Controlling Transboundary Trade in Plastic Waste

Policy Brief

GRID ARENDAL

A Centre collaborating with UN Environment

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Controlling Transboundary Trade in Scrap Plastic Waste
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Policy Brief

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Summary

Studies estimate that at most 9% of all plastic ever produced has been recycled, with an additional 12% incinerated, most of it only having been produced in the last decades (Jambeck et al., 2015). If no action is taken, the remainder will continue contaminating our environment in dumpsites, landfills, or leak into the ocean. While developed nations may boast of high plastic collection and recycling rates, the reality is often far more complex, as not all plastic placed in recycling bins is actually recycled. This is because scrap plastic formally registered as ´recycled´ by developed nations is commonly exported to emerging economies for further sorting, processing and recycling. This lowers processing costs and avoids environmental impacts in the country of origin, which may record an artificially high recycling rate while waste importing countries in emerging economies are ultimately responsible for processing the waste. However, waste importing countries typically lack the necessary enforcement and facilities to properly process this scrap plastic, resulting in ocean, air, and land pollution. Jambeck et al. (2015) found that many waste importing countries report high waste mismanagement rates, such as India (87%), Indonesia (83%), Viet Nam (88%) and Malaysia (57%). Jambeck et al. (2015) stressed that global scrap plastic imports and exports are not adequately represented in these figures, which means that the amount of imported waste that is mismanaged remains uncertain.

Considering these challenges, it is important to monitor and better understand the global plastic recycling sector, including its economic, social and environmental impacts. It is paramount to strengthen global regulations that adequately control transboundary movement of scrap plastic to provide greater transparency and avoid potential plastic leakages into the environment from the recycling sector. Further studies that identify opportunities for streamlining, monitoring and enforcement at a global level are required. Studies should seek out current and future opportunities throughout plastic value-chains to improve the industry's environmental performance and reduce marine plastic litter.

Introduction to a Global Challenge

Plastics consumption per capita is rapidly growing. Global plastic production has steadily increased to almost 350 million tonnes per year in 2017, growing three times faster than the global gross domestic product (Plastics Europe, 2018). When properly managed, plastic recycling minimizes resource pressures and reduces plastic leakages into the environment. It is fundamental in pursuing a circular economy. Almost all types of plastics are technically recyclable. However, the extent to which they are recycled depends upon available technology, sorting and logistics. Furthermore, just as any other globally-traded commodity, macroeconomic indicators and market conditions influence plastics recycling and scrap trade.

Globally, opportunities and challenges linked to scrap plastic trade and recycling are increasing, creating complex end-of-lifecycles for plastic products as many countries are increasing plastic recycling targets. For instance, a number of countries in Europe and the USA have ambitious recycling targets that heavily rely on transboundary movement of scrap plastic, largely characterized by flows of plastic waste to emerging economies in Asia. This means that despite the low overall recycling rates cited above, international trade in waste for recycling has boomed: Worldwide trade of recyclable plastics is a US$5 billion dollar per-year industry that spans the globe (Bureau of International Recycling, 2008).

Transboundary movement of plastic waste for disposal and recycling is governed primarily by the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. With 170 parties, the Basel Convention is the most comprehensive global environmental treaty regulating the international waste trade and provides one of the best opportunities to tackle transboundary challenges of plastic pollution (Raubenheimer & McIlgorm, 2018). The current regulation categorizes scrap plastic as waste that is not subject to any controls, notifications or special agreements. This promotes mismanagement and weak accountability from scrap plastic exporters and jeopardizes the environmental performance of low-grade plastic recycling.

Historically, China has been the main destination for much of the world´s scrap plastic. This imported waste often ended up in low cost recycling facilities with poor environmental standards, posing significant threats to both terrestrial and marine environments. In 2013, China began implementing enforcement actions against incoming waste and scrap shipments, and in 2017 China began enforcing a strict trade restriction that bans Chinese recyclers from importing 24 types of scrap (World Trade Organization, 2017). As a result, China decreased its scrap plastic imports by 93% from 2017 to 2018 (Figure 2).

