Affairs, 2016). In 2030, however, the United Nations estimates that there will be 41 megacities in the world, with

Thailand and Vietnam joining the “megacity-club”. Estimates show that China will have 7, Indonesia 1, the Philippines 1, Thailand 1, and Vietnam 1 megacity/ies by 2030 (United Nations Department of Economic and Social Affairs, 2016). The only country out of the six to not have a megacity in 2030 would thus be Malaysia. Most of these megacities are situated either by a larger river, in a river delta, or by the coast (UNEP, 2008). Without proper waste management and domestic policies to stop plastics leaking out to the sea, these cities could potentially become massive sources of land-based marine plastics pollution. Following Tibbetts’ (2015) argument about urbanization and megacities as a big source of plastics pollution, one can then expect mismanagement of waste to become an even bigger problem in East Asia in the future, with some of the waste most likely ending up as marine plastics pollution through *River Inputs* and *Direct Outfalls*.

Growth in plastics production and consumption

Currently, North America and Western Europe dominate in terms of annual plastics consumption per capita. The two regions consume 5 times as much plastics per capita as East Asia, with around 100kg/capita compared to East Asia’s 20kg/capita (Gourmelon, 2015). However, the global plastics production and consumption is rapidly shifting towards Asia. Numbers from 2013 show that close to 45% of global plastics was produced in Asia, with China producing nearly a quarter of the total global output (Gourmelon, 2015; Plastics Europe, 2016; Corben, 2017). Although it is hard to estimate what the growth in plastics consumption will be in the future, there are clear signs of a rapid growth of consumption per capita in East Asia, and it appears that the consumption is already on the way up (Gourmelon, 2015). Ron Corben noted in 2017 that: “Thailand is a regional leader in plastics per capita consumption of plastics at 40 kilograms. Malaysia reports 35 kilograms per person and Indonesia is at 17 kilograms per person” (Corben, 2017, para. 8). Solid waste generation is highly correlated to GDP per capita in a country (Geyer et. al., 2017), and as the graph in Figure 3 below shows, the past and projected GDP per capita in the six countries selected in this paper has kept and will keep on growing:

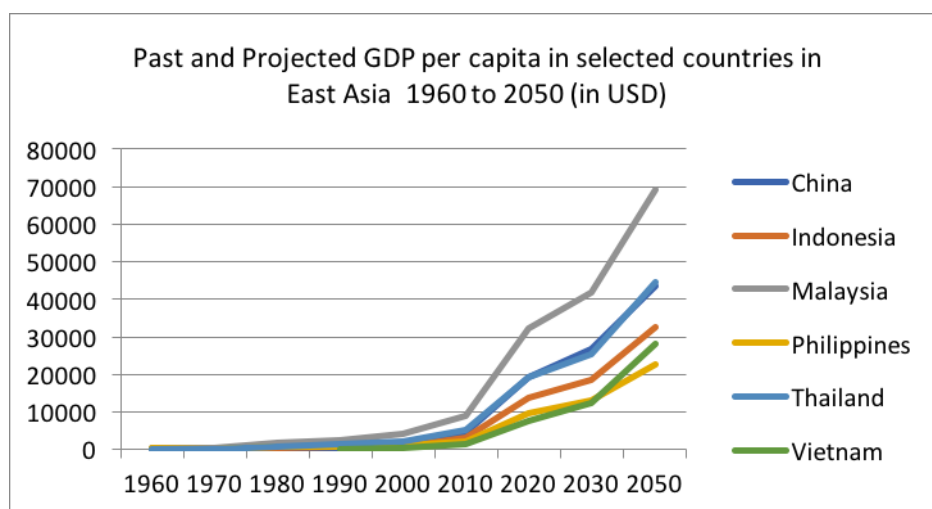


Figure 3 - Graph of Past and Projected GDP per capita in selected countries in East Asia from 1960 to 2050 (in USD)

Source: World Bank, 2018a; PWC, 2017; (Graph made by the author)

Considering that the total population of the six countries analysed in this text is rapidly moving towards 2 billion people (more than a 26% of the world’s population) (World Population Review, 2018), just a slight growth of plastics consumption per capita in the

region would be worrying without the presence of proper waste management infrastructure and domestic policies to prevent and mitigate against plastics reaching the ocean (Geyer et. al., 2017).

4.4 The growing sense of a global environmental emergency

Although having been an environmental problem for decades, the topic of marine plastics pollution from land-based sources did not gain much attention from policy makers and the public until around the change of millennium (year 2000) (Grida, 2018c; Andrady 2003). Marine plastics pollution, which looked like any other pollution just a few decades ago; harmful to the environment, but not more than an annoyance to humans, has quickly emerged as one of the most serious pollutants of the twenty first century (Andrady, 2003; UNEP, 2017a; Ruis, 2018). The United Nations Environmental Programme (UNEP) cemented this view in 2017, when they called marine plastic pollution one of the most serious threats to marine ecosystems today (Walnum, 2018). It is difficult to single out one specific reason for why the issue has caught the attention of the international society just now. An accumulation of evidence of an emerging environmental disaster have grown too large to avoid. Evidence of the serious consequences connected to the release of plastics from land-based sources, such as the possible serious human and animal health concerns connected to microplastics, the five large plastic gyres in the world oceans, and the increasing number of dead animals being washed up at shores from entanglement and ingestion of plastics, has been a wakeup call for both policy-makers and the public the past two decades (Andrady, 2003; Borelle et. al., 2017). Moreover, the rate of output of plastic debris is forecasted to grow continuously every year for the next decade (Jambeck, 2015). Figure 4 below exemplifies this growth, and provides estimates (low, mid, and high from 2010 to 2025) of how much plastic will be in our oceans if countries do not step up their combat against the release of plastics into the marine environment:

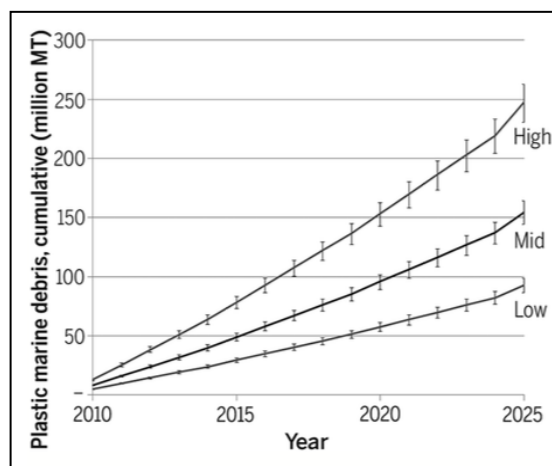


Figure 4 - Estimated growth of plastic marine debris from 2010 to 2025
Source: Jambeck et. al., 2015, p. 770

The international community has been trying to address the issue, albeit slowly until around 1994. The first big international efforts to address the issue of plastics in oceans started in 1972, with the London Convention on Dumping. The following 20-25 years of international efforts revolved largely around targeting dumping of waste at the sea, rather than focusing on land-based sources of marine plastic pollution. Moreover, up until the year 1994, no international effort singled out plastics as the primary cause of concern of marine plastic debris. The Third International Conference on Marine Debris (1994), and the establishment of Global Programme of Action for the Protection of the Marine Environment from Land-based

Activities (GPA) in 1995 changed the focus of the international society. From around year 2000, more and more international efforts recognised that it was important to focus on both sea- and land-based sources of plastic in oceans.

Since 2011, international efforts have accelerated, and focus has turned over to plastics and microplastics from land-based sources. There has also been a larger focus on policy and practical measures to address the issue, something that is cemented in the Honolulu Strategy, created at the Fifth International Conference on Marine Debris in 2011. The Honolulu Strategy was one of the first comprehensive outlines on how to combat marine plastics pollution (Chen, 2015). Goal A of the Honolulu strategy aims to reduce the amount and impact of land-based sources of marine debris introduced into the sea through 7 specific strategies (Honolulu Strategy, 2011; Chen, 2015). As a strong signal of the increased international attention dedicated to plastics pollution in the 21st century, The United Nations included the protection and sustainability of the ocean and marine wildlife in the Sustainable Development Goals (SDGs) in 2015. SDG 14 reads: “Conserve and sustainably use the oceans, seas and marine resources for sustainable development”, and the first chapter of SDG 14 tackles plastics pollution via marine debris (United Nations, 2016). SDG 14.1 reads: “By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution” (United Nations, 2016, para 1).

The latest evidence that just a few countries account for most of the plastics in oceans could also be the main driver for why the international community is accelerating their efforts in combating the issue. As Borelle et. al., (2017) notes, marine plastics pollution has many of the same traits as other global environmental issues: “as with many other contaminants (such as greenhouse gases and ozone-depleting substances), plastic is not constrained by national boundaries, because it migrates via water and air currents and settles in benthic sediments. More than 50% of the ocean’s area sits beyond national jurisdiction, including the infamous “garbage patches” in oceanic gyres where plastic accumulates” (Borelle et. al., 2017, p.1-2).

Many countries have already acted in the combat against marine plastics pollution from land-based sources by introducing domestic policies and legislation targeting the issue (Borelle et. al., 2017; European Commission, 2018). However, to combat the global issue of marine plastics pollution, it is imperative that the biggest sources of marine plastics pollution – many of which are in East Asia - act and introduce domestic and regional policies to combat the release of plastics into the ocean from their territory (Walnum, 2018). The countries that have already enacted policies, most of which are in Europe, are now pushing other countries (especially in East Asia) to enact the same targeted policies to combat marine plastics pollution (Borelle et. al., 2017). Many of these policies revolve around reducing consumption of single-use plastics, and mitigation of leakage through establishment of recycling and waste management policies (Walnum, 2018; European Commission, 2018; UNEP, 2016; UNEP, 2017a; STAP, 2011).

From 2016 until today, the international community has reached a consensus on the need to combat marine plastics pollution at source (on land). In February 2017, for example, the United Nations Environment Programme (UNEP) “declared war on plastics pollution” by launching an “unprecedented” campaign targeting sources of marine litter, micro-plastics in cosmetics and excessive waste of single-use plastics by 2022” (Corben, 2017, para. 10). In June 2017, the United Nations Ocean Conference called on all nations to reduce plastics consumption, and four of the countries analysed in this paper, China, Thailand, Indonesia, and

the Philippines committed to reduce plastics consumption (Corben, 2017). This was followed up in December 2017, where member states of the United Nations Environmental Programme strengthened their commitment to the combat against marine plastics pollution, by signing a resolution raised by Norway on marine debris and microplastics at the Third United Nations Environment Assembly (UNEP, 2017a). The international community has thus accelerated their work to get a binding and specific international agreement on marine plastics pollution the past few years, making the findings from this thesis highly relevant in the process of evaluating six of the worst pollutant countries' current efforts to combat the issue.

Note also that, although NGOs' primary function may be to educate the public on the possible consequences of everyday plastic usage, the importance of recycling, and the need to take care of the marine environment, they also provide first-hand evidence of the issue through data collected in initiatives such as beach clean-ups and self-initiated sampling expeditions (Ocean Conservancy, 2017; Sheavly and Register, 2007). There are a wide range of local, regional and transnational NGOs out there, with some of the most prominent and well-known ones being Ocean Conservancy, Plastic Oceans, The Ocean Cleanup, The Plastic Soup Foundation, Plastic-Pollution.org, and Greenpeace. Although these organizations serve an important function in the combat against marine plastics pollution, many of them do not contribute to the academic discussions that have led to the topic of this paper.

Table 2 below provides a full list of the most important international events related to the combat against plastics in oceans. Particularly important events are highlighted in **bold**:

Year	Event taking place	Focus on source (Land or Sea)	Highlights plastic debris? (yes/no)	Source
1972	London (Dumping) Convention	Sea	No	IMO (1972)
1973	MARPOL Convention	Sea	No	IMO (2018)
1974	UNEP Regional Seas Programme launched	Land and Sea	No	UNEP (2015)
1984	First International Conference on Marine Debris	Sea	No	GRIDA (2018c)
1988	Annex V of the MARPOL Convention enters into force	Sea	No	IMO (2018)
1989	Second International Conference on Marine Debris (Honolulu)	Sea	No	GRIDA (2018c)
	Basel Convention (on the Control of Transboundary Movements of Hazardous Wastes and their Disposal)	Land and Sea	No	Basel Convention (2018)
1992	Convention on Biological Diversity (CBD)	Sea	No	CBD (1992)
1994	Third International Conference on Marine Debris (Miami)	Land and Sea	Yes	Faris and Hart (1995)
	United Nations Convention on the Law of the Sea (UNCLOS) enters into force.	Sea	No	UNCLOS (1994)
1995	Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA) is established	Land	No	UNEP/GPA (2018); Washington Declaration (1995)
2000	Fourth International Conference on Marine Debris (Honolulu)	Land and Sea	Yes	GRIDA (2018c)
2001	Stockholm Convention (on Persistent Organic Pollutants)	Land and Sea	No	Stockholm Convention (2018)
2005	United Nations General Assembly delivers on Sustainable Fisheries (Resolution A/60/L. 31)	Sea	No	NOWPAP (2005)
2011	Revised MARPOL Annex V	Sea	Yes	IMO (2011)
	Fifth International Conference on Marine Debris (Honolulu), producing the Honolulu strategy	Land and Sea	Yes	Honolulu Strategy (2011)
2012	Manila Declaration: Creation of Global Partnership on Marine Litter (GPML)	Land	Yes	UNEP (2018a)

	Rio+20 Declaration: Significant reduction of marine litter until 2025	Land	Yes	GRIDA (2018c)
2014	First United Nations Environment Assembly, resolution on Marine plastic debris and microplastics (Res UNEA-1/6)	Land	Yes	NOWPAP (2005)
2015	G7 Action Plan to Combat Marine Litter	Land and Sea	Yes	G7 (2015)
2016	Second United Nations Environment Assembly, resolution on Marine plastic debris and microplastics (Res UNEA-2/11)	Land and Sea	Yes	UNEP (2018)
	UNICPOLOS panel discussion on Marine Debris, Plastics and Microplastics	Land and Sea	Yes	United Nations (2016)
2017	Third United Nations Environment Assembly, resolution on Marine plastic debris and microplastics (Res UNEP/EA.3/L.20)	Land and Sea	Yes	UNEP (2017)
2018	Sixth International Conference on Marine Debris (California)	Land and Sea	Yes	IMDC (2018)
	UN World Global Environmental Day Campaign 2018 topic: Beat Plastic Pollution	Land	Yes	United Nations (2018)
	5 out of 7 G7 countries agree on fighting plastics in oceans in a separate charter in their final communique	Land and Sea	Yes	Ruis (2018)
	The World Oceans Day Campaign 2018 topic: fighting plastics pollution in oceans.	Land and Sea	Yes	World Oceans Day (2018)

Table 2 – Table of the most important international efforts to curb marine plastics pollution from 1972 to 2019

Source: table made by the author

5 State of the Art

5.1 The rapid growth of research interest on the topic of marine plastics pollution

The research interest in marine plastics pollution has grown steadily since the first papers on the topic were published in the early 1960s (Vegter et. al., 2014). Although already somewhat outdated, Vegter et. al. (2014) observed that there were 561 publications on marine plastic pollution from 192 different journals worldwide between 1970 and 2013. Around half of the publications on the topic were published after 2008, and the number of publications have continued to increase rapidly after 2013 (Ryan, 2015). The graph in Figure 5 below shows the growth in number of publications on marine plastics pollution from 1970 to 2013:

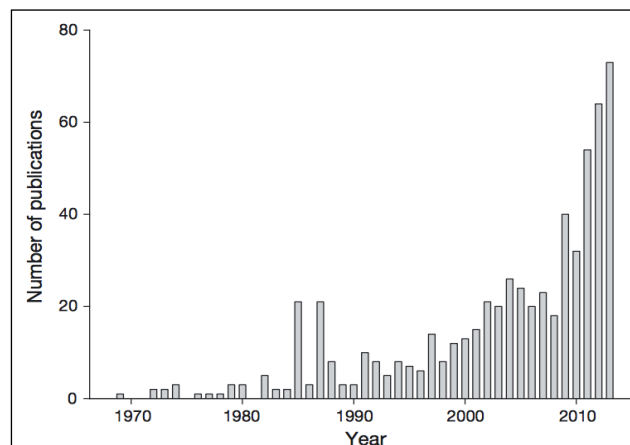


Figure 5 - Number of publication on marine plastic pollution from 1970 to 2014
Source: Vegter et. al., 2014

Research on marine plastic pollution has not only gained an increasing amount of interest the past decade, it has also changed in form, and developed into a diversified topic with several specialised sub-topics (Ryan, 2015; Bergmann et. al., 2015). These subtopics range from single-focus on dumping at sea, to monitoring of deaths by plastic entanglement among a specific bird population (Laist, 1997; Laist, 1987). Current pressing issues in marine litter research, such as microplastics and policy development to combat the issue, did not enter the field of academia until the year of 2000 (Ryan, 2015; Barboza et. al., 2015; Thompson, 2004). The graph in Figure 6 below shows the growth in the number of and the area of interest of papers and publications on marine litter between 1966 and 2013:

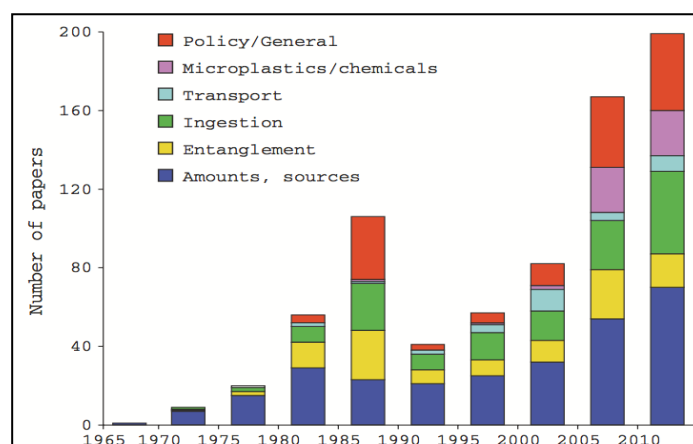


Figure 6 - Graph of number of papers on different aspects of marine plastics pollution in five-year intervals between 1965 and 2013

Source: Ryan, 2015, p.3

The graph in Figure 6 tells us that researchers tend to focus on specific areas within the broader topic of marine plastics pollution, instead of employing a holistic approach where all areas are discussed in the same publication. This could be due to the complexity of the topic.

However, despite this being a broad topic, it is possible to generalise research areas into four broader areas, each of which has its own set of specific sub-areas:

1. Research on the **presence** of plastics in the marine environment, such as the amount, transportation, and movement of plastics to and within the marine environment. This has led to;
2. Research on the **sources** of plastics to the marine environment, such as source country/region, and the types of plastics products ending up as marine plastics pollution. This has led to;
3. Research on the **consequences** of the presence of plastics in the marine environment., marine ecosystems and increasingly also human health. Which in return has led to;
4. Research on the **response** to the presence, sources and consequences of plastics in the marine environment, (policy).

These four sub-areas of research on marine plastics pollution will be discussed separately, before concluding thoughts on how this thesis will contribute to the research topic will be articulated.

5.2 The presence of plastics in the marine environment

Although a few early publications assessed the impact that marine plastics pollution had on the natural environment in oceans, the first 20 years of research on marine litter from 1965 to 1985 revolved around finding out how much marine litter and plastics humankind released and from which sources it was released from (Morris, 1980; Cundell, 1974; Merrell, 1980). Publications drew a picture of a growing volume of plastics released into the oceans, but focused mostly on direct release from sea-based sources as well as land-based sources close to the sea, omitting inland sources and waterways (Vegther et. al., 2014; Laist, 1987; Merrell, 1980; Clark, 2001; Morris, 1980; Cundell, 1974). Many early papers were also focused on regional studies of the presence of plastics in the ocean, such as Alaska (Day, 1980), The South Atlantic (Morris, 1980a), the Mediterranean Sea (Morris, 1980b), South America (Bourne and Imber, 1982), and The Middle East (Shiber, 1979), to mention a few.

Research on the presence of plastics in the marine environment has continued until today. To pursue a fact-based, qualitative approach on the estimation of the presence of plastics in the marine environment, *Litterbase*, a not-for-profit project, has established a directory of marine litter findings worldwide by compiling data from 817 research publications from 1960 until today. The directory provides evidence that plastics outnumber all other kinds of marine litter in the global oceans in terms of material composition of marine litter. The chart in figure 7 below, compiled from 523 publications from 3563 locations globally, shows that 60% of all marine litter findings have been plastics between 1960 and 2018 (LITTERBASE/AWI, 2018). When including other categories of plastics as well, such as fisheries plastics (fishing nets and fishing line), and styrofoam (a plastic product made for insulation and packaging), the composition of plastics totals 73%, or almost three quarters of all marine litter (LITTERBASE/AWI, 2018):

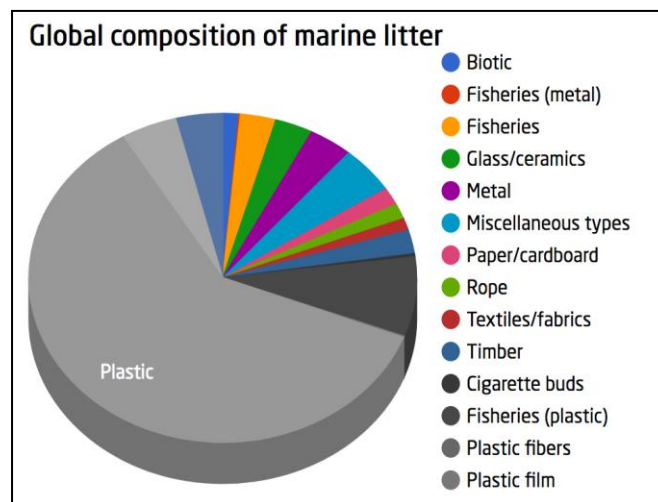


Figure 7 - Chart of Global Composition of Marine Litter
Source: LITTERBASE/AWI, 2018

Litterbase’s database of marine plastics research also shows that the problem is a global one, and that it is not confined to certain countries or regions. Nor is it confined to certain layers of the ocean. Plastics have been found in all layers, from surface to the seabed. It has been found in remote seas with little to no human activity, as well as in the deepest points of the ocean. (Dockrill, 2018). Van Sebille et. al. (2015) and Eriksen et. al. (2014) deliver an inventory on all plastics floating on the global seas, while Woodall et. al. (2014) and Van Cauwenberghe et. al. (2015) estimate that the deeper layers of the seas and the seabed are particularly rampant with plastics pollution. Japanese Researchers found plastics debris in the Mariana Trench in 1998 (Wallnum, 2018). The map in Figure 8 is based on the findings of 821 publications, and shows that plastic has been recorded in all our global oceans, both close to the coastlines and in open seas:

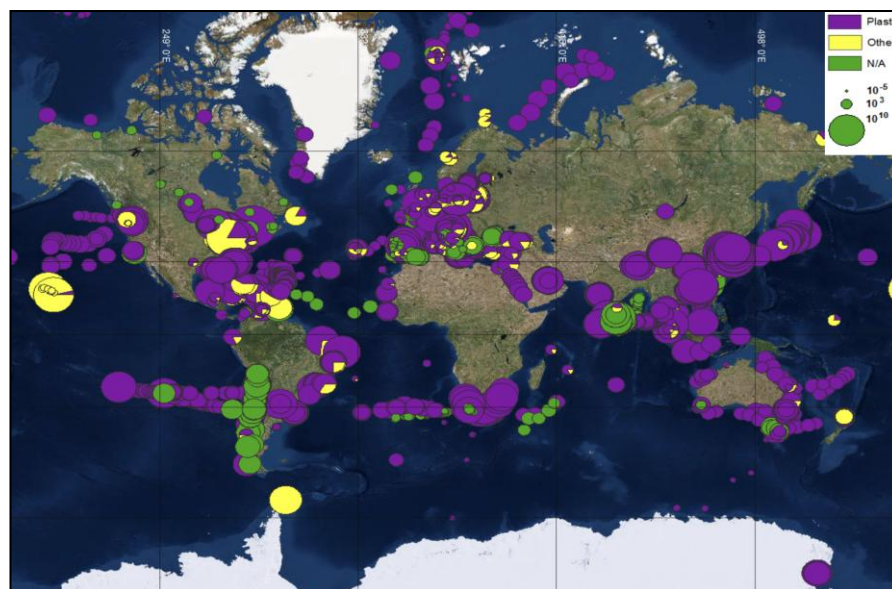


Figure 8 - Map of Distribution of Plastics in the World's Oceans (represented by purple)
Source: LITTERBASE/AWI, 2018

The recent acceleration of interest in the presence of marine plastics pollution has particularly revolved around the phenomenon of microplastics. “Microplastics” as a term and concept was

first coined by Richard Thompson, a marine biologist at Plymouth University in the United Kingdom, in his article “*Lost at Sea: Where is all the plastic*” in 2004 (Thompson, 2004; Marris, 2014; Barboza et. al., 2015). Thompson suggests that larger plastics pieces – now usually defined as macroplastics – break down in the natural aquatic environment (and thus slip through the larger-meshed sampling nets formerly used to sample the marine environment). After this discovery, marine plastic debris is now categorised into two main categories. Categorization is done based on the size of the plastic debris found, and is important due to the harm the debris afflicts upon the environment (Thompson, 2004; Napper and Thompson, 2019). The two categories are:

1. Macroplastics

The term macroplastics is used to identify plastics debris larger than 5mm in diameter found in the marine environment. Macroplastics could therefore range from a 5mm piece of a torn plastic bag, to a 1,5-litre plastic bottle, to a much bigger plastic parts such as the front skirts of a car (Auta et. al., 2017; Andrady, 2003; Bergmann et. al., 2016; Johnson, 2017).