The impacts of China's trade restriction have resonated throughout the global recycling industry. China went from importing 60% of scrap plastic generated by the G7 countries to less than 10% in 2018 (Hook & Reed, 2018). This poses significant challenges to developed and emerging economies. For example, in developed countries, new recipients for scrap plastic need to be found. In 2017 for example, a stockpile of 23,000 tonnes of unsorted imported scrap plastic was open-burned in Latvia. This is because appropriate recycling facilities were not available in the country and the importer was not able to trade scrap plastic to China due to their change in policy.* In emerging economies, one of the most tangible consequences of China's trade restrictions is the spill-over effect of scrap plastic imports to neighbouring countries, further straining domestic plastic waste processing.

* Personal communication with the Latvian State Environmental Service (March 25, 2019)

Flaws in the Current Global Recycling Model

Concerns around the global trade in scrap plastic are growing. Factors that promote inadequate waste disposal include the lack of enforcement, increased consumerism, existing waste management practices at the operational level, poor socio-economic conditions and the lack of a functioning market for secondary plastic material.

Drivers of plastic leakages from collected waste

Policy	• High recycling targets in developed countries that heavily rely on transboundary movement. • Emerging trade restrictions in recipient countries starting with China and followed by other countries. • Under current regulations, scrap plastic does not require control for the transboundary movement. • Lack of traceability or obligation for exporters to demonstrate the environmental performance of exported waste recycling.
Compliance	• Existing international trade codes do not match control requirements. This promotes low accountability and transparency throughout the value chain. • Weak enforcement of pollution control in recipient countries. • Competent authorities in waste importing countries lack capacity to monitor the amount of waste entering their territories.

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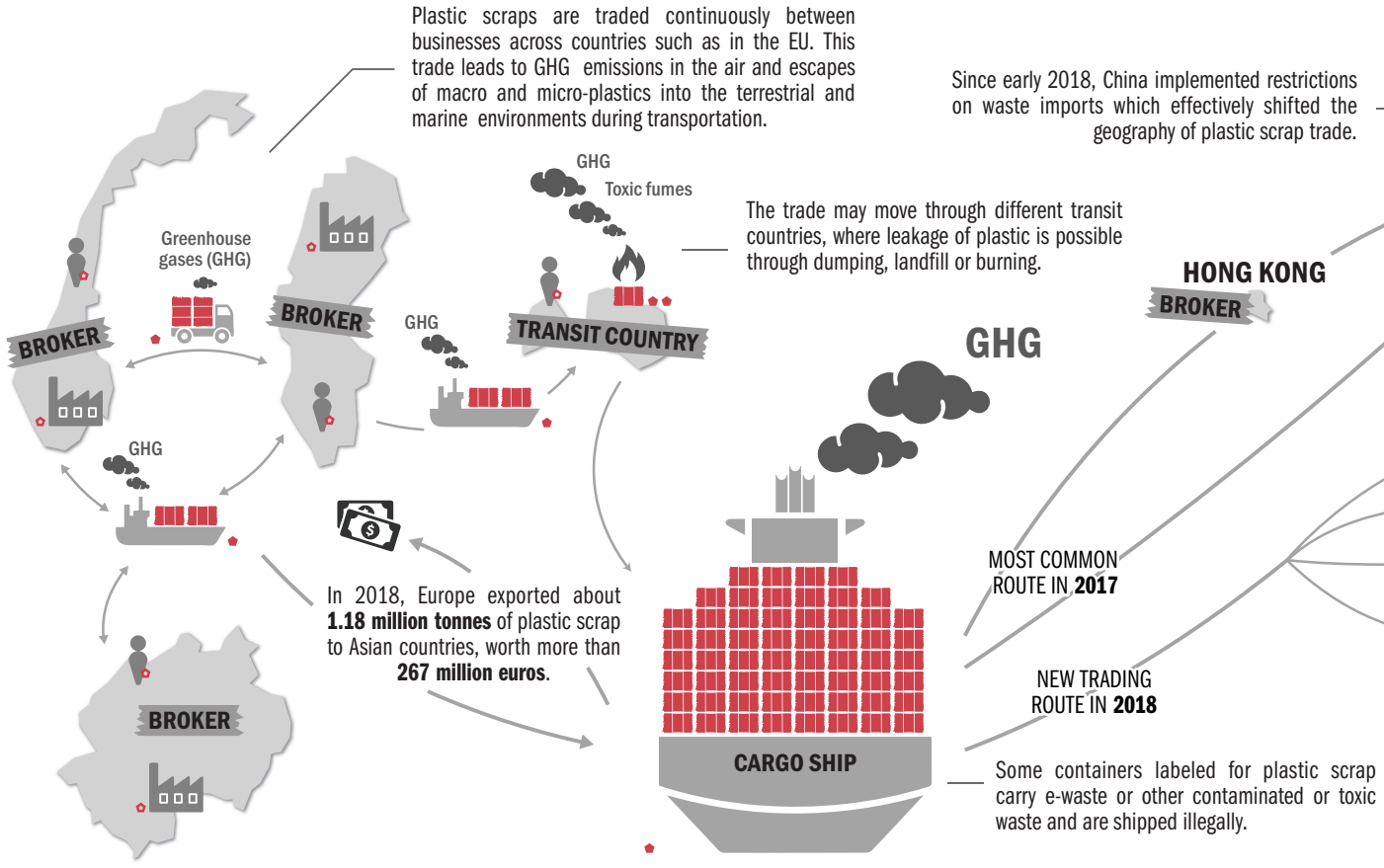
Figure 1