2. Microplastics

The term microplastics is used to identify plastics debris smaller than 5mm in diameter found in the marine environment. It is only recently that research has found that microplastics is present in all oceans, as well as in other bodies of water (lakes and rivers) (Thompson, 2004; Duis and Coors, 2016; Thompson, 2015; GESAMP, 2015M Auta et. al., 2017). An estimated 5,25 trillion microplastic particles weighting almost 269,000 tonnes are thought to be present in the ocean (Bergmann et. al., 2017; Thompson, 2015). Microplastics are divided into two sub-categories:

1. *Primary Microplastics*

This is plastic that is intentionally manufactured to be smaller than 5mm, and is in general purposed for specific industrial and domestic applications (Thompson, 2004; Thompson, 2015). For industrial purpose, primary microplastics generally comes in the form of resin pellets – which are precursor pellets used for making larger plastic products in a factory. For domestic purposes, primary microplastics are used in for example exfoliating facial scrubs, shampoos and toothpaste (Auta et al. 2017; Fendall and Sewell, 2009; Gregory, 1996; Duis and Coors, 2016). The biggest source of input of primary microplastics into the ocean are microbeads from exfoliating scrubs, since they are hard to filter out in wastewater and sewage (Fendall and Sewell, 2009).

2. *Secondary Microplastics*

This is plastic that has been broken down from macroplastics into microplastics in the natural environment through for example ultraviolet radiation, or mechanical abrasion (Auta et al, 2017; Thompson, 2004; Cole et. al., 2011; GESAMP, 2015; Thompson, 2015). An example of secondary microplastics is a plastic bag that has dissolved into millions of pieces through being rubbed against the sand at a beach by the water. Targeting the precursors of Secondary Microplastics has recently come on the agenda of several governments and countries globally to mitigate marine plastics pollution. The most evident precursors of secondary microplastics are plastic bags and plastic packaging (Thompson, 2015).

Whether it is a direct result of Thompson’s assumed emergency with microplastics or not, research on the presence of plastics in the marine environment has increased drastically since 2004 (Ryan, 2015). To illustrate, the number of scientific publications on microplastics has

grown significantly since the term was coined, from a mere couple of articles in 2004 to around 50 publications in 2014 (Thompson, 2015), as the table in Figure 9 below shows:

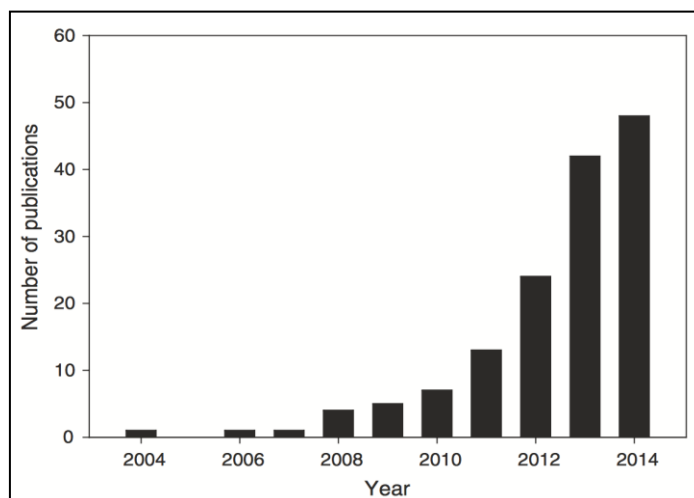


Figure 9 - Thompson's estimated growth of number of publications on microplastics
Source: Thompson, 2015, p.188

Thompson, now considered by many as an authority within microplastics research, has opened the discussion on the larger picture of marine plastics pollution, and managed to make a complex issue easier to understand for the public and decision-makers alike.

5.3 The sources of plastics in the marine environment

Country sources

An estimated 12 million metric tonnes (MMT) of plastics leak into the marine environment every year globally (Raubenheimer and McIlgorm, 2018; Villarrubia-Gómez et. al., 2017). Research suggests that East Asia by far outnumbers other regions of the world in terms of this leakage, with China and South East Asia particularly leading the way (Tibbets, 2015; Lebreton et. al., 2017; McCarthy, 2017; Isobe et. al., 2015; Auta et. al., 2017; Jambeck et. al., 2015; World Bank, 2018c). All the six countries studied in this thesis (China, Indonesia, Thailand, the Philippines, Vietnam, and Malaysia) come out on the top 10 list of the world's biggest sources of land-based marine plastics pollution in most research (Tibbets, 2015; McCarthy, 2017; Jambeck et. al., 2015), one of which is Jambeck et. al. (2015), who have made an estimation of how much mismanaged waste a country has, and have added in variable factors (coastline, urban population, plastics consumption). Their research found the numbers shown in table 3 below:

Global Rank	Country	Percentage of waste that is mismanaged	Quantity of mismanaged plastic waste (MMT/Year)	Percentage of global mismanaged plastic waste	MINIMUM Quantity of plastic marine debris (MMT/Year)	MAXIMUM Quantity of plastic marine debris (MMT/Year)
1	China	76	8,82	27,7	1,32	3,53
2	Indonesia	83	3,22	10,1	0,48	1,29
3	Philippines	83	1,88	5,9	0,28	0,75
4	Vietnam	88	1,83	5,8	0,28	0,73

5	Sri Lanka	84	1,59	5	0,24	0,64
6	Thailand	75	1,03	3,2	0,15	0,41
7	Egypt	69	0,97	3	0,15	0,39
8	Malaysia	57	0,94	2,9	0,14	0,37
9	Nigeria	83	0,85	2,7	0,13	0,34
10	Bangladesh	89	0,79	2,5	0,12	0,31
TOTAL All Top 10		787	21,92	68,8	3,29	8,76
TOTAL East Asia		462	17,72	55,6	2,65	7,08

Table 3 – Table of top 10 countries in terms of mismanaged plastic waste *MMT=Million Metric Tons
Source: Tibbetts, 2015; McCarthy, 2007; Jambeck et. al., 2015 (Table modified by the author)

Table 3 shows that the top ten countries account for almost 70% of all the mismanaged plastic leaking into the oceans globally, while the six countries which are the subject of this paper account for around 55,6% of it (highlighted in red). The minimum estimation of mismanaged plastic waste shows that the six countries analysed in this paper release 2,65 MMT, and the maximum estimates a little over 7 MMT of plastics released into the oceans every year due to mismanagement of Municipal Solid Waste (MSW). MSW is a term used to describe all the waste generated by private households after disposal. China by far outnumbers the other countries on the list, accounting for approximately 28% of the world's mismanaged plastics waste. An example to put these numbers into perspective is that China produces more than 30 times more mismanaged plastic waste than the United States, although the coastal population of China is only 2,5 times larger than that of the U.S. (Tibbetts, 2015; McCarthy, 2007).

Whereas the estimation made by Jambeck et. al. (2015) gives an overview over plastic inputs from coastal areas, it does not represent the full picture of how much plastic is released into the oceans globally, since the estimation omits plastics entering from inland areas. Lebreton et. al., (2017) estimate that rivers and waterways carry between 1,15 and 2,41 MMT of plastics into the ocean yearly (Lebreton et. al., 2017). This represents up to 20% of the total estimated plastics reaching the oceans every year from all sources globally (12MMT) (Raubenheimer and McIlgorm, 2018; Villarrubia-Gómez et. al., 2017). Lebreton et. al. (2017) analysed 40,760 watersheds in 182 countries worldwide to calculate which rivers are the biggest contributors of plastics in the oceans globally, and then calibrated the model against river plastics concentration measurements from Europe, Asia, North and South America to ensure global consistency (Lebreton et. al., 2017). The result of the calculation is shown graphically in the model in Figure 10 below:

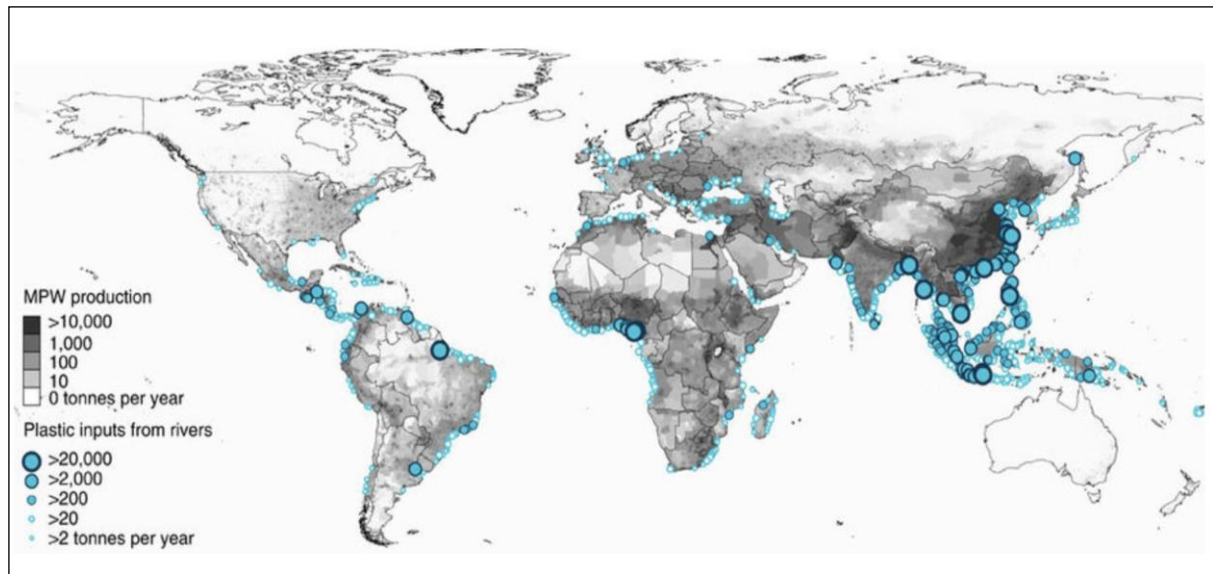


Figure 10 - Mass of river plastic flowing into oceans in tonnes per year.
Source: Lebreton et. al., 2017, p.2

As the figure above shows, the mass of river plastics flowing into the ocean (represented by blue dots) is far larger in East Asia than on other continents. Lebreton et. al. (2017) notes that: “the top 20 polluting rivers were mostly located in Asia and accounted for more than two thirds (67%) of the global annual input while covering 2.2% of the continental surface area and representing 21% of the global population” (Lebreton, 2017, p.3). This estimate of 67% comes very close to Jambeck et. al’s estimate of 70% in the same region. Out of the 14 rivers in East Asia, 12 of them are in the six countries analysed in this text, the distribution being as follows:

1. 6 in China (Yangze, Xi, Huangpu, Dong, Zhujiang, Hanjiang)
2. 4 in Indonesia (Brantas, Solo, Serayu, Progo)
3. 1 in the Philippines (Pasig)
4. 1 passing through China, Laos, Thailand, Cambodia, Myanmar and Vietnam (Mekong)

Hence, East Asia dominates the statistics in terms of volume of plastics entering the marine environment from land-based sources every year, with China and South East Asia alone accounting for more than half of the input. Most of this plastic ends up in global oceans, far away from said countries’ jurisdiction, and in some way or another affects the entire globe (Borelle et. al., 2017).

Product sources

The mere properties, low cost, and extended biodegradation period of plastics does not necessarily equate to an environmental hazard by itself (Andrady, 2003). The area of application and property of the plastic dictates whether it is prone to leak into the marine environment, and, if it does, how long it will take for the plastic to degrade or dissolve into microplastics (Andrady, 2003; Trowsdale, 2017). In Table 4 below, examples of how different properties of plastics result in different plastic debris items in the marine environment are shown:

Property of the plastic	Plastic Debris Item	Estimated time to degrade/dissolve into microplastics
Strength, durability, and relative inertness; virtually indestructibility in the marine environment	Fishing gear, rope, six-pack ring-strapping bands, and boat construction	600 Years (Fishing line)
General resistance to microbial and other degradation processes	Fishing gear including traps (crab pots); food packaging material; tampon applicators	450 Years (Nappy)
Transparency, biological inertness, low density, and cost effectiveness	Packaging material for food; plastics bags.	450 Years (Plastic bottle)
Ability to be constructed as a low-density foam that is generally negatively buoyant	Insulated beverage cups, bait boxes, and floatation devices	50 years (Styrofoam cup)
Low cost and disposability	Numerous consumer applications leading to common litter (e.g., candy wrappers, cigarette filters)	Unknown

Table 4 - Table showing property of plastics vs plastics debris item
Source: Andrady, 2003, p.389; NOAA, n.d., Trowsdale, 2017

Research between 1990 and 2019 on the main sources of marine plastics based on plastics products revolves around the following four products, all of which are single-use, with three being commonly found in Municipal Solid Waste (MSW):

Microbeads

Microbeads in cosmetics and soaps have been highlighted as one of the biggest sources of primary microplastics in the ocean (Xanthos and Walker, 2017; Fendall and Sewell, 2009; Chang, 2013; Gregory, 1996; Rochman, 2015; Napper et. al., 2015; Chang, 2013; Duis and Coors, 2016; Auta et. al., 2017). Microbeads are used in a wide range of cosmetic and hygiene products due to their ability to for example exfoliate the skin, or to ensure a cleaner brush of your teeth. The list of applications is long. According to Auta et. al., microbeads can be found in “facial cleansers, tooth paste, cosmetics, shower/bath gels, scrubs, peelings, eye shadow, deodorant, blush powders, make up foundation, mascara, shaving cream, baby products, bubble bath lotions, hair colouring, nail polish, insect repellents and sunscreen” (Auta et. al., 2017, p. 167). They are usually washed out in the sewage system after application (by for example washing your hands). Many scientists point out that the small positive advantages this plastic makes in everyday life does not cover up for the negative consequences of releasing microbeads into the ocean (Chang, 2013; Fendall and Sewell, 2009; Gregory, 1996; Duis and Coors, 2016; Auta et. al., 2017).

Plastic bags

Single-use (non-biodegradable) plastic bags, once in the marine environment, never fully biodegrade (Andrady, 2003; O’Brine and Thompson, 2010; Xanthos and Walker, 2017; Ślusarczyk and Kot, 2018;). Through time, they are mechanically, or through UV light, grinded down to microplastics (Green et. al., 2017; Xanthos and Walker, 2017; Steensgaard et. al., 2017). Before being dissolved into microplastics, plastic bags could “also impact benthic environments as they are known to cover the ocean floor with significant impacts to invertebrates inhabiting the sediment” (Wagner et. al., 2017, p.4). Moreover, plastic bags carry toxics that are released into the food chain through ingestion by both large and small animals (Alam et al., 2018).

Plastic bottles

Plastic bottles are a highly popular single-use plastics product worldwide, with more than 1 million plastic bottles consumed every minute globally in 2016 (Laville and Taylor, 2017; Trowsdale et. al., 2017; Schuyler et. al., 2018). That's 480 billion plastic bottles a year. And the number is estimated to grow by almost 20%, with more than half a trillion (500 billion) plastic bottles to be consumed every year by 2021 (Laville and Taylor, 2017). The issue with this number is that most of these bottles will end up being unrecycled after consumption: “Fewer than half of the bottles bought in 2016 were collected for recycling and just 7% of those collected were turned into new bottles. Instead most plastic bottles produced end up in landfill or in the ocean” (Laville and Taylor, 2017, para. 7).

Plastic packaging

Most produce and other fresh foods need some sort of packaging to ensure longer shelf-life, protection against externalities, and most importantly freshness from point of production to point of consumption. Plastics have proven to be a widely popular material to perform these tasks. It is cheap, widely available, and delivers a range capabilities that is suitable for packaging specifications; it could be soft, hard, flexible, waterproof, and air tight (Andrady, 2003). Between 40% and 60% of all plastics that is made globally goes to packaging (Plastics Europe, 2016; Geyer et. al., 2017). Most of this packaging is discarded right after the product it preserves is consumed, and therefore has a very short lifecycle.

5.4 The consequences of plastics in the marine environment

What started off in the late 1960s as research on the monitoring and assessment of the volume of plastics we release into the marine environment, quickly changed when researchers started to acknowledge that marine plastics pollution brought negative consequences to marine animals and ecosystems other than just annoyance (Vegther et. al., 2014; Ryan, 2015; Barboza, 2015; Derraik, 2002). Early research on marine plastics pollution illustrated the issue as one that brings negative consequences to the marine environment, but failed to see the bigger picture of ingestion, entanglement, microplastics, and toxins moving up the food chain. It also tended to focus on local and regional impacts, and thus failed to identify the issue as a global one (Ryan, 2015; Barboza, 2015).

The full scope of direct and indirect negative consequences of the issue is yet to be fully understood. Although the first report of the effect of plastic on marine animals came out in the

1960s (GRIDA, 2018b; Gall and Thompson, 2015; Ryan, 2016), the complexity of the issue did not get fully into the spotlight until the late 1980s (Gall and Thompson, 2015; Laist, 1987). In 1987, David Laist eloquently summed up the emergence of the issue and its potential consequences:

“The deceptively simple nature of the threat, the perceived abundance of marine life, and the size of the oceans have, until recently, caused resource managers to overlook or dismiss the proliferation of potentially harmful plastics debris as being insignificant. However, developing information suggests that the mechanical effects of these materials affect many marine species in many ocean areas, and that these effects justify recognition of persistent plastic debris as a major form of ocean pollution” (Laist, 1987, p.319).

Although estimates vary, between 400 and 600 marine species have been shown to have either ingested or gotten entangled in plastics since the research began monitoring the effects plastics have on the marine environment (Gall and Thompson, 2015; Green, 2015). It is currently widely acknowledged that marine plastics pollution carries serious consequences in particularly three areas: 1) Marine wildlife, 2) Human health, and 3) Economics (Chen, 2015; Gall and Thompson, 2015; Avio et. al., 2017; Ryan, 2016). These three areas are discussed in detail below.

1. Marine wildlife

Marine plastics pollution's impact on marine ecology is first and foremost connected to its impact on marine wildlife, such as fish, marine birds, marine mammals, and turtles (Vegeter et. al., 2014; Laist, 1997). Laist (1987) took note of the emerging consequences plastics posed on marine animals already in 1987, when he argued that:

“the accumulating debris poses increasingly significant threats to marine mammals, seabirds, turtles, fish, and crustaceans. The threats are straightforward and primarily mechanical. Individual animals may become entangled in loops or openings of floating or submerged debris or they may ingest plastic materials. Animals that become entangled may drown, have their ability to catch food or avoid predators impaired, or incur wounds from abrasive or cutting action of attached debris. Ingested plastics may block digestive tracts, damage stomach linings, or lessen feeding drives” (Laist, 1987, p. 319).

In other words, individual animals get either entangled in plastics debris, or they ingest it by thinking it is food. An increasingly large amount of plastics, both microplastic and macroplastic, is being found in the stomachs of dead sea birds, fish, and marine mammals (Ryan, 2016; Laist, 1997; Vegeter et. al., 2014; Gall and Thompson, 2015). Since plastic does not decompose naturally within the lifespan of these animals, any plastics ingested would stay in the stomach until the animal passes away (Laist, 1997). Ingested plastics cause serious consequences for the animals' health, such as: False satiation (the stomach feels full), pathological stress, blocked enzyme production, reduced growth rate, and reproductive complications (Auta et. al., 2017). Research has also shown that plastics could block parts or even the whole of the animal's stomach, and thus hamper the animal's ability to ingest food (Gall and Thompson, 2015; Auta et. al., 2017; Ryan, 2016). Marine animals are affected differently depending on the size, diet, and in area of the ocean it lives (Routley, 2018). The chart in Figure 11 below shows the chain of relation between the two main categories of marine plastics pollution, and their impact on marine wildlife:

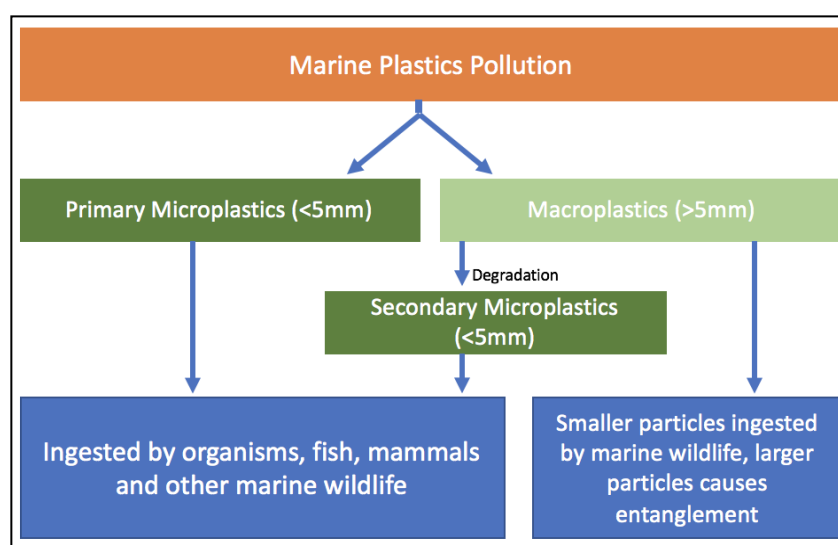


Figure 11 - Chart of categories of Marine Plastics Pollution

Source: Auta et al., 2015; Laist, 1997; Thompson, 2015; (Made by the Author)

Fish

An estimated 66% of the global fish stock has ingested some degree of plastics (Routley, 2018). Plastics in fish can cause intestinal injury and death (Auta et. al., 2017; Laist, 1997; Kühn et. al., 2015). More importantly, ingestion of plastics by fish can also transfer toxins and microplastics up the food chain to bigger fish, marine mammals, and even humans (Auta et. al., 2017; Jovanović, 2017).