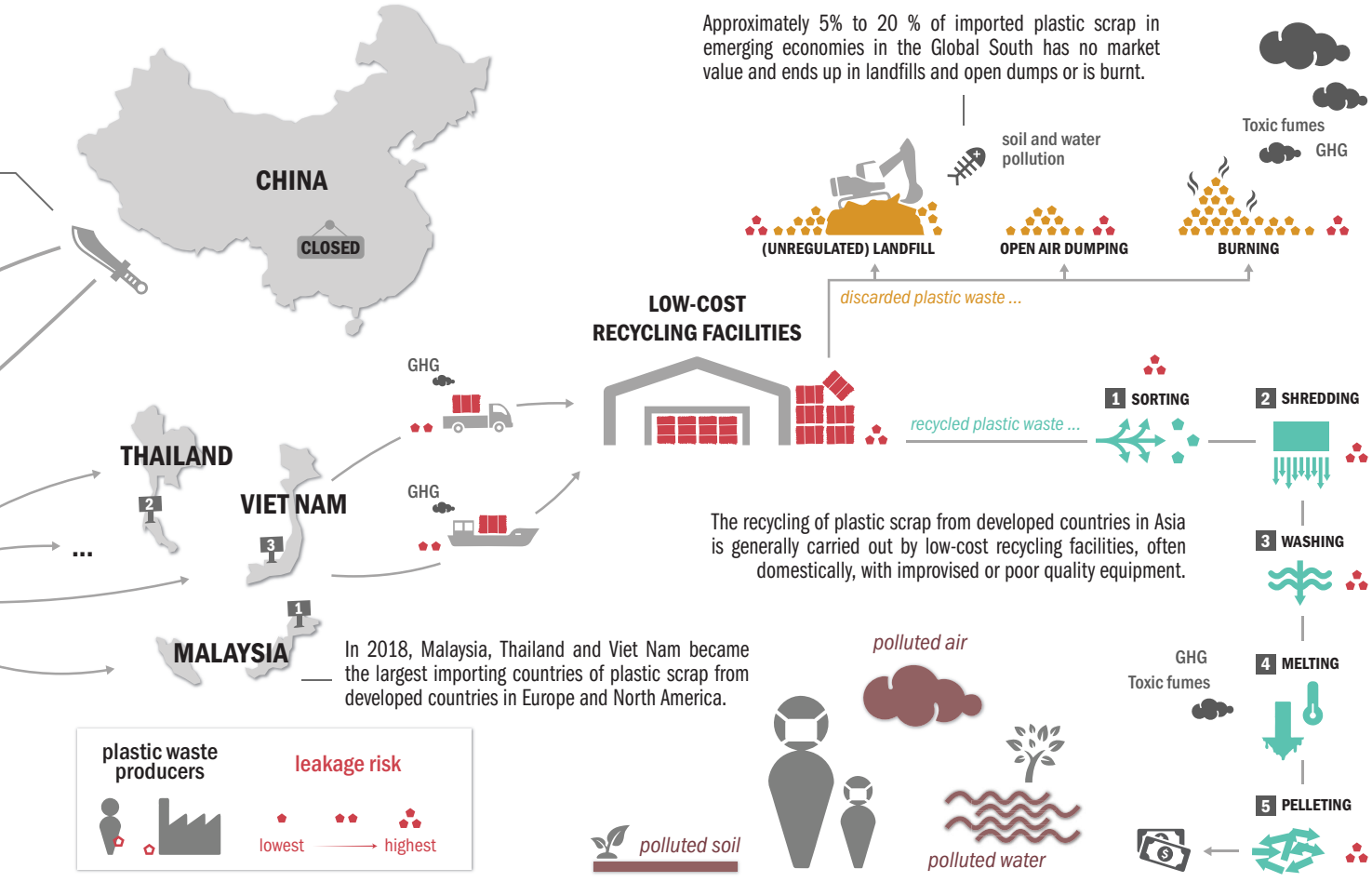
Impacts of plastic scrap transboundary movement