Turtles

Turtles have been found both to ingest and to entangle themselves in plastics (Laist, 1997; Laist, 1987; Gall and Thompson, 2015). Recent studies show that out of the 7 species of sea turtles in the world, plastic ingestion has been documented in 7 (100%) of the species and plastic entanglement in 6 (86%) (Gall and Thompson, 2015; Kühn et. al., 2015). Plastic bags, which look almost identical to jellyfish in water (a favourite food for turtles), are particularly dominant, but other plastic debris such as styrofoam, plastic ropes and plastic pellets have also been found inside the stomach of dead sea turtles (Gall and Thompson, 2015; Tomás et. al., 2002; Bjorndal et. al., 1994; Lutz, 1990; Center for Biological Diversity, n.d; Duncan et. al., 2019). Ingestion of plastic by turtles can lead to “blockage in the gut, ulceration, internal perforation and death; even if their organs remain intact, turtles may suffer from false sensations of satiation and slow or halt reproduction” (Center for Biological Diversity, n.d, para.10).

Birds

Relying on the coastline and the upper layers of the ocean to gather food, seabirds are especially exposed to the ingestion of marine plastics debris (Kühn et. al., 2015; Gall and Thompson, 2015). Findings of plastics ingestion by birds were one of the first signs of the negative impact of marine plastics pollution on wildlife, alarming scientists already in 1960 (Ryan, 2015). Out of 406 species of birds monitored, entanglement was found in 103 species (25%), and ingestion in 164 species (40%) (Kühn et. al., 2015). However, recent findings suggest that up to 90% of all bird species have ingested plastics, and that this number will increase to 95% by 2050 (Wilcox et. al., 2015). Plastic ingestion could cause birds to starve to death due to reduction of the storage volume of the stomach, as well as impacting

reproduction abilities (Center for Biological Diversity, n.d; Kühn et. al., 2015).

Marine mammals

Large marine mammals, such as seals and whales have been found to both ingest and entangle themselves in marine plastics debris (Laist, 1997; Gull and Thompson, 2015; Auta et. al., 2017). Tests from dead animals show that out of the 115 known species of marine mammals in the world, 30 species (45%) have ingested plastics, and 52 species (30%) have entangled themselves in it (Gall and Thompson, 2017; Routley, 2018). Ingestion of plastics can increase toxicological stress, and clog up the stomach (leading to starvation) for all species of marine mammals (Auta et. al., 2017). Moreover, microplastics have also been found to clog up the breathing filter of whales, reducing the animal's ability to filter out food (krill) from the water (Besseling et. al., 2015). Larger mammals on top of the marine food chain can have contamination levels of microplastics up to 3 billion times higher than their surrounding environment due to the multiplication effect up the food chain (WWD, n.d.).

2. Human health

The discovery that most plastic does not biodegrade in the marine environment, but rather breaks down into smaller and smaller pieces (microplastics) has opened up for more research on what would happen once these pieces reach humans through consumption of seafood (Thompson et. al., 2009; Van Cauwenberghe and Janssen, 2014; Rochman et. al., 2015; Ryan, 2015; Seltenrich, 2015; Galloway, 2015). Research suggests that toxics released from plastics once inside the human body could alter hormones, reduce fertility, reduce cognitive abilities, and increase the risk of cancer for humans (Naturvernforbundet, 2018). The scenario of transfer from food to humans builds on the human position of being on top of the food chain: Plankton ingests microplastics, small fish eats the plankton, larger fish eat those fish. Humans, at the top of the food chain eat the larger fish and mussels, and thereby receive the transfer of toxics and microplastic particles (Galloway, 2015; Reisser et al., 2014;). Scientists and other organizations that monitor the impact of marine plastics pollution are particularly concerned about the multiplication effect of toxins released from microplastics brought up through the food chain, and fear that humans end up with a large quantity of microplastics in their bodies through consumption of seafood (Seltenrich, 2015; Galloway, 2015; Reisser et al., 2014). This multiplication effect happens as tiny animals and organisms absorb chemicals from microplastics, which accumulate in their bodies. Animals higher up the food chain, such as marine mammals, and even humans, can have contamination levels of toxics and chemicals released by microplastics of up to millions of times higher than the water they live in (WWF, n.d; Galloway, 2015; Kewsani et. al., 2016). Peixoto et. al. (2019) argues that also common, commercial table salt can be a transferring agent of microplastics to humans. Researchers have also taken it one step further, and focused on the effects that nanoplastics (plastic particles smaller than 100 nanometres in diameter) can have on human health in the future (Koelmans et. al., 2015; Lambert and Wagner, 2016).

3. Economics

Although not as ubiquitous as the two other areas of impact, economics will most likely be impacted by marine plastics pollution (Newman et. al., 2015). Although far from certain, the estimated cost marine plastic pollution inflicts upon the society varies between 8 billion USD and 13 billion USD per year (GRIDA, 2018b; Kirby, 2014; Newman et. al., 2015; UNEP, 2014). This cost derives mostly from the need to clean up and remove marine plastic pollution to ensure successful operation of the following industries: Tourism, shipping, fisheries, and aquaculture, but also includes future costs of human health related issues (Newman et. al.,

2015; GRIDA, 2018b). The economic cost of marine plastics pollution is not exclusively bad for the society; it could also be a driver to intensify the combat against the release of marine plastics pollution (Newman et. al., 2015).

5.5 The response to plastics in the marine environment

Through the 1980s and 1990s, it became clear that plastics in oceans have a real, measurable impact on the environment, and an increasing amount of research tried to establish the negative impacts plastic has on marine ecology and marine animals by measuring number of dead animals from entanglement and ingestion (Derraik, 2002; Andrady, 2003; Carr, 1987; Laist, 1997; Laist, 1987; Ryan, 2015). Robert Bernard Clark contributed to the academic discourse and made the topic of marine pollution accessible with the first edition of his book “*Marine Pollution*” in 1986, but did not leave much space for a detailed discussion on plastics in oceans (Clark, 2001). Possible solutions to the problem of marine plastics pollution, such as preventing the usage of single-use plastics, and changing the behaviour of producers and consumers, also emerged in academia when the consequences of this type of pollution started being outlined and proven in the late 1980s (Ryan, 2015). There was a sudden hike of policy-related research on marine litter between 1985 and 1990, which could possibly be correlated to a higher level of international focus on marine litter in that period, especially from sea-based sources (MARPOL Annex 5 entered into force, and the first (1984) and second (1989) International Conference on Marine Debris were held), before amount of research dropped again in 1990 (Ryan, 2015; Clark, 1991).

Recent acknowledgement of the fact that marine plastics pollution may affect human health in ways we are yet to understand has put an increased focus on combatting and eliminating marine plastics pollution through public policy. Researchers have tried to provide solutions and ways to combat the issue both at source and through collection of the plastics that is already present in the ocean. Loehr et. al. (2017) highlights the need for global action on the issue with solutions cemented in the United Nations Sustainable Development Goals (SDGs), while Thevenon and De Sousa (2017) argue that employment of economic tools is key to deal with the issue.

Much of the research on the response to the issue is based on the serious consequences marine plastics, and especially microplastics, has on the global environment and human health, and thus argues that we need to target especially single-use or any plastics products with a short useable lifetime (Xanthos and Walker, 2017; Steensgard et. al., 2017). These publications are therefore often directed towards policy makers and other decision makers (also including the private sector and consumers), and suggest tangible measures and tools on how to limit plastics reaching the ocean (Xanthos and Walker, 2017, Loehr et. al., 2017; Ryan, 2015). There have been introduced a wide range of tangible suggestions on response to marine plastics pollution, through for example economic incentives (Oosterhuis et. al., 2014), taxation (Wagner et. al., 2017), monitoring (Ryan et. al., 2009; Theyenon and de Sousa, 2017), public education (Chen, 2011; STAP, 2016; Willis et. al., 2017; Andrady, 2003; Loehr et al., 2017; Le Guern, 2018). Extended Producer Responsibility (Perella, 2017), and waste management strategies (Newman et. al., 2015; Andrady, 2003).

In recent years, some papers have also been using a holistic approach, where marine plastics pollution is seen as a consequence of human mismanagement of land and sea resources. These papers incorporate marine plastics pollution responses into the larger picture of sustainable ocean governance, and propose the creation of a circular plastics economy to combat the current emerging issue of plastics in oceans (Harward, 2018; Thevenon and De Sousa, 2017;

Vince and Hardesty, 2017; Hu, 2012). A circular plastics economy is one where all plastics produced are either recycled or reused after initial consumption. The call for a holistic approach on combating marine plastics pollution is interlinked with an integrated approach on waste management, where governments establish a set of actions and initiatives to achieve a circular economy (Eriksen et. al., 2018; Loehr et. al., 2017). A circular economy on plastics is achieved when plastic waste is seen as a valuable resource that is brought back into the economy through either recycling or incineration after it is disposed (Eriksen et. al., 2018).

In recent years, starting around 2012, papers have been written on validation of the effectiveness of policies in combating the issue of marine plastics pollution. There are a few publications focusing on “best practices” by analysing countries where policy has effectively reduced the output of marine plastics pollution, such as Pettipas et. al. (2016), who analyse the Canadian policy framework, Willis et. al. (2017), who looks at the successfulness of waste abatement campaigns, Wagner (2017) and Viscusi (2012), who have looked at the effectiveness of US’ single-use shopping bag policies and recycling schemes for plastic bottles respectively, and the European Commission, 2018, who has analysed European countries’ approaches. The findings of these papers are particularly important for this paper and will be incorporated into the Analytical Framework introduced and described in part six.

Due to the slow biodegradation of plastics, the only way to remove the plastic already present in the marine environment within the foreseeable future is by physically removing it (Bergmann et. al., 2016; UNEP, 2016; Galgani et. al., 2013). The disadvantage is that clean-ups can be very costly and difficult (Wagner, 2017; Le Guern, 2018). Clean-up activities in Belgium and the Netherlands, for example, cost up to 34.000 euro per kilometre per year (Bergmann et. al., 2016). The cost is mainly connected to labour cost, so the cost in developing countries with lower salaries would be lower per kilometre. Furthermore, there are at the moment no feasible plans to clean up the two most pressing issues; the five global waste gyros (because they are too big in size), and microplastics (because the particles are too small in size).

Another effective tool to combat plastic pollution is the creation of an overarching national strategy that addresses marine plastics pollution to mitigate against plastics reaching the ocean. A country must first assess and evaluate how it should combat the issue through a set strategy. Having a strategy and action plan is an important step in the combat against marine plastics pollution, both because it serves as an acknowledgement that the problem exists, and because it guides decision-making on a political and practical level (Galgani et. al., 2010; IUCN, 2017; HELCOM, 2015). Not all researchers agree with the effectiveness of national policies, though. Routley (2008), for example, writes that: “while derelict fishing gear such as nets and floats are a contributor to the problem, land-based activity accounts for the majority of the garbage circulating in the ocean. Most of the world’s countries have ocean coastlines, and with so many jurisdictions and varying degrees of environmental scrutiny, truly curbing the flow of plastic isn’t realistic in the near term” (Routley, 2018, para. 6).

Alongside scientific research on effective policies to respond to the issue of marine plastics pollution, there has been growing interest from the public, media, policy makers, and international organizations on the topic. Most prominent is the Joint Group of Experts on the Marine Aspects of Marine Environment Protection (GESAMP), consisting of experts nominated by nine United Nations associated agencies (IMO, FAO, UNESCO-IOC, UNIDO, WMO, IAEA, UN, UNEP, UNDP), who has produced and publishes research on effective tools to combat marine plastics pollution (GESAMP, 2015). GESAMP has a pool of 500 scientists from 50 countries, who contribute with science-driven publications, workshops and

reports on marine plastics pollution (GESAMP, 2018). The United Nations Environment Programme has also developed a toolkit for policy makers that lists and explains policy measures to combat certain types of marine plastics pollution, with particular focus on single-use plastics (UNEP, 2017a). The Honolulu Strategy further outlines government measures that can be used in the fight against marine plastics pollution (Honolulu Strategy, 2012).

5.6 Concluding Thoughts on State of the Art

Trying to cover all aspects of marine plastics pollution from land-based sources within this paper would be a difficult task. Marine plastics pollution comes from such a large number of land-based sources, and have both disclosed and currently undisclosed effects on the environment, which calls for a much larger set of measures than just a one-track solution. After all, if there was a simple solution to combat marine plastics pollution, we might have not been in the situation we now find ourselves in the first place. The challenge of addressing marine plastics pollution is exemplified by Haward (2018), who has written some accurate words on the topic:

“Although there is broad-based recognition of the problem of marine pollution, the challenge in addressing marine plastic pollution reflects the complexity of a multi-faceted problem. A vast majority of marine plastic pollution derives from land-based sources (4.8–12.7 million metric tonnes of plastic annually), so a sole focus on marine oriented solutions is insufficient. The sources of such plastics are equally diverse, from commercial and recreational ships and vessels, fishing and aquaculture operations (rope, waste, fishing gear, nets) to land based sources, street litter, dumping, packaging (including plastic bags), plastic sheeting and production waste” (Haward, 2018, p 1).

On a domestic policy-level, some issues are more critical than others. For example, policies that improve handling, management and recycling of plastic waste would highly reduce the current estimated output of plastics into the oceans, while policies such as the banning and regulation of specific plastic products would tackle the issue at the source, rather than waiting until its already produced and circulated into the economy. The analytical framework part of this paper will thus focus on comparing government efforts and policies that are proven to target proper management of plastics life cycles, with a specific focus on key single-use plastic elements that have proven to be rampant in the marine environment. As Dockrill (2018) notes on marine plastics pollution: “the only way to stop this problem becoming worse is to regulate the production of single-use plastic and prevent the flow of this dangerous debris from our coastlines” (Dockrill, 2018, para. 14).

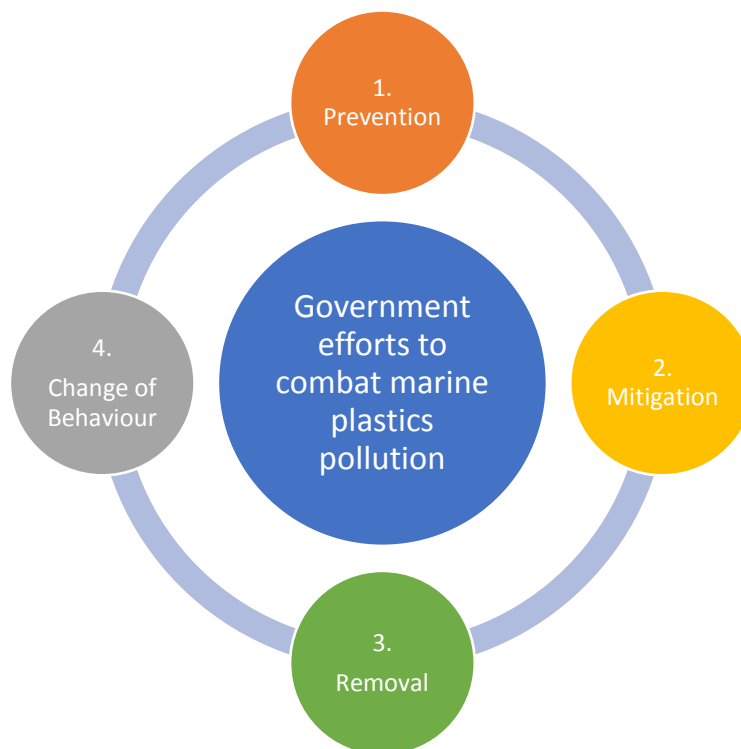
It is imperative for the international society that East Asian countries employ domestic tools and measures to curb the outflow of plastics into the oceans from their territories. The author has not found a single article or publication that has compared different domestic policies related to marine plastics pollution in East Asia. By comparing the domestic combat on marine plastics pollution in China, Indonesia, Malaysia, Vietnam, the Philippines and Thailand, this paper aims at contributing to the existing research by identifying shortcomings and/or unique measures in the combat against marine plastics pollution in the region.

6 Analytical Framework

6.1 Introduction of Analytical Framework

A multifaceted problem needs a multifaceted response. The analytical framework of this text aims at conceptualizing the various responses needed to effectively tackle the issue of marine plastic pollution from land-based sources into a clear framework where both general overarching policies, as well as specific policies will be assessed. The framework also takes into account that there are no single solutions to completely curb the outflow of plastics in the oceans, and thus focuses on specific pressing issues related to single-use plastics, as well as long-term solutions built on knowledge, recycling capacity and behaviour.

Given the lack of publications of similar papers and research questions, the analytical framework used to research and compare the six countries in this paper will be an eclectic one. This means that the criteria chosen to support the framework are gathered from several different sources, all writing on specific issues related to marine plastic pollution. The main criteria of the analytical framework have been found in publications written about what measures and tools should be employed to successfully combat marine plastics pollution through government policy. The four main criteria have been borrowed from Chen (2015), who has made a clear outline of the type of government response needed to combat marine plastics pollution from land-based sources through targeted policy. The four measures are: prevention, mitigation, removal, and change of behaviour, as shown in Figure 12 below:



*Figure 12 - Chart of government efforts needed to combat marine plastics pollution.
Source: Chart made by the author. Modification of Chen's (2015) regulatory and management framework of marine litter*

When done concurrently, the four measures aim at ensuring long-term improvements in reducing marine plastic pollution (Chen, 2015). They also represent a way to reach the final goal of creating a circular economy of plastics so that all plastics produced and released into the market should be collected in the end of the life cycle to either be recycled or incinerated. This ensures that no plastic reaches the ocean. Using these four main-criteria, therefore, allows for a broader assessment of a country's combat against marine plastics pollution from land-based sources, and can facilitate the identification of whether a country has too much or too little focus on a specific response measure.

The sub-criteria to support the four main criteria aim at addressing a mixture of general policies to combat marine plastics pollution, as well specific policies targeting the most prominent pollutants found in the ocean. The analytical framework of this text is thus a combination of criteria focused on the political tools (legislation, policies, law) and the economic tools (taxation, incentives, fines) that a country has in the combat against marine plastics pollution from land-based sources on a domestic level. All the sub-criteria used have been proposed and accepted as tangible domestic response measures to combat marine plastics pollution in academia and by international organizations.

6.2 Criteria

6.2.1 Criterion 1: Preventive measures

The first main criterion of this analytical framework aims at assessing whether a country has taken measures to prevent production and consumption of plastics that are commonly found in the marine environment. The most effective measure to combat marine plastics pollution would be a total ban of plastics. However, this would be highly unpractical and unlikely due to the many advantages plastics bring to modern society in production and consumption (Chen, 2001; Lindh; 2016; Andrady, 2003). Plastic is a useful material to for example reduce food waste, so a total ban on plastics consumption is not realistic. However, it is viable to ban and make targeted legislation on specific kinds of plastics, such as single-use plastics (plastic bags, bottles, packaging), without hurting plastics production needed for other kinds of application (Oosterhuis et al 2014; Wagner, 2017; Rochman 2016). Prevention and reduction of the volume of single-use plastics would significantly reduce the volume of plastics that reaches the marine environment (Routley, 2018). The three targeted legislations chosen to assess a country's domestic preventive measures are introduced below:

Preventive Measure 1: Ban on microbeads in cosmetics and hygiene products (Yes/No)

The biggest issue with microbeads in cosmetics and hygiene products is that, due to their small size, a large amount of them pass straight through the sewage filtering plant before they are released into waterways or straight to the ocean (Chang, 2013; Fendall and Sewell, 2009; Xanthos and Walker, 2017; Abbing, 2017). The global outputs of microbeads that pass straight through wastewater treatment plants are estimated to be 8 trillion particles (Xanthos and Walker, 2017). Banning microbeads in cosmetics and hygiene products would be the only effective combat against this problem (Abbing, 2017). This criterion will thus analyse whether a ban on microbeads exists or not.

Preventive Measure 2: Legislation on single-use plastic bags (Tax, Ban, Regulation, Nothing)

Plastic bags are one of the most widespread marine plastic pollutants (Wagner, 2017; Green et. al., 2015; Xanthos and Walker, 2017). According to Ocean Conservancy, a global NGO working on the issue of marine plastics pollution, plastic grocery bags (5th) and other plastic

bags (9th) were among the ten most frequent litter items collected globally during their International Coastal Cleanup campaign in 2017 (Ocean Conservancy, 2017). Single-use plastic bags are “thin-walled, lightweight plastic carrier bags distributed at check-outs and used to carry goods from supermarkets and other shops, but are usually only used for one shopping trip before discarded” (Ślusarczyk and Kot, 2018, p. 452). In theory, single-use plastic bags are unnecessary, since there are many alternatives such as multi-use bags made by thicker plastic or cotton fabric (Ślusarczyk and Kot, 2018; Steensgaard et. al., 2017). In practice, however, single-use plastic bags are extremely cost-effective and easy to produce, so they are still favoured as a carrying tool in many countries – especially in developing economies where purchasing power is low (Ślusarczyk and Kot, 2018; Andrady, 2003; Andrady and Neal, 2009).

Governments have three options on legislation on single-use plastic bags; ban, regulation or taxation/fees (IUCN, 2017; Xanthos and Walker, 2017). The table below was developed by Wagner et. al. (2017, p. 4) with a few modifications by the author, and gives a quick overview of the benefits and disadvantages of the three types of legislation:

Type of legislation	Overview	Benefits	Disadvantages
Ban	Retailers are prohibited from providing single-use plastic bags	1. Halts production and consumption of plastic bags completely 2. Relatively easy to enforce.	3. Could increase consumption of non-banned bags. 4. Eliminate consumer choice. 5. Bans on plastic bags increases purchases of separate plastic garbage bags
Taxes and Fees	Levies visible, separate fee on bags	1. Reduces consumption and litter. 2. Fosters reuse. 3. Fees kept by retailers can compensate for compliance costs or used to fund anti-litter programmes. 4. Relatively easy to enforce. 5. Retains consumer choice.	6. Increased cost to consumers 7. Increased administrative cost for regulator and retailer. 8. New taxes are generally unpopular
Regulation	Laws governing the thickness of plastic bags	9. Reduces production and consumption of the thinnest types of plastic bags 10. Increases recycling attractiveness of plastic bags (the thicker the bag, the more money is left for recyclers)	11. Possible increased cost to consumer 12. Increases the relative weight of plastics being consumed 13. Hard to enforce

Table 5 - Types of legislation on single-use plastic bags

Source: Wagner et al., 2017, p. 4; UNEP, 2016; Xanthos and Walker, 2017; Steensgaard et. al., 2017

The three types of legislation have their own benefits and disadvantages, but are all effective in reducing the number of plastics bags that end up as litter – and thus the number of plastics bags that end up in the marine environment (Wagner et al., 2017; Xanthos and Walker, 2017). This sub-criterion will assess what kind of legislation a government has implemented on single-use plastic bags (Tax/Fee, Ban, Regulation, or nothing).

Preventive Measure 3 - Does the country ban smoking on beaches? (Ban / Partial Ban/ No Ban)

Although not immediately evident for many people, cigarette butts are made up of cellulose acetate, which is a form of non-biodegradable plastic (Novotny and Slaughter, 2014; Cigarette Butt Pollution Project, n.d.; UNDP, 2016). Being small enough to be carried by waterways from inland, as well as from beaches by tide and rainwater into the ocean, cigarette butts pose a serious risk to the marine environment (Novotny and Slaughter, 2014). This risk gets

particularly evident when research shows that an estimated 4,5 trillion out of the 6 trillion cigarettes smoked globally every year gets deposited into the natural environment without entering a formal waste management system (Novotny and Slaughter, 2014; Cigarette Butt Pollution Project, n.d.; Dangerfield, 2018). With a total number of 1,836,838 butts collected on beaches, cigarette filters were the most common item collected globally in the International Coastal Cleanup campaign in 2017, and have continually made up more than 30% of all items collected the past five years (Ocean, Conservacy, 2017; Novotny and Slaughter, 2014). Cigarette filters have also been found inside the stomach of a wide spectre of marine wildlife, such as fish, birds, and marine mammals (Novotny and Slaughter, 2014). There are, however, 1 billion smokers in this world, and a total ban of smoking would be a highly unpopular move by any government. Not to say, it would also practically be very difficult to implement in today's world. However, a simple solution to prevent a direct outflow of cigarette butts into the ocean is, according to the UN, to ban smoking on beaches (UNEP, 2016; Kokhar, 2016).

All the six East-Asian countries analysed in this text have beaches that are utilised either by the local population or by tourists. Moreover, East Asia is one of the fastest growing markets for tobacco consumption, with more than half a billion smokers (The Nation, 2017; Khokhar, 2016). In that context, this criterion will identify whether the country analysed has banned smoking on beaches to prevent the direct leakage of butts from the beach to the ocean. The criterion considers that such a ban is most effective on popular beaches and a “partial ban” has therefore been included as an option, which will be used for countries that have banned smoking on only a selection of its beaches.

6.2.2 Criterion 2: Mitigating measures

The second main criterion of this analytical framework aims at assessing whether a country has taken measures to mitigate the outflow of plastics into oceans from land through targeted regulation and legislation. In the marine environment, plastic never fully biodegrades, it just degrades into smaller and smaller pieces (microplastics, nanoplastics) and thus must be cleaned up physically. Mitigation, as Wagner (2017) notes, is more feasible than a full-scale clean-up of the open ocean once plastic reaches the marine environment: “Cleaning-up marine litter from the open ocean is not currently feasible. In contrast, cleaning up land-based litter is feasible, but can be a significant expense for local governments” (Wagner, 2017, p.4). It is therefore vital for the government to have the right management measures in place to manage plastic waste once it is circulated into the economy, and catch it before it reaches and pollutes the marine environment (Wagner, 2017; Chen, 2015, UNEP, 2016). This means that Governments need to have policies in place that incentivise recycling and proper waste management, as well as the infrastructure to cope with plastics litter. To put it as simple as the UNEP has: Mitigating measures should be in place to “develop and implement legislation to prevent the waste, once created, from entering the marine environment” (UNEP, 2016, p. ix). The 3 sub-criteria chosen to assess mitigation measures thus focus on the extent of waste management in the country.

Mitigating measure 1: Existence of an overarching national marine litter strategy and action plan (Yes/No)

There is no set framework for how a strategy and action plan should look like, what measures it should outline, and how these measures should be implemented. However, the international community drafts a general picture of what a strategy plan should consist of in United Nations Environment Programme Resolution number UNEP/EA.3/L.20 from December 2017. Point 4c in the resolution encourages all member states to “develop and implement action plans for

preventing marine litter and microplastics, encouraging resource efficiency, including prevention and increasing collection and recycling rates of plastic waste and re-design and re-use of products, materials and avoiding the unnecessary use of plastic and plastic containing chemicals of particular concern where appropriate” (UNEP, 2017a, p.2). Meanwhile, the European Commission has defined their ideal action plan on marine plastics as a document with a: “strategy addressing the challenges posed by plastics throughout the value chain and taking into account their entire lifecycle” (European Commission, 2018, p.1). In other words, a strategy and action plan should encompass steps to ensure a closed-loop system (circular plastics economy), where all plastics produced are reduced, reused, and recycled (3Rs).

The author acknowledges that different countries have different ways to address an issue, and a comparison of the effectiveness of different strategy and plans would be a difficult task. Therefore, this sub-criterion only aims at analysing whether the country has established the needed guidelines and strategies to deal with the specific issue of marine litter and microplastics, or not.

Mitigating Measure 2: Implementation of Extended Producer Responsibility (EPR) on plastic packaging (Yes/No)

Plastic packaging represents nearly half of all plastic waste generated globally (Federigan, 2018). Some countries are now trying to deal with the growing volume of waste from plastic packaging by introducing requirements and regulations on production of plastic packaging. Regulations are meant to target single-use plastics, and thus aim at achieving a higher degree of reduction, reusability, and recyclability (UNEP, 2016; UCLA, 2013). The core legislation that regulates this is called EPR (Extended Producer Responsibility), and was first introduced by a Swedish academic called Thomas Linquist in a report to the Swedish Ministry of Environment in 1990 (Federigan, 2018). EPR is now particularly fronted by the Organisation for Economic Cooperation and Development (OECD), and dictates a higher degree of producer responsibility through transferring the cost of recovery and recycling of plastics packaging to the producer of plastics (OECD, 2018). This means, as Perella (2017) argues, that: “producers help to pay for the costs of collecting, transporting, recycling and responsibly disposing of these products and materials at the end of their life. EPR is focused on life cycle thinking, as it forces producers to remain accountable for their products past the factory gate – beyond the point of purchase and any warranty period” (Perella, 2017, para. 1). This is meant to incentivise development of ocean-friendly packaging solutions, such as biodegradable packaging, as well as bringing in needed funding for recycling solutions and government-run waste management programmes (UCLA, 2014; Ocean Conservancy, 2015). This sub-criterion will assess whether or not the country analysed has established and implemented EPR on plastic packaging production.

Mitigating measure 3: Legislation on MSW at open landfills (Ban/No Ban)

Municipal Solid Waste (hereafter MSW) is the term describing all the waste generated by a private household, from food scraps to plastics packaging. Plastics make up almost 80% of Municipal Solid Waste (MSW), and a ban on MSW at open landfills would reduce the likeliness of plastics being transferred into the ocean, as well as incentivising waste handlers to explore other waste-disposal options, such as recycling plants (Newman et. al., 2015; Andrady, 2003; UNEP, 2016). Open landfills are prone to be rampant sources of marine plastics pollution due to their geographical location (often close to major infrastructure, such as highways and waterways), and their lack of recycling capabilities (once plastic enters a landfill, it either stays or leaks into the nature) (Andrady, 2003). Open landfills are exposed to weather, people, and animals that could either intentionally or unintentionally transfer plastics

to the ocean (Winn, 2016; Newman et. al., 2015). A plastic bag dumped in an open landfill could for example be caught by the wind and blown into a nearby waterway such as a river, where it will eventually be transferred into the ocean (Gonzales et. al. 2017). This sub-criterion will assess whether the country analysed has implemented a ban on MSW at open landfills.

Mitigating measure 4: Estimated waste-to-energy (WtE) capacity (in percentage)

Given the low cost of production, low value of the product, and the extremely short life span of single-use plastic products, it may in most cases not be economically viable to recycle at the end of its lifecycle (after one usage) (Ocean Conservancy, 2015; Andrady, 2003; Chen, 2015; UNEP, 2016). Instead of discarding the plastic on a landfill, where it will stay indefinitely, an alternative solution is to exploit its energy-potential by burning it (Andrady, 2003; Ocean Conservancy, 2015). Burning plastic releases energy through heat, which in return can be used to create electricity or to heat water for district heating (Andrady, 2003; UNEP, 2016). In combination with recycling policies, waste-to-energy (WtE) is a popular way to ensure that plastic does not reach the ocean, especially complemented by a landfill ban (Ocean Conservancy, 2015). This sub-criterion will assess how much WtE capacity the country has established to mitigate against plastics ending in landfills.

6.2.3 Criterion 3: Removing measures

The third main criterion of this analytical framework aims at assessing whether a country has taken measures to monitor and remove plastics that have already been released into the marine environment (Theyenon and de Sousa, 2017; Galgani et. al., 2013). Removal and monitoring of existing plastic in the marine environment is an important measure to reduce the volume of marine plastics pollutants, as well as knowing whether the other three measures (prevention, mitigation, behaviour-changing) are effective. It is, however, imperative that removing measures are combined with prevention and mitigation measures, as there will be no effect of removal measures if the current volume of input into the marine environment is higher than what is being removed (UNEP, 2016; Wagner, 2017; Le Guern, 2018). The two sub-criteria chosen to assess a country's removing measures are introduced below.

Removing measure 1: Existence of national debris monitoring programme (Yes/No)

Monitoring is an important task in the combat against marine plastics pollution. To know whether enacted legislations are working, as well as being able to comprehend the size of the problem, a national debris monitoring programme is vital (Ryan et. al., 2009; Theyenon and de Sousa, 2017). Lack of information and monitoring data makes it very difficult for decision-makers (the government) to prioritise and to take appropriate action (Theyenon and de Sousa, 2017). Lack of monitoring to address marine debris was highlighted by the United Nations General Assembly as a significant barrier in addressing the main sources of marine litter in their resolution A/60/L.22 (Oceans and the Law of the Sea) from 2005 (Theyenon and de Sousa, 2017). This issue was also exemplified in Strategy item number 6 in the Honolulu Strategy, which calls for countries to: "Build capacity to monitor and enforce compliance with regulations and permit conditions regarding litter, dumping, solid waste management, storm water, and surface runoff" (Honolulu Strategy, 2011, p.ES2). The international community also agreed on establishing monitoring guidelines that will be used domestically in United Nations Environment Programme Resolution number UNEP/EA.3/L.20 from December 2017. Point 4b in the resolution encourages all member states to: "cooperate to establish common definitions and harmonised standards and methodologies for measurement and monitoring of marine litter and microplastics" (UNEP, 2017a, p.2). This sub-criterion will

therefore assess whether the country analysed has established a national debris monitoring programme or not.

Removing measure 2: Initiation of national clean-up initiatives (Yes/No)

National clean-up initiatives have proven to bring symbolic, esthetical, and long-term value (STAP, 2011; UNEP, 2016). They help to activate people and build on their awareness, but more importantly, they support monitoring and research through providing hard statistical evidence in the form of volume and type of debris cleaned up (Pettipas et. al., 2016; Chen, 2011; Galgani et. al., 2013). This is also recognised politically, through for example strategy item number 7 in the Honolulu Strategy, which calls for countries to “Conduct regular clean-up efforts on coastal lands, in watersheds, and in waterways — especially at hot spots of marine debris accumulation” (Honolulu Strategy, 2011, p.ES2). This was, same as with monitoring, echoed by the international community through United Nations Environment Programme Resolution number UNEP/EA.3/L.20 from December 2017. Point 4a in the resolution encourages all member states to “prioritise where feasible clean-up in the marine environment in areas where marine litter poses a significant threat to human health, biodiversity, wildlife or sustainable use and can be conducted cost-effectively and without harm to the ecosystems” (UNEP, 2017a, p.2). This sub-criterion will assess whether or not the country analysed has initiated clean-up initiatives.

6.2.4 Criterion 4: Behaviour-changing measures

The fourth main criterion of this analytical framework aims at assessing whether a country has taken measures to change the behaviour of its citizens on plastics consumption and waste management. Behaviour-changing measures should always accompany preventive, mitigating and removing measures, as this measure will foster a longer-term culture of sustainability within the population (Bergmann et. al., 2017; Loehr et al., 2017; Chen, 2011; Pettipas, 2016). The author has chosen two sub-criteria to assess behaviour-changing measures in a country: The existence of awareness campaigns, and the usage of economic incentives. Although different approaches, both these measures will change the behaviour of citizens over time (Chen, 2011).

Behaviour-changing measure 1: Does the country initiate national education campaigns on land-based sources to marine plastics pollution (Yes/No)

Public education and awareness campaigns are effective to raise awareness, influence behaviours, attitudes and values, and strengthening participation from the population on specific issues, such as marine plastics pollution (UNEP, 2007). They have the potential to be powerful tools in influencing how much plastics is consumed, and how people deal with the plastics after consumption (STAP, 2016; Willis et. al., 2017; IUCN, 2017; Chen, 2011; Xanthos and Walker, 2017; Bergmann et. al., 2017). By fostering a low waste society, you reduce the input of solid waste and thus plastics, into the natural environment (Chen, 2011; STAP, 2016; Willis et. al., 2017; Andrady, 2003; Loehr et al., 2017; Le Guern, 2018). Education and awareness campaigns have in some cases proven to be even more effective than incentives and other reduction policies (Willis et. al., 2017). Strategy element number 1 in the Honolulu strategy specifically also highlights the importance of conducting “education and outreach on marine debris impact and the need for improved solid waste management” as a key element to achieve the reduction of marine plastics pollution from land-based sources (Honolulu Strategy, 2011, p.ES2). This sub-criterion will therefore assess whether the country analysed has initiated national education campaigns on land-based sources to marine plastics pollution.

Behaviour-changing measure 2: Existence of container deposit legislation (CDL) as an economic incentive to recycle plastic bottles (Yes/No)

Plastic bottles and their accompanying bottle caps are two of the most common plastic items in the marine environment worldwide. On Ocean Conservancy's International Coastal Cleanup campaign 2017, plastic bottles were the 2nd most, and plastic bottle caps the 4th most common item found in the marine environment, both by the coast and at the open sea (Ocean Conservancy, 2017).

The core policy that facilitates for the recycling of bottles is popularly referred to as container deposit legislation (CDL), and has proven to be one of the most effective tools a government has to significantly reduce the input of bottles into the marine environment (Schuyler et. al., 2018; IUCN, 2017; UNEP, 2016; Chen, 2015). Having a recycling system set up through the implementation of CDL would limit the chances of plastic bottles and their caps being improperly disregarded and ending up in the oceans. By charging a small deposit fee on plastic bottles at the point of purchase, people are incentivised to deliver their empty plastic bottles at designated collection points for recycling. This economic incentive has proven to be highly effective, and is a popular solution to prevent the release of bottles into the marine environment in many European countries, as well as the U.S., and Australia (Schuyler et. al., 2018; IUCN, 2017; Viscusi et. al., 2012; European Commission, 2018). According to a European Commission report on circular economy, "The five best performing Member States with deposit schemes for PET bottles (Germany, Denmark, Finland, the Netherlands and Estonia) reached an average collection rate for PET of 94% in 2014" (European Commission, 2018, p.11). The policy has also been shown to reduce the number of bottles found in coastal waters with 40% (Schuyler et. al., 2018; STAP, 2011). Having an incentive to ensure recycling of plastic is also in line with Honolulu Strategy item number 2, which calls for countries to: "Employ market-based instruments to support solid waste management, in particular waste minimization" (Honolulu Strategy, 2011, p.ES2). This sub-criterion will therefore assess whether the country analysed has implemented CDL as an incentive to recycle bottles, or not.

Behaviour Changing Measure 3 – Are the 3Rs (Reduce, Reuse, Recycle) on MSW officially promoted by the government? (Yes/No)

As highlighted repeatedly in this text, proper waste management is key to combat leakage of plastics from land to the ocean. An overarching mind-set leading to proper waste management is the promotion of the 3Rs, which promotes reduction, reuse, and recycling (hence the three Rs) to minimise waste generation and maximise resource efficiency (COBSEA, 2008; Mohanty, 2011; Memon, 2010; UN, 2017). The 3R principle does not deliver a pre-defined set of rules and regulations that should be implemented, but rather functions as a theoretical, integrated approach on waste management. The idea is that the three Rs (reduce, reuse and recycle) on MSW will reduce environmental degradation and ensure sustainable development by being integrated into all policies and legislations related to production and consumption of goods that end up as solid waste (Mohanty, 2011; UN, 2017; Samiha, 2013; Memon, 2010).

Promotion of the 3Rs involves creating a society where everyone is a stakeholder of waste generation, from national and local governments, to the private sector, to the civil society. Stakeholder should not only think about reducing waste in all parts of their dealings, but should all contribute to take steps towards a circular economy (McDougall, 2018; Memon, 2010). The three Rs are especially valuable in protecting the environment in countries where

waste generation is growing, and where governments target economic growth through increased productivity, manufacturing and domestic consumption, which is the case in many developing countries in Asia (Liu, 2009; COBSEA, 2008; Mohanty, 2011; Samiha, 2013; Marshall & Farahbakhsh 2013; Shekdar, 2009; McDougall et. Al., 2008). Promotion of the 3Rs must be supported by targeted and specific legislation and policy making to be an effective tool (Memon, 2010). Examples of such policies could be the creation of regulation on the thickness of plastic shopping bags allowed to be produced, or a legislation on designing plastic packaging that can be reused for other purposes. As some of the other criteria in this text already consider targeted legislation, this criterion will just identify whether the country analysed promotes the 3R principle in its policy-making in general. To identify this, the author seeks to examine long-term plans, waste management legislation, and/or other strategy papers.

6.3 Summary of the Analytical Framework

Criteria	Sub-criteria	China	Indonesia	Philippines	Vietnam	Thailand	Malaysia
1. Preventive measures	Ban on microbeads in cosmetics and hygiene products (Yes/No)						
	Legislation on single-use plastic bags (Tax/Fee, Ban, Nothing)						
	Does the country ban smoking on beaches? (Ban / Partial Ban/ No Ban)						
2. Mitigating measures	Existence of an overarching national marine litter strategy and action plan (Yes/No)						
	Implementation of Extended Producer Responsibility (EPR) on plastic packaging (Yes/No)						
	Legislation on MSW at open landfills (Ban/No Ban)						
	Estimated waste-to-energy (WtE) capacity (in percentage)						
3. Removing measures	Existence of national debris monitoring programme (Yes/No)						
	Does the Government support and facilitate national clean-up initiatives (Yes/No)?						
4. Behaviour- changing measures	Does the country initiate national education campaigns on land-based sources to marine plastics pollution (Yes/No)						
	Existence of container deposit legislation (CDL) as an economic incentive to recycle plastic bottles (Yes/No)						
	Are the 3Rs (Reduce, Reuse, Recycle) on MSW officially promoted by the government? (Yes/No)						

Table 6 - Summary of the Analytical Framework (Table Made by the Author)

7 Case Studies

7.1 China

7.1.1 Preventive measures

Ban on microbeads in cosmetics and hygiene products (Yes/No)

Although an estimated 209.6 trillion plastic microbeads (equalling 307 tonnes) enter the global oceans from China every year, China has not taken any national political action to ban microbeads in cosmetics and hygiene products (Cheung and Fok, 2017; Honcoop, 2017). There were talks about a ban on microbeads in toiletries before the 2018 annual meeting of the National People's Congress (NPC) in March 2018, but the topic did not gain attention during the meeting (Wang, 2018).

Legislation on single-use plastic bags (~~Tax~~/Fee, Ban, Nothing)

China has chosen a two-sided approach in the combat against single-use plastic bags on a national level (Zhu, 2008; LawInfoChina, 2012; Zhu, 2011). The first one is the banning of plastic bags deemed too thin in a bid to push producers to produce more durable and reusable plastic bags (Zhu, 2008; Zhu, 2011). The second one is the implementation of fees on plastic bags to push for reduction of usage on the consumer side. The legislation dictating this two-side approach was enacted at the end of 2007, implemented in June 2008, and is named: “Administrative Measure for the Paid Use of Plastic Bags at Commodity Retailing Places” (Zhu, 2008; LawInfoChina, 2012; Zhu, 2011). Popularly called the “Plastic-bag ban” (PBB), the law prohibits the production, selling and consumption of plastic bags thinner than 0.0025mm, as well as free shopping bags at points of sale by enforcing that all shopping bags should be sold at above their production price at all retail outlets (Zhu, 2008; LawInfoChina, 2012; Xing, 2009; Xanthos & Walker, 2017). There are, however, widespread evidence that free shopping bags are given out for free at most smaller retailers and markets in both urban and rural China (Zhu, 2008). Implementation and enforcement of the legislation seems to be particularly weak in rural areas of China (William et. al., 2012; Zhu, 2008; Xanthos & Walker, 2017; Xing, 2009). Other studies, however, find that the two-sided approach has reduced the usage of plastic shopping bags by up to two-thirds in some areas of China (Zhu, 2011). Nonetheless, the country ultimately has enacted the legislation to reduce consumption of single-use plastic bags, and whether the legislation is successful or not depends on how much effort is put into enforcing it.

Does the country ban smoking on beaches? (~~Ban~~ / Partial-Ban/ No Ban)

China does not have a national ban on smoking cigarettes on beaches (Tobacco Control Laws, 2018a). The Chinese Ministry of Health has implemented a smoking ban in public spaces through the law *Implementation Rules on Regulations on Public Places Sanitation Administration* (Original: 公共场所卫生管理条例实施细则), but the law only mentions public places such as public indoor facilities, hotels, restaurants and bars, without mentioning beaches (Tobacco Control Laws, 2018; The Central People's Government of the Republic of China, 2011). Moreover, the existing smoking ban is not enforced through penalties and fines, which has resulted in most of the 300 million smokers in the country ignoring it completely in their daily lives (Hancock, 2015; Moore, 2011). Should China therefore extend the existing ban to also encompass beaches in the future, there are no guarantees that such a ban will be effective in its mission of removing cigarettes from the beaches until proper enforcement is in place.

7.1.2 Mitigating measures

Existence of an overarching national marine litter strategy and action plan (Yes/No)

China does not have an overarching national strategy and action plan that targets plastic and marine litter specifically (COBSEA, 2018). The country does, however, incorporate an overarching holistic national strategy on how to combat water pollution in the much wider umbrella policy called “*Action Plan for Prevention and Control of Water Pollution*” (COBSEA, 2018; China Water Risk, 2015). This action plan, also nicknamed the “Water Ten Plan” because of its list of ten specific measures, seeks to put forth targets, requirements, tasks, and measures to combat all types of water pollution, originating from all types of sources in China (China Water Risk, 2015). The Water Ten Plan specifies industries and producers that must monitor and control their emissions into waterways and the sea (Tan, 2015; China Water Risk, 2015). However, plastics and the plastic industry are not mentioned in the water ten plan (Tan, 2015; China Water Risk, 2015), and the author of this text would therefore categorise China as not having a marine litter strategy and action plan in place.

Implementation of Extended Producer Responsibility (EPR) on plastic packaging (Yes/No)

At the time of writing, China has not implemented EPR on plastic packaging (Luo and Wang, 2018; Wang and Peiry 2009). However, there have been recent talks about an upcoming revision of China’s existing *Solid Waste Environmental Pollution Prevention and Control Law* of 1995 to also include EPR on plastic packaging (Luo and Wang, 2018). In July 2018, China announced a proposed new article (Article 22) of the law solely on EPR and product and packaging recycling. This article would dictate liability and responsibility for recycling on plastic packaging producers, and thus create the legal foundation needed to implement EPR in the country (Luo and Wang, 2018). This amendment would follow a longer series of talks about EPR on plastic packaging in China. In January 2017, The State Council of China issued a plan on the implementation of EPR within 2025 (China Daily, 2017). According to the announcement, China will start planning its EPR in 2020 and targets full implementation within 2025 with the aim of recycling 50% of all solid waste (including plastic packaging) in the country (China Daily, 2017). However, since the policy has not yet been implemented, the author chooses to categorise China as not having EPR on plastic packaging.

Legislation on MSW at open landfills (~~Ban~~ / No Ban)

Although China increasingly looks at alternative methods to handle waste, landfills are still the main method to deal with municipal solid waste (MSW) in the country (Zhou et. al., 2017). Many of China’s landfills are located by the coast or close to waterways, and rampantly experience poor management and little maintenance (The Collective, 2015). The country seeks to diversify its handling of waste and aims at reducing its reliance on landfills drastically the next five year, but there are no talks about a specific legislation banning MSW at landfills at the time of writing (Guo, 2017).

Estimated waste-to-energy (WtE) capacity (35%)

As the country slowly moves away from landfills as the preferred mean of waste disposal, China’s waste-to-energy capacity has grown steadily for the past two decades (The Collective, 2017; Guo, 2017). China started intensifying its development of WtE capacity around year 2000, and currently has the largest capacity in the world in terms of volume of waste able to incinerate (Guo, 2017; Li et. al., 2016). The promotion of development and investment into WtE capacity was articulated in the country’s 13th five-year-plan, running

from 2016 to 2020 (Li et. al., 2016; The Collective, 2017; Gosens et. al., 2017). The 13th five-year-plan targets a 60% increase in WtE capacity in terms of electricity produced (from 4,7 Gigawatt to 7,5 Gigawatt) (Gosens et. al., 2017). In 2017, the country had 296 incineration plants in 28 of its 31 provinces, all of which burned 100 million tons of municipal solid waste in total, generating 35TWh of electricity (Guo, 2017). China's WtE capacity is currently estimated to cover 35% of disposed waste in the country, up from just under 10% in 2005 (Guo, 2017; Li et. al., 2016). The WtE capacity is increasing annually, and the current 5-year plan targets 50% WtE capacity by 2020, with estimates targeting 60% capacity by 2025 (Li et. al., 2016; Guo, 2017).

7.1.3 Removing measures

Existence of national debris monitoring programme (Yes/No)

China introduced a five-year national debris monitoring and research programme on marine plastics called “*National Key Research and Development Programme: Marine Microplastics Monitoring and Ecological Risk Assessment Technology Research Project*” in 2015 (Yan, 2018). The programme receives 4.6million USD, mostly through the central government, and is established to provide data for improved and informed decision making on microplastics and marine plastics (Yan, 2018). The programme is headed by a leading expert on marine plastics, Professor Li Daoji at the Plastic Marine Debris Research Center in East China Normal University and provides samples through physical sampling of water at 60 coastal cities as well as by the Yangze and Pearl river basins (Yan, 2018). Apart from this, the recently established Ministry of Natural Resources operates an annual monitoring programme (formerly operated by the State Oceanic Administration (SOA) until the new ministry was established in 2018) (Li, 2017; Wang et. al., 2017; NOWPAP, n.d; State Oceanic Administration, 2015). This annual monitoring programme has been held from September to October every year since 2007. Compounded data on monitoring is shared publicly online, together with annual publishing of reports on the quality of the marine environment, as well as information on the current status of marine litter, quantities, path, distribution, and negative consequences in China (NOWPAP, n.d.).

Initiation of national clean-up initiatives (Yes/No/Partly)

China has no centralised national clean-up initiative in place but collaborates with local Non-Governmental Organizations (NGOs) as well as provincial and local governments on their initiatives (CRAES, 2013; Shi, 2016). NGOs working with the marine environment are called ENGOS in China, and must be endorsed and affiliated to the *Ministry of Civilian Affairs* as well as the *Ministry of Natural Resources* to be allowed to operate in the country (CRAES, 2013). An example of a successful government-endorsed nationwide public marine litter clean-up is *Coastline Guardian*, which was established by two NGOs called Shenzhen Mangrove Wetlands Conservation Foundation (MCF) and Shanghai Rendu Ocean in 2014 (Shi, 2016). China also supports international clean-up campaigns, the most prominent of which is the annual International Coastal Cleanup (ICC) Campaign created by the Ocean Conservancy - an American NGO, but hosted by Shanghai Rendu Ocean in China (Ocean Conservancy, 2017; NOWPAP, n.d.; CRAES, 2013). The country has taken part in the ICC every year since 2007 (NOWPAP, n.d.). 5,525 people from China participated in last year's ICC 2017, which is a small number compared to the total population of the country (Ocean Conservancy, 2017). To compare, Hong Kong Special Administrative Region, with less than 8 million inhabitants, had 76,000 participants in the campaign the same year (Ocean Conservancy, 2017). Despite these collaborations, however, the author would categorise

China as only partly having national clean-up initiatives, given that there are no regular nationwide initiatives hosted by the Chinese Government itself, and due to the restrictions in place on establishing ENGOs in the country.

7.1.4 Behaviour-changing measures

Does the country initiate national education campaigns on land-based sources to marine plastics pollution? (Yes/No).

There is a general lack of information on what kind of initiatives and campaigns China has established to educate the public on the marine litter problem. Public education and awareness of the marine plastics problem seems not to be a priority for the Chinese government, especially not on a national level (Wang and Lin, 2018). The country allows Environmental NGOs (ENGOs) to deliver public education campaigns and general information on the negative consequences of marine litter, but these campaigns are held locally and are dependent on the (limited) resources of ENGOs and are therefore not equivalent to national education campaigns hosted by the government (CRAES, 2013).

Existence of container deposit legislation (CDL) as an economic incentive to recycle plastic bottles (Yes/No)

There is no formal national container deposit legislation in place in China (Zhang and Wen, 2014). Although having no national policy on bottle deposits, there have been several local government trials and projects on bottle deposits, such as in Beijing, where passengers can pay for their train ride on the metro by recycling their bottles at selected stations (Schiller, 2014). The reason why no CDL is established in China could be because recycling of PET bottles mostly happens informally (without the supervision of any government agent) through an “army of trash collectors” that collects bottles from trashcans, the streets, and landfills, and sells the bottles to recyclers (Haas, 2017; Schiller, 2014; Zhang and Wen, 2014). These trash collectors may lead an important role in keeping the bottles out of the landfills and ensure recycling just like CDL would, but they do not change the behaviour of producers and consumers of plastic bottles (Haas, 2017; Zhang and Wen, 2014).

Are the 3Rs (Reduce, Reuse, Recycle) officially promoted by the government? (Yes/No)

China’s promotion of the 3Rs of MSW is integrated into a much larger vision of turning the economy from a linear to a circular one, where the goal is to create an economy where the country’s limited resources are brought back into the economy again after consumption and disposal (McDowall et. al., 2017; Thieriot, 2015). China’s *Circular Economy Promotion Law* of 2008 particularly highlights 3R promotion as a key national strategy to achieve future sustainable growth in production and consumption in the country (McDowall et. al., 2017; National People’s Congress, 2008; Zhu, n.d.). The Law and its promotion of the 3Rs have both been emphasised in the country’s two most recent five-year plans (the 12th Five-Year Plan 2011-2015, and the 13th Five-Year Plan 2016-2020), as well as in established *Circular Economy Development Strategies Action Plan*, which lists tangible deliverables and targets to achieve the mission of the 2008 Law (National Development and Reform Commission PRC, 2016; Zhu, 2008; McDowall et. al., 2017). China’s promotion of the 3Rs of MSW are directed mostly towards the producing industry (private and state-owned companies) and to the local government and does not include the consumers (general public) (Thieriot, 2015; National People’s Congress, 2008).

7.2 Indonesia

7.2.1 Preventive measures

Ban on microbeads in cosmetics and hygiene products (Yes/No)

Indonesia joined the United Nations Environment Programme's Clean Seas campaign in February 2017 and has thus pledged to join other signatories of the campaign in eliminating the use of microbeads in toiletries (UNEP, 2017b). However, adding microbeads in cosmetics and hygiene products is still legal in Indonesia, and there has been no political discussion on the possibilities of an upcoming ban on national level at the time of writing (5Gyres, 2018).

Legislation on single-use plastic bags (Tax/Fee, Ban, Nothing)

Through its comprehensive plan of reducing marine litter by 70% by 2025, Indonesia has pledged to reduce the usage of single-use plastic shopping bags with 30% within 8 years (Ompusunggu, 2018; Hutt, 2018). The country has chosen a tax/fee approach to reach this goal and was supposed to start exercising taxes not exceeding IDR200 (USD0.014) on single-use plastic bags from July 2018 (Normala, 2018; Indonesia-Investments, 2017). Entering July 2018, however, and the tax was not implemented (Gokkon, 2018). The reason why it was not implemented could be because there is a great deal of discussion around whether the tax will be successful in decreasing demand for single-use plastic bags in the country (Rokkon, 2018; Black, 2016). Officials say that a three months' pilot project with IDR200 tax per plastic bag in 23 selected cities in 2016 decreased consumption by between 40 and 55% (Black, 2016; Gokkon, 2018). Opposition to the tax range from NGOs, who highlight that they think the tax is too low, and would thus not change the behaviour of consumers, to the plastic industry, who argue that any tax – either on consumers or producers of plastic bags would eventually hurt the industry (Gokkon, 2018; Black, 2016). Possibly admitting the failure to implement the planned July 2018 tax, Indonesian lawmakers announced in August 2018 that they are drafting a new regulation that will incentivise producers to produce environmentally friendly plastic bags, rather than hitting consumers with a tax per bag consumed (Jakarta Post, 2018). The new regulation is set to be enacted and implemented by 2019 (Jakarta Post, 2018). At the time of writing, however, the country has not implemented legislation on single-use plastic bags.

Does the country ban smoking on beaches? (Ban / Partial Ban/ No Ban)

Indonesia has an overarching national ban on smoking in public places, such as schools, hospitals, playgrounds, and places of worship (Ministry of Health Republic of Indonesia, 2011; Tobacco Control Laws, 2018b). This national ban, however, does not extend to beaches (Tobacco Control Laws, 2018b). The national law also functions more as a guidance, and must be supported by locally enacted laws, which has proved resource intensive to implement in many cases (Tobacco Control Laws, 2018b). This could put a restraint on the speed of implementation should beaches be included in a national ban in the future.

7.2.2 Mitigating measures

Existence of an overarching national marine litter strategy and action plan (Yes/No)

Indonesia announced a *National Plan of Action on Combating Marine Plastic Debris* in May 2017 (The Government of the Republic of Indonesia, 2017). The plan covers an eight-year

period from 2017 to 2025, and specifically highlights five pillars on how the country wants to curb the outflow of marine plastic pollution. Out of these five pillars, four are relevant to land-based sources of marine plastic pollution: 1) behaviour change, 2) reduction of land-based leakage, 3) reduction of production and consumption, and 4) improved waste management and infrastructure (The Government of the Republic of Indonesia, 2017). The fifth pillar seeks to reduce sea-based leakage of plastics. The plan of action lays the foundation for how the Indonesian government will work locally, nationally and internationally to combat marine plastic debris, but does not articulate any specific measures or goals in this pursuit (The Government of the Republic of Indonesia, 2017). The plan is headed and enforced by the “Coordinating Ministry of Maritime Affairs”, which oversees the execution of the plan by 11 ministries (The Government of the Republic of Indonesia, 2017).

Implementation of Extended Producer Responsibility (EPR) on plastic packaging (Yes/No)

Producers of goods are, according to Paragraph 2 in Article 22 of Law number 18/2008 (*The Act Regarding Waste Management*), obliged to take steps to reduce solid waste generation already at the time of production (The Act Regarding Waste Management, 2008; Indll, 2013; Sulami et. al., 2017). Implementation of Article 22 is supported by Government Regulation 81/2012 (regarding the implementation of the reduce, reuse, and recycle (3R) concept through waste banks) and Government Regulation 81/2012 (regarding household waste management), which both create a roadmap for producers in Indonesia to implement EPR concepts within a 10-year period and thus force producers to be responsible for waste, as opposed to the consumers (Damanhuri, 2017; Indill, 2013). However, Extended Producer Responsibility has not yet taken form on a national level at the time of writing, and there are no concrete plans to draft legislation to pursue it at the time of writing (Indll, 2013; Sulami et. al., 2017).

Legislation on MSW at open landfills (~~Ban~~/ No Ban)

70% of Indonesia’s municipal solid waste (MSW) is sent to open landfills (Rawlins et. al., 2014; Global Recycling, 2017). Although there is no legislation banning plastics at open landfills in Indonesia, Indonesian Law number 18/2008 (*The Act Regarding Waste Management*) requires all new landfills to be equipped with integrated processing, sorting and recycling facilities, which could keep plastics away from the landfills (Rawlins et. al., 2014). Also, the country aims at closing down most of their open landfills in the foreseeable future, by requiring local governments to decommission open landfills through the enacted national Law 18/2008 (Rawlins et. al., 2014). This could limit the amount of plastics leaking into the natural environment through open landfills, but does not equal a national ban on MSW at open landfills.

Estimated waste-to-energy (WtE) capacity (20%)

There is a strong political drive in Indonesia to increase the capacity of WtE to fulfil the country’s goal of being free of waste by 2020 (Jong, 2017; Global Recycling, 2017). However, the ambition has met strong opposition from the civil society, which calls for investigation into possible health and environmental effects of WtE plants (Rawlins et. al., 2014). An example of this opposition is that the Supreme Court annulled Presidential Regulation (18/2016) on “the acceleration of the development of waste-based power plants or incineration” after outcry from civic groups in 2016 (Global Recycling, 2017). Indonesia’s current installed waste-to-energy capacity is almost 40%, but only an estimated maximum of only 20% of the capacity is in use to incinerate MSW (Rawlins et. al., 2014).

7.2.3 Removing measures

Existence of national debris monitoring programme (Yes/No)

There is currently no national, centralised monitoring programme for marine debris or marine plastic pollution in existence in Indonesia (Sur et. al., 2018). There is a general lack of centralised data on how much, from what source, and what type of marine litter is present in Indonesian waters, which in return makes decision-making difficult (Indraningsih, 2010; Walton et. al., 2003). The country has, nonetheless, emphasised monitoring as an important strategy to reduce land-based leakage of plastics into the oceans in the 2017 National Plan of Action on Combating Marine Plastic Debris (The Government of the Republic of Indonesia, 2017; Burhanuddin, 2017). In other words, a monitoring programme could be under development although not finalised and established at the time of writing.

Initiation of national clean-up initiatives (Yes/No)

Out of the 1 billion USD per year for four years committed by the Indonesian government to combat marine plastic pollution, a significant portion will go to clean-up initiatives (UN Ocean Conference, 2017; Langenheim, 2017). The 2017 *National Plan of Action on Combating Marine Plastic Debris* highlights clean-up as important measures in the combat against marine plastic pollution, but focus seems to lay more on the aesthetic aspects of clean-ups (for tourism) rather than the ecological benefits of this measure (The Government of the Republic of Indonesia, 2017). Nonetheless, clean-ups are held regularly throughout the whole country. To perform these clean-ups, the Indonesian government either teams up with different initiative takers, such as NGOs or the private sector, or initiates their own clean-ups through the Ministry of Environment and Forestry (MEF), the Ministry of Maritime Affairs and Fisheries, or the Indonesia Navy (Burhanuddin, 2017).

7.2.4 Behaviour-changing measures

Does the country initiate national education campaigns on land-based sources to marine plastics pollution (Yes/No)

The public general understanding of the negative consequences of single-use plastics and how plastic affects the marine environment when thrown away without proper waste management is poor throughout the country (Langenheim, 2017; Sur et. al., 2018). Out of the annual 1 billion USD pledged by the government to combat marine plastic pollution, the government will set aside money to finance local and national education campaigns throughout the country (Sur et. al., 2018; World Bank, 2018d). Moreover, to improve public understanding of the issue of marine plastic pollution, Indonesia has decided to integrate the issue of marine plastic debris into the curriculum of its national education from 2017 and onwards (UN Ocean Conference, 2017). The Indonesian government has also teamed up with two of the country's largest Islamic organizations, namely Nahdlatul Ulama (NU) and Muhammadiyah, to raise awareness about plastic waste and the negative consequences of single-use plastics to their more than 100 million followers throughout the country (Hutt, 2018; Ompusunggu, 2018).

Existence of container deposit legislation (CDL) as an economic incentive to recycle plastic bottles (Yes/No)

Indonesia does not have container deposit legislation on plastic bottles (Damanhuri, 2017). The government considered an implementation of a tax of 0.014USD per bottle sold, but this suggestion never materialised into legislation (Rachman and Schonhardt, 2016; Damanhuri,

2017) Moreover, a one-off tax on bottles sold would most likely not be comparable to a container deposit legislation, since this legislation requires an interplay between the government and producers of plastic bottles to ensure that consumers are persuaded that they will get the deposit back by delivering bottles at collection points (Bottlebill, n.d.). The current system of bottle recycling in Indonesia builds on informal recycling through waste pickers, who get paid a certain price per bottle returned to waste collecting stations for recycling (Damanhuri, 2010; Damanhuri and Padmi, 2012; Chaerul et. al., 2013; Damanhuri, 2017). This system, however, does not necessarily motivate consumers to recycle and thus does not function as a behaviour-changing measure in the long term.

Are the 3Rs (Reduce, Reuse, Recycle) on MSW officially promoted by the government?

(Yes/No)

3R promotion is a key strategy for Indonesia to reach its 2025 clean-from-waste strategy (Waste4Change, 2018). Indonesia clearly highlights 3R promotion in two of its key waste management documents, namely *Government Regulation no. 81/2012 regarding Household Waste Management and Household-like waste*, and *President Regulation No.97/2017 on Policy and National Strategy of MSW* (The Drafting Committee of the State of the 3Rs in Asia and the Pacific; 2018). Government regulation no. 81/2012 repeatedly calls for the promotion of the 3Rs on a general basis in all waste management practices nationwide, while President Regulation No.97/2017 establishes clear targets on reducing waste with 30% and to process and manage at least 70% of the waste generated by 2025 (Ministry of Environment and Forest Indonesia, 2012; Ministry of Law and Right Indonesia, 2017). President Regulations in Indonesia are national strategy policies in the country, and thus call for full support from all 31 ministries in the country to work towards the goal (Waste4Change, 2018). In other words, promotion of the 3Rs of MSW is key in all parts of the government's dealings. Apart from this, the country also articulates 3R promotion as a principle approach on waste management through Law No. 18/2018 (The Drafting Committee of the State of the 3Rs in Asia and the Pacific; 2018). One of the key practical measures to support the expedition of 3R promotion is the establishment of *Integrated Waste Management Facility for Reduce-Reuse-Recycle Purpose* (TPST 3R), which encourages proper waste disposal from consumers, and ensures proper waste management in urban areas (Waste4Change, 2018).

7.3 The Philippines

7.3.1 Preventive measures

Ban on microbeads in cosmetics and hygiene products (Yes/No)

The Philippines does not have a ban in place on microbeads in cosmetics and hygiene products (The Manila Times, 2017; Romero, 2018; Felongco, 2016). However, both civil society and lawmakers are pushing for implementing a ban in the near future (Felongco, 2016; Pazzibugan, 2016). The push for a ban was initially led by two NGOs called The EcoWaste Coalition and Oceana Philippines, who in 2016 challenged lawmakers to implement a ban after the U.S. drafted their ban in 2015 (Pazzibugan, 2016). By 2017, 48 other NGOs and organizations had joined the push, which reached the top level of politics in the country by 2018, with Senator Loren Legard taking a leading role in facilitating for a ban at the Senate of the Philippines (Romero, 2018; The Manila Times, 2017). The so-called “Legard Bill” on the banning of microbeads may be underway within the end of 2018 (Romero, 2018). However, at the time of writing, no ban was in place.

Legislation on single-use plastic bags (Tax/Fee, Ban, Nothing)

The Philippines does not have a national legislation on single-use plastic bags, but legislation is developed and enacted primarily by the country’s local government, also called Local Government Units (LGUs) (Slack, 2018; Plastic Bags Regulation Act of 2013). Similar to the case of microbeads, Senator Loren Legard has been active in establishing and pushing for political dialogue on the topic of plastic bags nationally. Senator Legard filed the first bill on plastic bags in Philippines in March 2011, called *Total Plastic Bag Ban Act*, but the bill was never enacted by the Congress (Senate of The Philippines, 2011). Nonetheless, the push for legislation on single-use plastic bags continued in the country, with suggested bills on plastic bag bans in 2013, 2014, and 2015, none of which were enacted (Senate of the Philippines, 2018). Although lacking a national legislation on the issue, several Local Government Units (LGUs) such as municipalities/cities and provinces have enacted their own local legislation on plastic bags (Plastic Bags Regulation Act of 2013; Duboise, 2012; Fabro, 2017; Cimat, 2017). The capital, Manila, enacted its own law in 2012 called City Ordinance 8282, which prohibits the use of plastic bags on dry goods and puts restrictions on their usage for wet goods (Manila Standard, 2017). However, the enforcement of the law seems to be lacking six years after its implementation (Villanueva, 2017; Manila Standard, 2017). This seems to also be the case in other municipalities (Fabro, 2017; Cimat, 2017).

Does the country ban smoking on beaches? (Ban / Partial Ban/ No Ban)

The Philippines does not include beaches in any of its national laws on smoking in public places, although some local municipalities have smoking bans on beaches in place (Tobacco Control Laws, 2018c; Adel, 2016). The son of Philippines’ current president Rodrigo Duterte and Davao City Vice Mayor, Paolo Duterte, has expressed his desires for a national ban on smoking on beaches in a bid to save the country’s beaches (Adel, 2016). He could have some leverage on his father, but such a ban would still need to pass through the formal national political channels before an implementation would be in place.

7.3.2 Mitigating measures

Existence of an overarching national marine litter strategy and action plan (Yes/No)

The Philippines does not have an overarching national marine litter strategy and action plan (COBSEA, 2018). Nor does the country have a single agency that has the specific mandate on marine debris prevention and control (COBSEA, 2018; APEC, 2017). This hinders the ability of the country to develop policy to address the issue of marine plastic pollution, as well as the ability to enforce enacted laws targeting marine debris and waste management (APEC, 2017).

Implementation of Extended Producer Responsibility (EPR) on plastic packaging (Yes/No)

The Philippines has not implemented Extended Producer Responsibility (ER) on plastic packaging (Federigan, 2018; Slack, 2018). There is an ongoing discussion on whether EPR should be included into the country's leading law on waste management called *Ecological Solid Waste Management Act of 2000* (Republic Act 9003) as an alternative sustainable solution to cope with the country's growing volume of municipal solid waste (MSW) (Federigan, 2018; Lawphil, 2001). However, at the time of writing, no formal implementation of EPR has been enacted.

Legislation on MSW at open landfills (~~Ban~~/No Ban)

The Philippines relies heavily on open landfills, despite the country's efforts in decreasing its dependability on this method of managing municipal solid waste (MSW) (Van Ryan, 2017). Particularly pressing is the issue of using open dumpsites and unsanitary landfills, because they are illegal in the country according to what was considered a landmark law from 2000 called *The Ecological Solid Waste Management Act* (Officially called the Republic Act 9003) (Van Ryan, 2017; Song, 2017; Sapuay, 2005; Environmental Management Bureau, 2015). The Act aimed for landfills and dumpsites to either be closed or transition into sanitary and controlled landfills within 2010 (Sapuay, 2005; Environmental Management Bureau, 2015). The Philippines thus has a half-way ban on landfills and dumpsites through the ban of the type of landfill and dumps that cause the most harm to the marine environment. However, the government struggle to enforce the law, and 17 years after the law was passed (and 7 years after the deadline), the reliance on and existence of unsanitary landfills and open dumps have changed very little in the country (Van Ryan, 2017; Song, 2017). The author could not find a specific law targeting MSW on open landfills in the country.

Estimated waste-to-energy (WtE) capacity (0%)

Unlike in many developing countries where incineration/WtE is seen as a prospective alternative to landfills as means to manage waste, incineration/WtE is not an option in the Philippines. Waste incineration has been banned in the Philippines since 1999 through the implementation of the *Philippine Clean Air Act of 1999* and the *Ecological Solid Waste Management Act of 2000* (Geronimo, 2017). Article 3, Section 20 in the Clean Air Act of 1999 bans incineration of all types of municipal, biomedical and hazardous waste, due to the possible toxic fumes incineration emits (The Philippine Clean Air Act of 1999; Geronimo, 2017). The Ecological Solid Waste Management Act highlights that waste incineration should be excluded as a policy to deal with solid waste in the country (Ecological Solid Waste Management Act of 2000). This means that any waste-to-energy installation is illegal in the Philippines, and the country thus has no waste-to-energy capacity at present (Geronimo, 2017). It came as a surprise, therefore, that the Philippine Department of Energy (DoE) in April 2018 decided to invest in the country's first WtE-facility in Puerto Princesa City despite the ban on incineration (Manila Standard, 2018). This decision has been met with heavy criticism and opposition, since it effectively will be illegal according to Philippine Law

(Mayuga, 2018; Geronimo, 2017).). The DoE, backed by President Rodrigo Duterte, argues that WtE facilities are imperative in handling the country's growing waste issue, as well as an important step in the pursuit of a zero-waste future (Mayuga, 2018; Department of Energy, 2018; Geronimo, 2017). The facility under construction is not yet operative, and leaves the country with 0% WtE capacity at the time of writing.

7.3.3 Removing measures

Existence of national debris monitoring programme (Yes/No)

The Philippines does not have a centralised national debris-monitoring programme, and lacks systematic data gathering or research efforts on the issue (Apec, 2017). In general, there has been performed very little research on the presence, sources, and consequences of marine debris pollution in Philippines (Abreo, 2018; Laciste, 2007). Out of the 1,756 published scientific articles on marine debris found on LITTERBASE, only three were focused on the Philippines (Abreo, 2018; LITTERBASE/AWI, 2018) Although clean-up initiatives provide some data on the issue, lack of centralised monitoring and long-term research limits the ability and capacity of lawmakers to take informed decision on the issue of marine plastic pollution (Abreo, 2018; Laciste, 2007).

Initiation of national clean-up initiatives (Yes/No)

The Philippine Government hosts a clean-up event called National Clean Up Day the third Saturday of September annually (Philippine News Agency, 2017). This event coincides with the International Coastal Cleanup Campaign (ICC), and is initiated and organised by the Philippine Department of Environment and Natural Resources (DENR) in coalition with Local Government Unites (LGUs), NGOs, the private sector and universities (Philippine News Agency, 2017). The event was established through Presidential Proclamation number 244 in 1993, which called for a national clean-up day in the third week of September every year under the establishment of September as the annual "National Clean-up Month" (Medina, 2016; Republic of the Philippines, n.d).

7.3.4 Behaviour-changing measures

Does the country initiate national education campaigns on land-based sources to marine plastics pollution (Yes/No/Partly).

Filipinos have a low level of awareness of the cause and effect of marine plastics pollution from land-based sources (APEC, 2017). The Philippine Government acknowledges this and has initiated several initiatives to improve awareness of the problem (APEC, 2017). One initiative promotes the introduction of a waste management curriculum in schools at all levels nationally to increase awareness of plastic consumption and to push for recycling (APEC, 2017). The National Clean-up Month of September every year also seeks to intensify training, education and awareness of sources of marine debris pollution to (Republic of the Philippines, n.d).

Existence of container deposit legislation (CDL) as an economic incentive to recycle plastic bottles (Yes/No)

The Philippines does not have a nationwide container deposit legislation in place, although a bill to establish one is under review at committee level at the Philippine Senate (Pena, 2018). The bill, filed by Senator Joel Villanueva in 2016 is called "An Act Requiring the

Implementation by Brand Owners of Management Plans that Provide Refund Values for Certain Beverage Containers" (Senate Bill No. 1032) (Senate of the Philippines, 2016; Pena, 2018). Senate Bill 1032 is a push for the government to implement a nationwide bottle deposit system with a proposed deposit/refund value of PHP 10 (0,20 USD) (Senate of the Philippines, 2016). However, the bill is still pending review at the committee level at the time of writing (Senate of the Philippines, 2016; Pena, 2018).

Are the 3Rs (Reduce, Reuse, Recycle) on MSW officially promoted by the government?

(Yes/No)

The Philippines national government promotes 3Rs but has not made this an official strategy of waste management by including it in its main waste management law *Ecological Solid Waste Management Act of 2000* (Republic Act 9003 (RA9003)) (Lawphil, 2001; The Drafting Committee of the State of the 3Rs in Asia and the Pacific; 2018). RA9003, however, repetitively uses words such as reduce, reuse and recycle of MSW, but without mentioning them as a combined strategy (Lawphil, 2001). Moreover, promotion of the 3Rs were highlighted as key solutions to reduce the country's waste issues in the country's National Solid Waste Management Strategy (2012-2016) (Republic of the Philippines, 2012). Waste management initiatives are mostly left to the Local Government Units (LCU) in Philippines to implement, and this seems to be the case also for the 3Rs (Sañez; n.d.; The Drafting Committee of the State of the 3Rs in Asia and the Pacific, 2018). The country is, however, currently developing targeted, national 3R policy and regulation on MSW (The Drafting Committee of the State of the 3Rs in Asia and the Pacific, 2018). Although the Philippines' approach to promoting the 3Rs for MSW is not as clear cut and well communicated in its current policy papers (much because of the government model with LCUs), the author will categorise the country as a promoter of the 3Rs on a national level.

7.4 Vietnam

7.4.1 Preventive measures

Ban on microbeads in cosmetics and hygiene products (Yes/No)

Vietnam does not have a ban on microbeads in cosmetics and hygiene products (Marsden, 2017; Beat the Microbead, 2018). There is a general lack of information on Vietnam's policy on microbeads. The author of this text also found no information about whether there is an ongoing political discussion on a future ban of using microbeads in cosmetics and hygiene products, or not.

Legislation on single-use plastic bags (Tax/Fee, Ban, Nothing)

Vietnam does not have a tax/fee or ban on single-use plastic bags in place (Nguyen, 2017). To deal with the increased consumption of plastic bags in the country, the Vietnamese Ministry of Finance is considering the implementation of a higher environmental tax on the production of plastic bags (Nguyen, 2017; Lan, 2017). The suggested increased tax will range between VND40,000 to VND 0,000 (1,7USD to 3,5USD) per kilogram of plastic bags produced (Nguyen, 2017; Lan, 2017). The suggested increase has been met with opposition by the Vietnam Chamber of Commerce and Industry (VCCI), who represents thousands of Vietnamese businesses countrywide (VnExpress, 2017). VCCI has argued that the government should tax plastic bags individually to consumers. They also state that a tax per kilogram produced would push producers to produce thinner plastic bags, which would ultimately be contradicting the government's intention of reducing plastic bags in circulation for a cleaner environment, since they are less cost effective to recycle and less durable (VnExpress, 2017; Nguyen, 2017). On a recent note, however, Tran Hong Ha, Minister of Natural Resources and Environment in Vietnam, gave promises to the former UN Environment Chief Erik Solheim of ceasing production of all single-use plastic bags in the near future, during the sixth Global Environment Facility Assembly (GEF 6) in Danang, Vietnam June 2018 (Phuong, 2018). This is also in line with the 2009 "National Strategy on Integrated Solid Waste Management to 2025, vision to 2050", which targets a step-wise reduction of single-use plastic bags (The Socialist Republic of Vietnam, 2009). The 2009 National Strategy Document targets a 65% decrease in the use of plastic bags by 2020, and 85% by 2025 (Nguyen, 2017; The Socialist Republic of Vietnam, 2009)

Does the country ban smoking on beaches? (Ban / Partial Ban/ No Ban)

Vietnam has not included a specific mentioning of smoke-free beaches in its national law on smoking in public places (Tobacco Control Laws, 2018d; Socialist Republic of Viet Nam, 2012). The author of this text could also not find any evidence that an extension of current smoking-laws to include beaches, or a new law on smoke-free beaches, currently are being discussed politically.

7.4.2 Mitigating measures

Existence of an overarching national marine litter strategy and action plan (Yes/No)

Vietnam does not have an overarching national marine litter strategy and action plan (COBSEA, 2015). The country does include elements of a strategy needed to curb the outflow of plastic into the marine environment in its "National Strategy on Integrated Solid Waste

Management to 2025, vision to 2050”, however, this strategy is not dedicated to the specific issue of marine debris pollution (Socialist Republic of Vietnam, 2009).

Implementation of Extended Producer Responsibility (EPR) on plastic packaging (Yes/No)

Although there have been talks about an implementation for the past few years, Vietnam has currently not implemented Extended Producer Responsibility (EPR) on plastics (Nguyen, 2017). The 2005 Law on Environmental Protection introduced the concept of EPR and the need for producers to take responsibility for the recycling of their products (Nguyen, 2017). The concept of EPR was further supported in 2015 through Prime Minister Decision 16/2015/QĐ-TTg on “take-back and treatment of discarded products” (Nguyen, 2017). However, the author of this text is uncertain about whether the concept of EPR has further developed into concrete plans for legislation in the country since then.

Legislation on MSW at open landfills (~~Ban~~/No Ban)

Landfills are the main disposal method for municipal solid waste in Vietnam, and open landfills are not banned (Nguyen, 2017). The exact number of landfills and the percentage of reliance on them for dumping MSW is debated. The Vietnamese Ministry of Construction (MOC) states that the country has 660 open landfills, holding 76-82% of total collected MSW (Nguyen, 2017). Meanwhile, according to a report made by the Japan International Cooperation Agency (JICA) on solid waste in Vietnam, Vietnam has a total of 573 open landfills, holding a maximum of 56% of MSW collected in the country (Nguyen, 2017). Nonetheless, there is little argument that the country relies on landfills for its MSW, a fact that the government seeks to change in the long-term. The Vietnamese government released a *National Strategy on Integrated Solid Waste Management to 2025, vision to 2050* in 2009, which targets an 85% recycling, reuse and recovery rate of MSW by 2020 (The Socialist Republic of Vietnam, 2009). This could be a response to the country’s massive waste generation growth the past decade, with a doubling in MSW generated from 2004 to 2015 (Dezan, 2018). Meanwhile, however, there is no ban on MSW at open landfills in place, and the strategy does not articulate whether bans or closures of open landfills are aimed for in the process of reaching the targeted recycling, reuse and recovery rate.

Estimated waste-to-energy (WtE) capacity (0,1%)

Development of WtE capacity has not been a key strategy for the Vietnamese government in its efforts in tackling the country’s growing solid waste issues (Nguyen, 2017; COBSEA, 2015). The country currently has one dedicated WtE plant and 44 incinerators (that do not produce energy). The country had an investment approved on a second WtE facility in the Mekong Delta by the Asian Development Bank in February 2018, but exact details on its capacity and expected year of completion has not been made publicly available yet (Dezan, 2018). The plant currently operating has a capacity 75 tons of burned waste a day, or 27,375 tons a year (Dezan, 2018). This capacity divided by the 28 million tons of waste generated by Vietnam yearly, gives the country a WtE capacity of 0,1% (Dezan, 2018). To realise the benefits of WtE, the Vietnamese capacity needs to be much higher, which would require infrastructure and technology investments much greater than the country can currently achieve with its current waste management finances (Nguyen, 2017).

7.4.3 Removing measures

Existence of national debris monitoring programme (Yes/No)

There is no national marine debris monitoring programme established in Vietnam (COBSEA, 2015). The data gathered on marine litter are in most cases used for commercial projects and

technological capacity, and there is no accumulation and compilation of data on the sources and presence of marine litter for scientific monitoring purposes (COBSEA, 2015). Out of the 821 published scientific articles on distribution of marine litter on LITTERBASE's compiled data, no article is focused on Vietnam (LITTERBASE/AWI, 2018). This is also the case for the compiled data from 1,065 articles on the effects of marine debris (LITTERBASE/AWI, 2018).

Initiation of national clean-up initiatives (Yes/No)

The Vietnamese government does not initiate its own national clean-up initiatives (COBSEA, 2015). Clean-ups have mostly been initiated and organised by Vietnamese and international NGOs, which have organised the participation of Vietnam in the International Coastal Clean-up Campaign (ICC) since 2000 (COBSEA, 2015; United Nations, 2016; Nguyen and Fabres, 2018). The yearly ICC events in Vietnam involve local communities, students, youths, and government agencies, with the private sector recently also starting to take part (Nguyen and Fabres, 2018). Although being held annually, real participation is low compared to the population of Vietnam, with 1,181 participants in ICC 2017 (Ocean Conservancy, 2017). This number equals less than 0,0013% of the country's total population of 95 million people the same year (Trading Economics, 2018).

7.4.4 Behaviour-changing measures

Does the country initiate national education campaigns on land-based sources to marine plastics pollution (Yes/No)

Vietnam does not initiate national education campaigns on land-based sources to marine plastics pollution, or marine debris in general. Awareness of marine debris and land-based sources to marine plastics pollution in general is poor (COBSEA, 2015). The country has distributed and propagated information to its citizens and tourists on environmental protection, but not on marine debris specifically (United Nations, 2016). The 2009 “*National Strategy on Integrated Solid Waste Management to 2025, vision to 2050*” articulates that education on plastic bags and littering will be brought into the national curriculum at schools (The Socialist Republic of Vietnam, 2009), but it is uncertain whether this will include the topic of marine pollution or not.

Existence of container deposit legislation (CDL) as an economic incentive to recycle plastic bottles (Yes/No)

Vietnam does not have a container deposit legislation in place to incentivise recycling of plastic bottles (Bottle Bill Resource Guide, 2018). Moreover, the author could not find a single source discussing a possible implementation of a container deposit legislation in Vietnam, neither in news, official statements, or in scientific articles.

Are the 3Rs (Reduce, Reuse, Recycle) on MSW officially promoted by the government? (Yes/No)

Vietnam announced in 2009 that they will collect 95%, and reuse and recycle as much as 60% of all its Municipal Solid Waste (MSW) by 2020 (Vietnam News, 2009). These goals were also inscribed into the 2009 *National Strategy on Integrated Solid Waste Management to 2025, vision to 2050* (The Socialist Republic of Vietnam, 2009). The ambition of reduction, reuse and recycling by 2020 was supposed to be supported by the creation of a national plan on 3R promotion in cooperation with the Japanese International Cooperation Agency (JICA) (Nguyen, 2009; Sakai et. al., 2011). Somewhere along the line, however, the process to

develop this plan seems to have stopped, since no national plan on 3R promotion has been released yet, at the time of writing, 8 years later. Moreover, the author could not find any recent policy documents or waste management plans that highlight 3R promotion as a key strategic initiative to manage waste, and would therefore categorise Vietnam as a country that does not officially promote the 3Rs.

7.5 Thailand

7.5.1 Preventive measures

Ban on microbeads in cosmetics and hygiene products (Yes/No)

Thailand has not banned microbeads in cosmetics and hygiene products (Beat the Microbead, 2018; APEC, 2017). The author of this text could not find any indications that the Thai government has discussed a future ban on microbeads, although it has acknowledged that it knows the consequences of microbeads in toiletries (APEC, 2017).

Legislation on single-use plastic bags (~~Tax~~/Fee, ~~Ban~~, Nothing)

Thailand does currently not have any national legislation on single-use plastic bags. The country has seen a rapid increase in single-use plastic bags nationwide in the past few years, with Bangkok having the highest average daily consumption in the country with 8,7 plastic bags per capita per day (Chantanussornsiri and Jitpleeheap, 2018). The Thai Government has acknowledged that the rapid rise in consumption of plastic bags will put pressure on existing waste management infrastructure as well as pose a possible threat to the environment, and is currently discussing what kind of legislation it should implement to reduce the consumption (Chantanussornsiri and Jitpleeheap, 2018; Thai PBS, 2018). Legislation discussed range from taxation per plastic bag, to taxation of producers, to replacing regular plastic bags with biodegradable ones (Chantanussornsiri and Jitpleeheap, 2018). The Thai government has already done pilot projects on temporary and regular bans on plastic bags, such as banning plastic bags the 15th of each month since 2015 (The Strait Times, 2015). Moreover, many grocery chains and other retailers have initiated their own policy on plastic bags, such as ban or fees (The Strait Times, 2015). The most favoured permanent policy nationwide at the time of writing, however, seems to be a tax per plastic bag sold, but there is currently no timeline for enactment and implementation of such a legislation (Chantanussornsiri and Jitpleeheap, 2018). The Thai government has also tried alternative policies to mitigate against plastic bags entering the marine environment. Thailand Thai National Park Office has for example banned plastic bags in the country's zoos and 154 national parks (Coconuts Bangkok, 2018). However, this ban is only for bringing plastic bags into these locations, and does not account for a national ban. Neither will it reduce the overall consumption of plastic bags, although it could hinder plastic bags leaking directly into the marine environment.

Does the country ban smoking on beaches? (~~Ban~~ / **Partial Ban** / ~~No-Ban~~)

Thailand recently banned smoking on 24 of its most popular tourist beaches nationwide (Southeast Asia Tobacco Control Alliance, 2018; Behan, 2016; COBSEA, 2018; Zeldin, 2017; Kim, 2018). The ban was pushed after a survey led by the Thai Marine and Coastal Resources Research and Development Centre earlier in 2017 found 100,000 cigarette butts on a 5,5 kilometer stretch of a beach called Cha-am in central Thailand (Satyaem, 2018; Kim, 2018). The ban was developed by the national Thai Department of Marine and Coastal Resources (DMCR) and signed by the local government authorities in the 15 provinces who implemented and enforced it within their jurisdiction on the 1st of February 2018 (COBSEA, 2018; Kim, 2018). Ignoring the ban results in fines of up to 100,000 Thai Baht (3,000USD), one year in prison, or both (Behan, 2016). If the ban proves successful on the current 24 beaches, the Thai government may look into expanding it to a full national ban, involving all the country's 357 beaches (Zeldin, 2017; Kim, 2018). Already half a year after the ban was enacted, however, reports came in on it failing of its mission due to low levels of enforcement

(Southeast Asia Tobacco Control Alliance, 2018; Jaikusol, 2018). Nonetheless, assessing the effects of the ban may be more fruitful after a couple of years have passed, when physical measures of the beaches would provide statistical data to show whether the ban has been successful in reducing the amount of cigarette butts on the beaches or not.

7.5.2 Mitigating measures

Existence of an overarching national marine litter strategy and action plan (Yes/No)

Thailand does not have a specific strategy and action plan on marine litter and marine plastics pollution. Instead, the country has drafted an overarching plan on how to reduce and manage its overall dependency on and consumption of plastics, called the “*Plastic Waste Management Plan 2017-2021*” (Original title in Thai: แผนจัดการขยะพลาสติกอย่างบูรณาการ) (Pollution Control Department, 2016). This plan is overseen and under the responsibility of the Pollution Control Department in the Ministry of Natural Resource and Environment in Thailand, and contains numerous suggestions for how to tackle the issue of plastics dependency, such as promotion of eco-friendly substitutes for plastic, financial tools for plastic debris management, and recommendations of heightened producer responsibility (Pollution Control Department, 2016; UN Ocean Conference, 2016). Although not directly targeting marine plastic pollution, the plan highlights efforts that would impact the leakage of plastics into the marine environment from land, such as EPR, focus on recycling (it includes plans to recycle 60% of plastic consumed nationwide by 2021), reduction of single-use plastics, and the importance of increased awareness and scientific monitoring (Pollution Control Department, 2016; Ocharoenchai, 2017). The plan, however, does not outline any specific strategy or detailed policy on how the country is supposed to pursue its targets, but acts more as an acknowledgement of the negative impact of plastics on the environment in Thailand (Ocharoenchai, 2017). Since the plan does not target marine litter/and or marine plastic pollution specifically, the author will categorise Thailand as not having an overarching national marine litter strategy and action plan.

Implementation of Extended Producer Responsibility (EPR) on plastic packaging (Yes/No)

Extended Producer Responsibility on plastic packaging is not implemented in Thailand (Chotichanathawewong and Thongplew, 2009; Kamuang and Siriratpiriya, 2017). Nonetheless, the Thai government has discussed the idea, and has drafted (but not implemented) a strategy called *Strategic Plan on packaging and Packaging Waste Management*, where Extended Producer Responsibility (EPR) is highlighted as a possible solution to handle waste (Kamuang and Siriratpiriya, 2017). This draft strategy articulates measures to minimise waste from packaging (including plastic) through four areas: “1) designer, producer, importer and packer, 2) product transporter and distributor, 3) user and consumer, and 4) waste collector, transporter and processor” (Kamuang and Siriratpiriya, 2017, p. 35). However, at the time of writing, no legislation on EPR had been implemented.

Legislation on MSW at open landfills (~~Ban~~/ No Ban)

Landfills are still the favoured option as means to dispose municipal solid waste (MSW) in Thailand (Chinda et. al., 2013; Kamuang and Siriratpiriya, 2017). The country has 1,000 landfills and open dumps, out of which 119 are sanitary landfills that protect against leakage of waste into the environment (Kamuang and Siriratpiriya, 2017). As many of its neighbouring countries, Thailand has experienced a rapid surge in volume of MSW the past few decades, which has put pressure on the capacity of its open landfills (Chinda et. al., 2013; Kamuang and Siriratpiriya, 2017). The country tries to counter the issues of full landfills by

looking at source reduction, rather than alternative waste management and disposal methods, and thus plans to continue using landfills as means to dispose MSW (Kamuang and Siriratpiriya, 2017). Neither of its three long-term steering documents on handling waste (The *20-Year Pollution Management Strategy (2017-2036)*, the *Pollution Management Plan*, and the *Master Plan on Waste Management (2016-2021)*) mention a possibility of an upcoming ban on MSW at landfills, although increasing incinerator and WtE capacity is mentioned as a possible strategy (Kamuang and Siriratpiriya, 2017; Pollution Control Department Thailand, 2016).

Estimated waste-to-energy (WtE) capacity (0,62%)

There are currently three operational waste-to-energy (WtE) facilities operating in Thailand (namingly in Songkhla, Phitsanulok and Phuket provinces) (Kamuang and Siriratpiriya, 2017; Wipatayotin, 2018). Meanwhile, three more are being built and tested in Nakornpathom, Trat and Chonburi provinces (Kamuang and Siriratpiriya, 2017; Peerapong and Limmeechokchai, 2016). Thailand is set to double its WtE capacity in terms of electricity produced from 311 MW in 2014 to 600 MW in 2036 (Jittapong, 2016). The total capacity of the three facilities currently under operation amounts to maximum 460 tons of MSW per year (Jutidamrongphan, 2018; Jacob et. al., 2013). Considering that Thailand produced an estimated 73,660 tons per day of MSW in 2017, the WtE capacity in percentage of total MSW handled amounts to just 0,62% (Jutidamrongphan, 2018; Peerapong and Limmeechokchai, 2016; Kamuang and Siriratpiriya, 2017; Jacob et. al., 2013; Piyarat and Pampasit, 2017).

7.5.3 Removing measures

Existence of national debris monitoring programme (Yes/No)

Thailand has established a national monitoring programme administered and operated by the Department of Marine and Coastal Resources (DMCR). DMCR collects data on type, source, presence and ecological effects of marine debris through physical sampling at river mouths, coral reefs, and beaches (DMCR, 2017; APEC, 2017). This data is also distributed to Ocean Conservancy to improve regional data sets (APEC, 2017). Research done by DMCR has contributed to improve decision making, create policies, and design campaigns, by for example establishing that most of the marine plastic pollution within Thai territory came from land-based sources (APEC, 2017; DMCR, 2017). Moreover, in November 2017, DMCR initiated a long-term study on microplastics, which it hopes will provide answers on how microplastics affect organisms and marine animals (DMCR, 2017).

Initiation of national clean-up initiatives (Yes/No)

The Thai national government both initiate its own clean-up initiatives and support clean-up initiatives initiated by other actors, such as NGOs, private companies, and local governments (COBSEA, 2018; DMCR, 2017). NGOs are particularly active on a local level, with some of them hosting clean-ups as often as every second week (Ecokohtao, n.d.). On a national level, Thailand's Department of Marine and Coastal Resources (DMCR) coordinates Thailand's yearly participation in the International Coastal Cleanup (ICC) campaign held every September (Ocean Conservancy, 2017). In addition to ICC, DMCR arranges regular clean-up activities across the country several times a year, where they work in coordination with the public and local authorities (COBSEA, 2018).

7.5.4 Behaviour-changing measures

Does the country initiate national education campaigns on land-based sources to marine plastics pollution (Yes/No)

There is a low level of awareness around land-based sources to marine plastic pollution in Thailand (COBSEA, 2018; Wongruang, 2018). The Thai Government has tried to tackle this by initiating short-term campaigns on specific single-use items across the country. One such campaign was the national campaign to stop bottled water producers covering their plastic bottle caps with plastic, which successfully changed production practices of bottled water in the country (APEC, 2017). However, as far as the author of this text could find, there have not been started any national awareness campaigns to educate the population on land-based marine plastic pollution in Thailand.

Existence of container deposit legislation (CDL) as an economic incentive to recycle plastic bottles (Yes/No)

Thailand has not implemented container deposit legislation (CDL) on plastic bottles (Bottle Bill Resource Guide, 2018). The author of this text did not find any indication that the Thai Government is discussing the possibility of enacting CDL, nor any evidence that bottle recycling is on the political agenda in the country.

Are the 3Rs (Reduce, Reuse, Recycle) on MSW officially promoted by the government? (Yes/No)

Thailand's long-term waste plan, called the *Master Plan on Waste Management (2016-2021)* specifically highlights promotion of the 3Rs as a key framework to reduce waste generation by 2021 (Ministry of Natural Resources and Environment Thailand, 2016). The master plan lists promotion of the 3Rs to all stakeholders in society through a strategy they call the "civil state concept", which includes participation by the government sector, the religious sector, the private sector, the education sector, and the public/NGO sector to reduce waste generation (Ministry of Natural Resources and Environment Thailand, 2016; Simachaya, 2017). A separate plan on how to effectively push the 3Rs is not developed, but the commitment to promote them was further strengthened in a national action plan called *Thailand Zero Waste (2016 – 2017)* (Ministry of Natural Resources and Environment Thailand, 2016). The 3Rs are promoted by the national government, while local governments implement initiatives that fall under the promotion umbrella, such as improving waste disposal facilities, collection and transportation routines, and education of communities (Simachaya, 2016; COBSEA, 2018).

7.6 Malaysia

7.6.1 Preventive measures

Ban on microbeads in cosmetics and hygiene products (Yes/No)

Malaysia does currently not have a ban on microbeads in cosmetics and hygiene products (Clean Malaysia, 2016). Moreover, although there are various NGOs calling for a ban on the microbead in the country, the national government has not shown any sign of there being an upcoming ban or a discussion thereof (Clean Malaysia, 2016).

Legislation on single-use plastic bags (Tax/Fee, Ban, Nothing)

Legislation on plastic bags are difficult to suggest politically in Malaysia, since getting a free plastic shopping bag at point of purchase is seen as a consumer's right by most of the population (Zen et. al., 2013; Asmuni et. al., 2015; Kow, 2018). The Malaysian government acknowledges that Malaysians have an excessive consumption of plastic bags, with an average of 300 plastic bags per person per annum, and has tried to act on this issue through different campaigns (Zen et al., 2013; Chua, 2018). One such campaign is the *No Plastic Bag Campaign Day (NPBD)* created in 2011, where a MYR 0.20 (USD0.06) fee is imposed on plastic bags in participating supermarkets every Saturday. Studies from 2013 showed that NPBD had resulted in a limited evidence of changing consumer behaviour, which suggests that such a campaign may prove more effective if implemented on all days of the week (Kamaruddin & Yusuf, 2013; Zen et. al., 2013; Asmuni et. al., 2015). This may happen in the near future, as the Malaysian government on May 28, 2018 through Housing and Local Government Minister Zuraida Kamaruddin, expressed the idea that the country may introduce a nationwide plastic bag ban within one year (Kow, 2018; Channel News Asia, 2018; Chua, 2018). At the time of writing, however, no national overarching legislation is in place to limit the consumption of single-use plastic bags in Malaysia.

Does the country ban smoking on beaches? (Ban / Partial Ban/ No Ban)

There is no national ban on smoking on beaches in Malaysia (Tobacco Control Laws, 2018e). The country's official listing of public places with smoking bans, called "*Declaration of Non-Smoking Areas*" (of 2011, 2012, 2014, and 2015), does not include beaches on its lists (Tobacco Control Laws, 2018e; Malaysia Federal Gazette, 2018). The author could find no evidence of a political discussion on including beaches in the list of smoking-free public areas.

7.6.2 Mitigating measures

Existence of an overarching national marine litter strategy and action plan (Yes/No)

Malaysia does not have an overarching national marine litter strategy and action plan (Kaur and Jaabi, 2017). The author of this text could also find no evidence that such a strategy and action plan is under development by the Malaysian government.

Implementation of Extended Producer Responsibility (EPR) on plastic packaging (Yes/No)

Malaysia has not implemented Extended Producer Responsibility (EPR) on plastic packaging, although both the *Solid Waste and Public Cleansing Management Act* of 2007 and chapter 6

of the *10th Malaysian Plan* (2010-2015) incorporate elements similar to EPR policy (Zainu and Songip, 2017; Minister of Economic Affairs of Malaysia, 2018a).

Legislation on MSW at open landfills (~~Ban~~/ No Ban)

Malaysia has a long history of using landfills (both open and closed) to manage its municipal solid waste (MSW). As recently as in 2010, for example, an estimated 95% of all MSW collected ended up in open landfills (Fauziah and Agamuthu, 2012; Agamuthu and Fauziah, 2008). However, the amount of MSW has grown rapidly in line with household purchasing power the past few decades, putting pressure on the capacity of landfills (Zainu and Songip, 2017; Kamaruddin et. al., 2017). In 2017, 80% of existing landfills in Malaysia were close to reaching their full capacity (Zainu and Songip, 2017). Overfilled landfills have put a pressure on the government to explore new ways to handle the country's waste. The need to explore new ways to handle MSW was communicated in Chapter 6 of the *10th Malaysian Plan* (2010-2015), the country's overarching five-year steering document, which mentions the need for the country to change its waste management policies to move away from landfills (Minister of Economic Affairs of Malaysia, 2018a). Chapter 6 in the *11th Malaysian Plan* (2016-2020) further emphasised moving away from landfills as a main strategy for waste management towards 2020 (Minister of Economic Affairs of Malaysia, 2018b). The country has previously stated that it seeks to reduce waste disposal of MSW into landfills with 40% by 2020 (Kaur and Jaabi, 2017). Nonetheless, despite cementing these strategies in their steering documents, the reality is that Malaysia still relies heavily on open landfills to manage their MSW, with almost all of its collected MSW still being dumped in the existing 166 open landfills countrywide (Kamaruddin et. al., 2017). Moreover, there have been no concrete political discussion about a possible upcoming ban on MSW at open landfills, even though a scheduled closure of all full landfills is agreed on (Zainu and Songip, 2017; Baharom, 2017).

Estimated waste-to-energy (WtE) capacity (2,8%)

The 11th Malaysian Plan especially mentions the importance of treating waste as a resource rather than just waste, and thus opens up for the investment in waste-to-energy (WtE) and incineration facilities (Minister of Economic Affairs of Malaysia, 2018b). At the time of writing, however, Malaysia only has one operating WtE facility, with one more currently under construction (Zainu and Songip, 2017; Lim, 2017; Baharom, 2017; Sovacool and Drupady, 2011). The existing facility is located outside Kuala Lumpur, and has a capacity of 700 tons of MSW per day, which represents a 2,8% of the estimated 25,000 tons MSW produced every day in the country (Sovacool and Drupady, 2011; Zainu and Songip, 2017). In other words, the current WtE capacity of Malaysia is 2,8%.

7.6.3 Removing measures

Existence of national debris monitoring programmes (Yes/No)

Malaysia does not have a national marine debris monitoring programme (Kaur and Jaabi, 2017; APEC, 2017; Mobilik et. al., 2014). The Maritime Institute of Malaysia (MIMA) has an ongoing study on beach cleanliness called the clean-coast index (CCI) which is used to measure effectiveness of initiatives and enforcement actions based on the amount of marine debris found on beaches over time (Kaur and Jaabi, 2017; MIMA, 2017). The author of this text will, however, not classify CCI as a national debris monitoring programme due to the limited extent of information the index provides compared to what a national debris monitoring programme should account for to be effective in its mission. The gaps in the country's monitoring efforts have been known for more than a decade and limits the

government's decision making capabilities (Kaur and Jaabi, 2017; UNEP, 2008). A 2008 assessment called Marine Litter for East Asian Seas done by the United Nations Environmental Programme (UNEP), discovered that the country lacked systematic monitoring, had no data on source differentiation (land-based or sea-based sources), no information on paths and accumulations of debris, and less than sufficient information on the ecological and environmental effects of marine debris within its territorial waters (Kaur and Jaabi, 2017; UNEP, 2008).

Does the Government support and facilitate national clean-up initiatives (Yes/No)

The Malaysian government does not organise a specific national clean-up initiative, but supports a wide range of locally and internationally initiated clean-ups across the country through the Ministry of Natural Resources and Environment and the Marine Parks Department (Reef Check Malaysia, 2013). Clean-up initiatives are initiated and organised by Malaysian NGOs in partnership with larger international NGOs, such as for example *Reef Check Malaysia*, the local chapter of the American NGO Reef Check, which coordinates the country's participation in the annual International Coastal Clean-up Campaign (ICC) as well as a series of other clean-up initiatives across the country (Sia, 2018; IYOR, 2018). The ICC 2017 report, however, shows that public interest in joining clean-ups is low in Malaysia, with only 198 Malaysians participating in the 2017 version of ICC (Ocean Conservancy, 2017). If this number is correct, it equates to just 0,00006% of the total Malaysian population of 31 million, most of whom live by the coast (World Population Review, 2018). Despite low participation rates in clean-up initiatives, the Malaysian Government's heavy involvement and support of clean-ups in the country speaks in favour of the country being categorised as supporting and facilitating national clean-up initiatives.

7.6.4 Behaviour-changing measures

Does the country initiate national education campaigns on land-based sources to marine plastics pollution (Yes/No)

Department of Marine Parks Malaysia (DMPM) has stated that awareness of the marine debris problem among the general public is good, however this seems to be the case only for marine debris originating from mismanaged waste on beaches, and thus does not cover the larger picture of land-based sources (APEC, 2017; Agamuthu et. al., 2012). The discussion around banning plastic bags also shows that Malaysians have a low level of awareness of the cause and effect of single-use plastic consumption, and how plastic ends up in the ocean (Tan, 2018). The private industry in Malaysia, however, has tried to act to educate its consumers. An example of such is the ongoing 2012 "Don't be a litterbug" campaign founded by the Malaysian Plastic Foundation (MPF) (Marine Litter Solutions, n.d.). However, as far as the author's research could reveal, Malaysia does not have any national education campaigns on neither land-based sources to marine plastics pollution in specific, nor on marine debris in general.

Existence of container deposit legislation (CDL) as an economic incentive to recycle plastic bottles (Yes/No)

Malaysia does not have a container deposit legislation in place to incentivise recycling of plastic bottles (Bottle Bill Resource Guide, 2018; Wong, 2018). Moreover, the author could not find any sources discussing a possible implementation of a container deposit legislation on a national level in Malaysia, neither in news, official statement, or in scientific articles.

Are the 3Rs (Reduce, Reuse, Recycle) on MSW officially promoted by the government?

(Yes/No)

In a bid to deal with the country's growing MSW generation, the Malaysian national government has a goal of reaching a household recycling rate of 22% by 2020, up from a rate of 17,5% in 2018 (Ministry of Economic Affairs of Malaysia, 2018b; Spaen, 2018). To reach this goal, the government has pushed the promotion of the 3Rs through the *Malaysia 11th Plan*, which highlights the 3Rs as a key strategy to reduce the country's growing waste problems and achieve sustainable consumption and production (Ministry of Economic Affairs of Malaysia, 2018b). Officially, therefore, Malaysia promotes the 3Rs.

7.7 Summary of Case Studies

Criteria	Sub-criteria	China	Indonesia	Philippines	Vietnam	Thailand	Malaysia
1. Preventive measures	Ban on microbeads in cosmetics and hygiene products (Yes/No)	No	No	No	No	No	No
	Legislation on single-use plastic bags (Tax/Fee, Ban, Nothing)	Fee and Ban	Nothing	Nothing	Nothing	Nothing	Nothing
	Does the country ban smoking on beaches? (Ban / Partial Ban/ No Ban)	No	No	No	No	Partial Ban	No
2. Mitigating measures	Existence of an overarching national marine litter strategy and action plan (Yes/No)	No	Yes	No	No	No	No
	Implementation of Extended Producer Responsibility (EPR) on plastic packaging (Yes/No)	No	No	No	No	No	No
	Legislation on MSW at open landfills (Ban/No Ban)	No Ban	No Ban	No Ban	No Ban	No Ban	No Ban
	Estimated waste-to-energy (WtE) capacity (in percentage)	35%	20%	0%	0,1%	0,62%	2,8%
3. Removing measures	Existence of national debris monitoring programme (Yes/No)	Yes	No	No	No	Yes	No
	Does the Government support and facilitate national clean-up initiatives (Yes/No)?	Partly	Yes	Yes	No	Yes	Yes
4. Behaviour-changing measures	Does the country initiate national education campaigns on land-based sources to marine plastics pollution (Yes/No)	No	Yes	Partly	No	No	No
	Existence of container deposit legislation (CDL) as an economic incentive to recycle plastic bottles (Yes/No)	No	No	No	No	No	No
	Are the 3Rs (Reduce, Reuse, Recycle) on MSW officially promoted by the government? (Yes/No)	Yes	Yes	Yes	No	Yes	Yes

Table 7 - Summary Findings from Case Studies (Table Made by the Author)

8 Discussion of Findings

8.1 Setting the stage for the discussion

The topic of marine plastics pollution from land-based sources was a topic largely disregarded in politics, science, and by the general public up until the early 2000s. The increased number, larger extent and depth of research on the topic after Richard Thompson coined the term microplastics in 2004, however, has rapidly placed the topic at the top of the political agenda nationally in many countries, as well as internationally through both regional political bodies and the United Nations. This paper has shown how far research on the issue of marine plastics pollution has evolved over the past few decades, as well as how the international community has responded to the incoming reports on extent, sources, and consequences of the issue. A growing body of evidence suggests a range of negative impacts, should we not be able to curb the global outflow of plastics into the oceans from land-based sources (UNEP, 2016; Loehr et. al., 2017; Cressey, 2016; Thompson, 2004; Browne et. al., 2011; Wallum, 2018). Marine animals, marine and non-marine biodiversity, as well as human health, have emerged as possible victims of marine plastics pollution (Chen, 2015; Gall and Thompson, 2015; Avio et. al., 2017; Ryan, 2016). This has ultimately put pressure on countries to establish the domestic policies needed to curb outflow of plastics from their territories (UNEP, 2017a).

The six countries studied in this paper, China, Indonesia, the Philippines, Vietnam, Thailand, and Malaysia, are all on the global top 10 list of the worst emitters of marine plastics pollution from land-based sources. For this reason, they provide an interesting research case for how they respond to the issue, and how they differ in their efforts to curb marine plastics pollution. This paper has built an eclectic framework to assess each of the six countries' domestic efforts in curbing marine plastics pollution. This framework was built on a holistic approach to marine plastics pollution, and introduced four government measures (preventive, mitigation, removing, and behaviour-changing) supported by sub-criteria targeting specific areas of vulnerability of leakage of plastics into the oceans from land-based sources. This discussion of findings, part 8 of the paper, will first discuss the findings of the case studies in detail for each of the domestic government measures analysed, and then move on to answering the research question of the paper.

8.2 Preventive measures

The three preventive measures examined in this text are the first steps a country should take to immediately and effectively prevent the production and consumption of specific plastic products that are rampantly found in the ocean. Single-use plastic bags and cigarette butts are two of the most common items found not only on beaches worldwide, but also in the open water (Ocean Conservancy, 2017; LITTERBASE/AWI, 2018). The plastic microbead, moreover, has the ability to pass through sewage treatment filters, and thus ends up in wastewater that eventually reaches the ocean. The preventive measures act as a first defence to put an end to the mass-leakage of plastics that are consumed by a large share of people in any country, so that the government can invest money and time in the pursuit of the other three measures. The common denominator of the three prevention measures is that they are all difficult to enforce effectively. Production and/or consumption of the three plastic items are widespread, which makes enforcement costly, time-consuming, and unpopular with both consumers and producers. The measures would, therefore, only be successful when supported by behaviour-changing measures, which aim at raising awareness to the population about why the prevention measures are implemented in the first place, and to decrease the demand for

plastics products. The findings on preventive measures in the six case studies are combined and summarised in table 8 below:

Criteria	Sub-criteria	China	Indonesia	Philippines	Vietnam	Thailand	Malaysia
1. Preventive measures	Ban on microbeads in cosmetics and hygiene products (Yes/No)	No	No	No	No	No	No
	Legislation on single-use plastic bags (tax/fee, ban, nothing)	Fee and ban	No	No	No	No	No
	Does the country ban smoking on beaches? (Ban / Partial Ban/ No Ban)	No	No	No	No	Partial Ban	No

Table 8 - Findings, Preventive Measures (Table Made By the Author)

The results found in the six case studies paints a picture of a region that does not have the domestic measures in place to be able to efficiently curb the outflow of the most prevalent plastic items from their territory. None of the six countries analysed have a ban on microbeads in cosmetics, only one country (China) has introduced legislation on single-use plastic bags, and only one country (Thailand) has introduced a partial ban on smoking on beaches. However, although there are more similarities than differences in currently implemented policies among the countries, the countries differ widely to what degree they are discussing future implementation of the three measures.

On the plastic microbead, only two countries, China and the Philippines, have had political discussions on the possibilities of a ban on a national level. For China, talks surfaced before the 2018 meeting of the annual meeting of the National People's Congress on a possible ban, but it never materialised into policy. In the Philippines, a possible ban has been discussed by national lawmakers although a bill is yet to be drafted. Meanwhile, Indonesia, Vietnam, Thailand, and Malaysia have had no high-level mentioning or discussions of an upcoming ban. There can be many explanations for why none of the six East-Asian countries analysed have enacted and implemented a ban on the microbead, but the author will in particular highlight two possible reasons:

1. *Legislation on microbeads has surfaced rather recently on the global stage*
The first country to ban the microbead through national legislation was the U.S. in December 2015. Less than four years later, in mid-2019, only a handful of countries have enacted a nationwide ban on microbeads in cosmetics, all of which are developed countries per definition: Taiwan (October 2016), South Korea (October, 2016), U.K. (July, 2018), New Zealand (July, 2018), and Canada (July, 2018) (Beathemicrobead, 2018).
2. *Producers are taking self-action to ban the microbead*
Although companies possibly do this in an effort to highlight their Corporate Social Responsibility (CSR), the public pressure has created a landscape where an increasing number of global cosmetics and hygiene product producers are creating worldwide company policies where they discontinue the usage of the microbead in their products (Beathemicrobead, 2018). A national legislation on the microbead

may be seen in many countries as excessive, given that the private sector increasingly is moving away from using it in their products either way (Beathemicrobead, 2018).

On single-use plastic bags, China has been far more proactive in reducing consumption of single-use plastic bags than the other five countries analysed in this paper. Being the only country that has implemented legislation, China in 2008 implemented a two-step approach with a combination of taxation and regulation to reduce production and consumption of single-use plastic shopping bags. There are, however, wide evidences suggesting that the legislation is a failure in its mission of reducing the overall plastic consumption in the country, although the government has announced that it has seen 66% reduction in plastic bag consumption specifically. Although concrete legislation is missing in Indonesia, the Philippines, Vietnam, Thailand and Malaysia, several of the countries have taken steps towards a future enactment of legislation on plastic bags. These countries, however, differ in which type of policies they seek to implement. Vietnam discusses introducing a tax on production rather than consumption, meaning that producers must pay a certain amount of tax according to how many kilos of plastic bags they produce. Indonesia, Malaysia and the Philippines, meanwhile, have discussed a tax per plastic bag sold. Indonesia failed to implement a suggested tax on plastic bags at sales points in July 2018, but will most likely announce a new tax in the near future that could be targeting producers instead. Thailand is still to decide on which policy it favours, but it seems like taxation on point-of-sale is the most popular policy alternative at the time of writing. The author can think of three possible reasons for why Indonesia, the Philippines, Vietnam, Thailand and Malaysia have yet to enact legislation on single-use plastic bags:

1. *Legislation on single-use plastic bags tend to affect the population economically, creating a general opposition against such legislation among the population.*
Whether it is a tax on production or consumption, or through regulation on thickness and material composition, the end cost of legislation on single-use plastic bags tends to be put on the end consumer (Xanthos and Walker, 2017). Public opposition to legislation is, therefore, widespread in many countries. This has been particularly evident in the political discussions on plastic bag legislation in the five countries without enacted implementation, where all the five countries have experienced opposition to taxation, both from consumers and from producers.
2. *Difficult enforcement landscape*
The shopping and consumption climate are fundamentally different in the six countries analysed in this text compared to other primarily western countries where single-use plastic bag legislation has been implemented successfully. Consumption of groceries and goods in many western countries are dominated by chain stores and larger retailers. These stores usually have companywide policies and guidelines, as well as a compliance department, to ensure that all their stores are operating in line with current legislation. Although chain stores are present in the six countries analysed too, a greater part of consumption happens through smaller independent stores, traditional shops and wet-markets, without the same capacity or incentive to ensure compliance (Raerdon et al., 2010; ATKearney, 2016). A large number of independent stores could perhaps also mean that enforcement bureaus need to audit a much larger number of stores compared to chain stores, possibly straining enforcement capacity and quality of plastic bag legislations.

3. *Lack of real, viable alternatives*

Although alternatives to the single-use plastic bags are available today, they may not be as cost-friendly for the Asian consumer or as easy to produce for the producer as single-use plastic bags (Evans, 2018). Some reusable alternatives, such as ones made from linen and cotton, may pose a greater risk to the environment than plastic bags, since they would be transferring the environmental cost from marine plastics pollution to water scarcity and air pollution. As an example, a reusable cotton bag must be used 131 times before breaking even with a single-use plastic bag in terms of emission omitted through production (Gnam, 2018; Evans, 2018). It could be that the five countries analysed in this text that have yet to introduce legislation on single-use plastic bags, are waiting for more cost-friendly alternatives with proven environmental benefits, such as for example mass production of biodegradable single-use bags, before introducing legislation. It would be difficult to ban single-use plastic bag without any viable alternatives.

Although all the six countries studied have beaches that are frequented by both the local population and international tourists, Thailand is the only country out of the six that has taken national action to ban smoking on beaches. Thailand's legislation on smoke-free beaches only covers 24 beaches, but the law may be further extended to a fully national legislation if it turns out to be successful in its mission of reducing cigarette butts on the coast. Apart from Thailand, lawmakers in neither of the remaining five countries have discussed a smoking ban on beaches. Political discussion and current legislation on smoking in China, Indonesia, the Philippines, Vietnam and Malaysia revolve around the public health perspective of smoking, and have not touched upon the environmental impacts smoking have. This public health perspective could be a natural one, considering that these countries have experienced a rapid surge in the numbers of smokers over the past decades (Blau, 2012; WHO, 2018). Attention on a ban on smoking on beaches may be drowning in the larger and more pressing issue of preventing the possible future smoking-related public health issues and the costs these issues bring.

8.3 Mitigating measures

As highlighted in part 4 on the relevance of this thesis, plastics have become a vital part of everyday life throughout the globe, and our dependency on the material is predicted to grow even further in the coming decades (Bergmann et. al., 2016). The global yearly plastic production is set to more than double from the current estimated 350 million tons in 2018 to more than 700 million tons in 2030, and further grow five-folds to 1800 million tons by 2050 (Bergmann et. al., 2016). Such an enormous growth in plastic circulating in the economy puts pressure on governments to establish a policy framework to properly deal with plastics from production to disposal. The capabilities and the low cost of the material has far too many economic and social benefits for modern society, and a drastic prevention measure such as a total ban on plastics would not only be impossible, but also unwise (Chen, 2001; Lindh; 2016; Andrady, 2003). The mitigation measures studied in this text cover a mere foundation of policies needed to mitigate against the possible damage plastics can have on the marine environment once it enters the economy. The findings on mitigating measures in the six case studies are combined and summarised in table 9 below:

Criteria	Sub-criteria	China	Indonesia	Philippines	Vietnam	Thailand	Malaysia
2. Mitigating measures	Existence of an overarching national marine litter strategy and action plan (Yes/no)	No	Yes	No	No	No	No
	Implementation of Extended Producer Responsibility (EPR) on plastic packaging (Yes/No)	No	No	No	No	No	No
	Legislation on MSW at open landfills (Ban/No Ban)	No Ban	No Ban	No Ban	No Ban	No Ban	No Ban
	Estimated waste-to-energy (WtE) capacity (in percentage)	35%	20%	0%	0,1%	0,62%	2,8%

Table 9 - Findings, Mitigating Measures (Table Made By the Author)

The results from the six case studies show that none of the six countries analysed have pursued the full spectre of mitigation measures needed to stop plastics leaking from land-based sources to the ocean once it circulates in the economy. Only one country, Indonesia, has an overarching marine litter strategy and action plan in place. None of the six countries have implemented Extended Producer Responsibility on plastic packaging through legislation, none of the countries have a ban on MSW at open landfills, and only two countries, China and Indonesia, have had a specific focus on increasing WtE capacity as an alternative mean to get rid of non-recyclable plastics.

As mentioned, Indonesia is the only country out of the six that has created an overarching national marine litter strategy and action plan. This does not mean that the other five countries, China, Malaysia, Thailand, the Philippines, and Vietnam, do not have strategies and action plans to deal with marine debris and marine plastics pollution. Rather, it could mean that such strategies are the responsibility of individual government bureaus and departments, instead of being overarching national policies. As an example, some of these five countries have included strategies targeting marine litter pollution in either their waste management laws or in their environment laws. Vietnam and Thailand have included plastics in their waste management plans, but neither have outlined any specific strategies to combat marine litter in any document, although relevant ministries and government offices could have plans in place to mitigate against it. Similarly, China's "Water Ten Plan" from 2015 does not mention plastic pollution or marine litter specifically, but the development of strict requirements and legislation on pollution from land to waterways in the process of enforcing the plan may also target plastics in the future. Malaysia and the Philippines, meanwhile, have not established any plan or strategy to combat marine litter or marine pollution, neither through a separate document nor through documents and laws on waste-management and the environment. With its separate steering document on marine litter, Indonesia clearly communicates what the government seeks to achieve and how it aims at achieving it in the context of combatting marine debris and marine plastics pollution (The Government of the Republic of Indonesia, 2017). The document is overarching several relevant ministries and works as a guiding document for how the country wants to achieve an ocean free of plastics. The document was announced in 2017, which makes it hard to analyse whether or not it has brought any tangible

positive effects in its mission, but the author believes, nonetheless, that Indonesia has positioned itself better than the other five countries in the long-term combat against marine litter.

None of the six countries analysed have implemented Extended Producer Responsibility (EPR) on plastic packaging at the time of writing, although all countries have traces and encouragement of a similar concept in their main waste management laws. Malaysia, Thailand, Vietnam and the Philippines all state in their waste management laws that producers of goods that end up as MSW should take more responsibility in ensuring proper waste management after the products are disposed. China and Indonesia, meanwhile, have come a step further than the other four countries in the process of EPR enactment by announcing detailed deadlines on future implementation. China is planning to implement EPR on plastics packaging by 2025, while Indonesia has created a roadmap to implement within 2022. The reason why none of the countries studied have implemented EPR on plastics packaging at the time of writing could first and foremost be because EPR on plastics is a very recent policy alternative worldwide. In fact, apart from the EU where EPR policies are currently under implementation, China and Indonesia are two of the few actors worldwide that have announced implementation of the policy, putting the two countries very much at the forefront of implementing the measure globally (OECD, 2014; OECD 2016; Quoden, 2016). Moreover, being a relatively new concept in the space of plastics packaging, the author would argue that the six countries studied may need some time to establish their EPR measures on plastics packaging. Proper implementation and governance of EPR principles needs capacity, well-established recycling infrastructures, clear guidelines, political will, and close cooperation between the private sector and the government (OECD, 2016). These structures take time to establish, but it is positive to see that all the six countries studied have taken steps towards a possible future implementation. Ocean Conservancy (2017) estimates that establishing proper waste management in China, Indonesia, the Philippines, Vietnam and Thailand could mean a reduction of the global input of plastic into the ocean by as much as 45%.

None of the countries have introduced a ban on Municipal Solid Waste (MSW) on landfills, although four of the countries (The Philippines, Vietnam, Thailand and Malaysia) aim at reducing their reliance on open landfills as a mean of managing MSW (out of which plastics is a large part). This aim could, however, be motivated by an increasing lack of landfill-space in the four countries, rather than the combat against leakage of plastics from their open landfills. The aims also do not state whether a ban on MSW on open landfills is in question or not. Another possible reason for why no country has a ban on MSW at landfills in place could be because this type of legislation is a rather new one in the sphere of combatting marine plastics pollution from land-based sources. At the time of writing, the European Union is the only global actor that has taken steps towards banning MSW at landfills (Fioretti, 2019).

In terms of Waste-to-Energy (WtE) capacity, China and Indonesia largely outcompete the other four countries analysed. China currently has the capacity to incinerate and create energy out of 1/3 (35%) of its total annually generated MSW, while Indonesia's capacity stands at around 1/5 (20%). These figures are far ahead of the 2,8% WtE capacity of Malaysia, and the less-than 1% capacity of the Philippines, Thailand and Vietnam. The six countries' approach on WtE promotion also differs widely. China and Indonesia have a clear goal of increasing their WtE capacity as an effort to deal with their growing output of MSW. Thailand, Malaysia and Vietnam have mentioned WtE as a possible alternative solution to landfills in their principal waste laws, but have not concretised a clear strategy on how to develop WtE-capacity. The Philippines, meanwhile, is the only country with zero current WtE capacity, due

to the fact that WtE/incineration of waste is illegal under current Philippine environmental law. The four countries without a clear strategy to increase WtE capacity may suffer the negative consequences that a lack of focus on such capacity may bring in the future. All the four countries have and are experiencing rapid economic development, which also brings increased waste generation (Tibbetts (2015). Growth in waste generation puts pressure on landfills, making them vulnerable to the leakage of plastics into the marine environment (Tibbetts (2015; UNEP, 2016). WtE capacity supports a circular economy by giving otherwise worthless plastics a value as a resource that can be used to produce energy and would thus serve a duo-beneficial cause in the four countries: Less pressure on landfills and cheap electricity. China and Indonesia may have positioned themselves advantageously in the combat against plastics leaking from landfills with their focus on developing WtE capacity, which could lead to tangible, long-term results in reducing the amount of plastics leaking into the ocean from their territories. However, as the public response to incineration of waste in several of the countries studied has shown, using WtE-facilities to burn waste is not uncontroversial (Koty, 2016). Burning plastic waste releases both CO₂ and other poisonous gasses such as dioxin into the atmosphere if not filtered properly (Koty, 2016).

8.4 Removing measures

Although a full clean-up of the oceans is practically not possible at the moment, the two removing measures studied in this text create an important foundation in policy to nourish a culture of understanding and civil partisanships in the combat against marine plastics pollution from land-based sources (Wagner, 2017; Le Guern, 2018). Removing measures themselves do not amount to a sustainable and effective national policy in the combat against marine plastics pollution from land-based sources, but the measures bring valuable information for decision-making, support education and awareness measures, and bring a temporary relief to the marine environment from the negative consequences of plastics (STAP, 2011; UNEP, 2016; Pettipas et. al., 2016). The findings on the two removing measures in the six case studies are combined and summarised in table 10 below:

Criteria	Sub-criteria	China	Indonesia	Philippines	Vietnam	Thailand	Malaysia
3. Removing measures	Existence of national debris monitoring programme (Yes/No)	Yes	No	No	No	Yes	No
	Does the Government support and facilitate national clean-up initiatives (Yes/No)?	Partly	Yes	Yes	No	Yes	Yes

Table 10 - Findings, Removing Measures (Table Made By the Author)

The results from the six case studies show that the six countries analysed have pursued a mixed approach to removing measures that differs from country to country. Only two of the countries, China and Thailand, have established a national debris monitoring programme, while all countries support and facilitate for national clean-up initiatives.

China's and Thailand's marine debris monitoring programmes both deliver extensive monitoring by including factors such as the extent, the sources, the path, and the consequences of marine plastics debris within most of the countries' territories (DMCR, 2017; Yan, 2018). Although the execution, coordination and the extent of their national debris monitoring programmes differ between the two countries, they both have the structures,

practices, and capacity in place to support fact-based decision making through their respective programmes (DMCR, 2017; Yan, 2018). Indonesia, the Philippines, Vietnam, and Malaysia have all not established a national monitoring programme. The lack of monitoring in these countries may weaken the countries' decision making capabilities to efficiently target marine plastic pollution through policy and initiatives. Without a national monitoring programme, the four countries could find it hard to evaluate and assess the success of their policies and efforts to stop the leakage of marine plastics pollution from land-based sources to the ocean.

All six countries studied facilitate for and support national clean-up initiatives one way or another. All governments support the annual International Coastal Cleanup Campaign (ICC) either by coordinating it from government ministries (Indonesia, the Philippines, and Thailand) or from non-governmental organizations (China, Vietnam, and Malaysia). The real annual participation level in the campaign, however, is low in all the six countries compared both to the countries' populations and to the participation level of peers in North-America and Europe (Ocean Conservancy, 2017).

The two removing measures studied do, however, not carry equal weight in their importance to the long-term combat against marine plastics pollution from land-based sources. The author would argue that a functional national debris monitoring programme has the ability to carry much larger, long-term, tangible effects through policy support compared to the short-term tangible effects achieved by clean-up initiatives. In that context, China and Thailand have taken a greater effort in terms of removing-measures than the other four countries without a national monitoring programme have. Thus, these two countries have positioned themselves far better in terms of effectively implementing other domestic policy measures to combat marine plastics pollution from land-based sources.

8.5 Behaviour-changing measures

Education and public awareness about the issue of marine plastics pollution is imperative to reach a long-term goal of curbing outflow of plastics from land-based sources into the marine environment (Bergmann et. al., 2017; Loehr et al., 2017; Chen, 2011). Most of the plastics we consume daily today is the one we bring with us from the supermarket and other stores where we buy our daily necessities. Packaging and plastic bags simplify our daily lives, but they also contribute a great amount of non-recyclable and hard-to-recycle municipal solid waste (Andrady, 2003). Creating a long-term behaviour-change in how people deal with their daily plastic consumption, and how aware they are of how plastics are managed after disposal is key in the combat against marine plastics pollution. Three criteria on behaviour-changing measures have been studied in this text: One criterion targeting improvement of awareness among the public, one criterion assessing whether the country has implemented economic incentive to improve awareness and responsibility of recycling of plastic bottles, and one criterion assessing whether the country promotes a holistic approach on plastic waste thorough the 3R principle (reduce, reuse, recycle). The findings on behaviour-changing measures from the six case studies are combined and summarised in table 11 below:

Criteria	Sub-criteria	China	Indonesia	Philippines	Vietnam	Thailand	Malaysia
4. Behaviour-changing measures	Does the country initiate national education campaigns on land-based sources to marine plastics pollution (Yes/No)	No	Yes	Partly	No	No	No
	Existence of container deposit legislation (CDL) as an economic incentive to recycle plastic bottles (Yes/no)	No	No	No	No	No	No
	Are the 3Rs (Reduce, Reuse, Recycle) on MSW officially promoted by the government? (Yes/No)	Yes	Yes	Yes	No	Yes	Yes

Table 11 - Findings, Behaviour-Changing Measures (Table Made By the Author)

The six countries analysed in this paper have more differences than similarities in how they pursue behaviour-changing measures. Two countries (Indonesia and the Philippines) have, to a varying degree, initiated national education campaigns, none of the countries have implemented container deposit legislation (CDL), and five of the countries (China, Indonesia, the Philippines, Thailand and Malaysia) are officially promoting the 3Rs on MSW on a national level.

The six countries studied have a generally low level of awareness about the sources and consequences of marine plastics pollution among their public, but just two countries (Indonesia and the Philippines) have created national initiatives to educate their citizens on the issue. Although differing in form and extent, both Indonesia and the Philippines have implemented national education campaigns to increase awareness of marine plastics pollution from land-based sources to their population. To ensure a generational shift in awareness, both countries have integrated marine plastics pollution and recycling principles in their national education curriculum. Indonesia further utilises the strong position of religion in the country by cooperating with two of the largest religious organizations to spread awareness and to educate its people on plastics pollution. The author notes that this could be a successful practice in the Philippines too, where religion is also a large part of everyday life. As far as the author could find, China, Vietnam, Thailand, and Malaysia do not have national education and awareness campaigns initiated, although Vietnam have articulated the importance of education and awareness in its national strategy to reduce waste.

None of the six countries have implemented a Container Deposit Legislation (CDL) to incentivise recycling of plastic bottles (and plastic bottle caps) among their populations. Nor have any of the countries analysed had a political discussion around the possibilities of enacting CDL. The author wants to particularly highlight two possible reasons for why none of the countries have implemented CDL:

1. *Plastic bottles are already recycled through informal trash collectors*

A common denominator between all the six countries that may affect the incentive to implement CDL is that they all have a big presence of informal recycling practices in the form of informal trash collectors. Plastic bottles are prized products for informal trash collectors, because most of the bottles are made of high-quality, easy-to-recycle plastics, and therefore gives a higher recycle-sum when sold to informal recycling companies and operators (Medina, 2008; Zhaqng et. al., 2010). An example of the informal sector's effectiveness is that an estimated 90% of Beijing's plastic bottles are recycled through trash collectors and the informal recycling industry in the city (Koty, 2016; Zhen-Shan et. al., 2009; Westlake, 2016). Informal trash collectors keep bottles out of the environment by bringing them back into the economy through recycling, but they diminish the effect CDL has on changing the behaviour and attitude of consumers towards plastics.

2. *Limitations on available infrastructure investment capital to support CDL*

Another reason why CDL may not have been implemented in any of the countries is that such implementation needs to be assisted by larger initial capital investments into equipment and infrastructure (although this investment has been proven to be returned through lower expenditure on other recycling collection solutions) (Porter, 1978; Moore and Scott, 1983). Equipment for consumers to use to return the bottle is needed together with the infrastructure and logistics to handle the bottles from delivery point to recycling plants. The cost of such a legislation could be too large to swallow for the six countries analysed in this paper, all of which are experiencing rapid economic development and may have other investment priorities on their agenda. A change in consumer behaviour towards recycling could of course be beneficial to push governments to be willing to make such investments.

National promotion of the 3Rs of Municipal Solid Waste (reuse, reduce, and recycle) is a starting point towards an integrated approach on waste management (COBSEA, 2008; Mohanty, 2011; Memon, 2010; UN, 2017). The goal of the 3Rs of MSW is to change the behaviour of both consumers and producers of plastics to ensure a more sustainable production and consumption. All the six countries analysed in this text have signed the Ha Noi 3R Declaration, which in Goal 1 calls for promotion of the 3Rs on MSW through establishment of national and local policy and legislation - thereby committing to pursue the 3Rs by 2023 (Ha Noi Declaration, 2013). It is rather ironic then, that out of the six countries analysed, the author found that Vietnam (where Ha Noi is the capital) was the only country that did not promote the 3R principle. Vietnam has made efforts in the scope of the 3Rs, and is part of a regional cooperative effort to establish the 3R principles, but the author could not find any clear evidence that the principles are promoted officially, on a national level. The other five countries all promote the 3Rs, although the way they are promoted differs between the countries. China seems to have a top-down approach, where the 3Rs are promoted mostly to local governments, private and state-owned companies, thereby overlooking their promotion to the public (Thieriot, 2015; National People's Congress, 2008). Thailand, Indonesia, Malaysia and the Philippines, meanwhile, seem to focus on building up awareness and adherence to the 3Rs from the bottom up, with initiatives targeting consumers directly, as well as waste handlers and producers. The evidence for whether China's or the other four countries' approach is the most effective is inconclusive, and it is highly possible that both approaches promote the goal of a culture of integrated waste management in a step towards a circular economy.

8.6 Answering of Research Question and Discussion on Relevance of Findings

Considering that all the six countries analysed in this paper have been measured to be among the top 10 sources of marine plastics pollution from land-based sources globally, the findings of this paper may be far from surprising. None of the countries analysed have established a holistic domestic government effort in the combat against marine plastics pollution from land-based sources. Nonetheless, the mission of the first research question of this paper was to examine and discuss the differences and similarities in the six countries' domestic approach to deal with the issue, through asking the question:

How do domestic government efforts to control marine plastics pollution from land-based sources differ between China, Indonesia, the Philippines, Vietnam, Thailand, and Malaysia?

The findings from the case studies in this paper have found that China, Indonesia, the Philippines, Vietnam, Thailand and Malaysia have more similarities than differences in their domestic efforts to control marine plastics pollution from land-based sources. None of the countries have implemented policies to fully support either of the four government measures of prevention, mitigation, removing, and behaviour-changing. Although none of the six countries analysed in this paper have the full policy framework needed in this pursuit, there are traces and notions of a political will and public pressure to deal with the issue in all countries.

All the six countries have established some of the measures studied and have shown political awareness of the issues relating to marine plastics pollution, while none of the six countries have implemented the full, holistic, domestic policy framework needed to effectively combat marine plastics pollution. In theory, Chen's four management measures of prevention, mitigation, removing and behaviour changing, need to be done simultaneously to ensure an efficient combat against marine plastics pollution, and hence need an equal and balanced amount of attention from the government. In practice, however, lack of resources, political will, technical know-how, and citizen engagement means that the six governments analysed fail in pursuing the four-measure approach by focusing on only a few of the measures.

Marine pollution is and needs to be both a domestic and a global issue simultaneously. A borderless ocean means that marine plastics pollution affects the entire globe. For example, a plastic bag leaked out in the ocean through a river in the Philippines may end up on the shores of Mexico. Therefore, there is an increasingly growing pressure from the international community on countries to curb outflow of plastics into the oceans from their domestic territories. Haward (2017) noted this trend in 2017, when he argued that:

“The problem of plastic pollution in the world's seas and ocean has attracted increasing scientific concern, with calls for an international agreement to address this issue. Any such agreement would extend, complement, and also challenge existing international, regional, national, sub-national, and local initiatives. Responses to the problem of marine plastic pollution will need to involve and link state and non-state actors, business, and civil society, looking to integrated solutions that move away from traditional state-based, sector-focused responses to oceans' issues” (Haward, 2018, p.1)

The global nature of the problem of marine plastics pollution requires an international agreement, but any such agreement would have to be enforced through domestic policies.

This raises a question of whether the six countries analysed currently have the domestic policy framework in place to support an international agreement to curb marine plastics pollution from land-based sources.

At the moment, as has been shown by this paper, none of the countries studied have the holistic framework necessary to implement an international commitment to reduce outflow of plastic from land-based sources. Nevertheless, all the six countries analysed have signed an international resolution on curbing marine plastics in the Third United Nations Environment Assembly in Nairobi in December 2017 (UNEP, 2017a; Williams, 2017). This shows that that there is at least some political will and awareness in all the countries to act on the issue. Should this resolution, however, materialise into an international agreement, the countries will need to back up their commitments by showing that they are able to and willing to change and improve domestic efforts and policy.

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Appendix

Abstract

English

The leakage of plastics into the marine environment from land-based sources has proven to cause significant damage to marine ecology, marine animals, marine birds, and ultimately also to human health. Although a global problem, the sources of marine plastics pollution are confined to a relatively small number of countries, with leakage from these territories accounting for up to 70% of all plastics leaked into the marine environment globally. Six of the ten largest sources are located in East Asia, with China, Indonesia, The Philippines, Vietnam, Thailand and Malaysia accounting for 55% of the total estimated global leakage of plastics into the marine environment.

This thesis examines the domestic responses to the leakage of plastics into the marine environment from the aforementioned six East Asian countries by analysing whether the countries have employed a holistic approach to combat the issue through domestic policy. This holistic approach builds on four domestic government measures, namely prevention, mitigation, removal and behaviour-changing measures, that, when implemented in unison, will create a foundation for the long-term curbing of marine plastics pollution leaking from land-based sources. The thesis finds that, despite each of the six countries having enacted a certain level of measures to combat the issue, none of the six countries have employed the holistic approach needed to fully target the most pressing types of marine plastics pollution from land-based sources.

Deutsch

Das Austreten von Kunststoffen in die Meeresumwelt vom Lande aus hat nachweislich erhebliche schädliche Auswirkungen auf die Meeresökologie, die Meerestiere, die Meeresvögel und letztendlich auch die menschliche Gesundheit gehabt. Obwohl es sich um ein globales Problem handelt, sind die Ursachen für die Verschmutzung der Meere durch Kunststoff auf eine relativ kleine Anzahl an Ländern beschränkt. Leckagen aus deren Gebieten machen bis zu 70 Prozent aller Kunststoffe aus, die weltweit in die Meeresumwelt gelangen. Sechs der zehn größten Verschmutzungsquellen befinden sich in Ostasien, wobei China, Indonesien, die Philippinen, Vietnam, Thailand und Malaysia zusammen für 55 Prozent des geschätzten weltweiten Austretens von Kunststoffen in die Meeresumwelt verantwortlich sind.

In dieser Arbeit werden die einheimischen Reaktionen auf das Austreten von Kunststoffen aus den oben genannten sechs ostasiatischen Ländern in die Meeresumwelt untersucht. Dabei wird analysiert, ob die Länder einen ganzheitlichen Ansatz gewählt haben, um das Problem durch die Innenpolitik zu bekämpfen. Dieser ganzheitliche Ansatz beruht auf vier einheimischen staatlichen Maßnahmen, nämlich Maßnahmen zur Verhinderung, Milderung, Beseitigung und Verhaltensänderung, die, wenn sie zusammen durchgeführt werden, die Grundlage für eine langfristige Eindämmung der Verschmutzung durch Kunststoffe, die vom Lande aus in das Meer sickern, schafft. Die Arbeit zeigt, dass, obwohl jedes der sechs Länder gewisse Maßnahmen zur Bekämpfung des Problems ergriffen hat, keines der sechs Länder den ganzheitlichen Ansatz gewählt hat, der erforderlich ist, um die dringlichsten Arten der Verschmutzung der Meere durch Kunststoffe vollständig zu erreichen.