Sources: Bing et al. (2015); Brooks et al. (2018); Eurostat; Geyer et al. (2017); Japan e-Stat; Michida (2011); Statistics Canada; Swiss Statistical Office; US Census Bureau; Verma et al. (2016).

Drivers of plastic leakages from collected waste *(continued)*

Market indicators	• Low grade, mixed, unsorted and contaminated scrap plastics are costly to process and have little or no market value. • Low oil and gas prices make virgin plastic cheap and undermine the market for secondary plastic feedstock. • Global trade deficit with China lowers return shipping costs. • Low demand for recycled feedstock and materials. • Lower environmental controls, working standards and cheaper labour make it cost effective to export waste to emerging economies.
Waste management, transportation and technology	• Insufficient recycling and technological capacity along with high capital and operational costs in industrialised countries. • Despite advancing methodologies to recycle plastic, there are still technological shortfalls that make sorting scrap plastic challenging (Bureau of International Recycling, 2008). • Recycling bias amongst developed nations. Within the EU, domestic plastic recycling is selective toward plastics that are easy to collect and recycle. Yet, this represents only a small fraction of plastics consumed. The remainder is generally exported. • Delays in transportation trade hubs e.g., over-supply at ports in emerging scrap plastic markets.
Culture	• Single-use plastic consumerism trends. • While some plastic products such as building materials have long lifecycles, the majority of plastic products have a short lifetime lasting between one day and two years. • Lack of a universally agreed definition of "recyclable" thwarts commitments to promote changes among consumers.



By Levi Westerveld & Patricia Villarrubia-Gómez. GRID-Arendal (2019).
* This graphic considers impacts of plastic waste trade only. Plastic pollution itself has many more well documented effects on both land and marine environments and wildlife among others.

New Players in South East Asian Scrap Plastic Markets

China´s labour surplus economy allowed the country to absorb developed countries' waste, commonly through small scale operations-even at a household level. Yet, as highlighted above, strict import restrictions on plastic waste are now in place, including bans on 24 types of scraps, such as Polyethylene terephthalate (PET), Polyethylene (PE), Polyvinyl chloride (PVC) and Polystyrene (PS), decreasing scrap plastic imports by 93% from 2017 to 2018 (Figure 2).

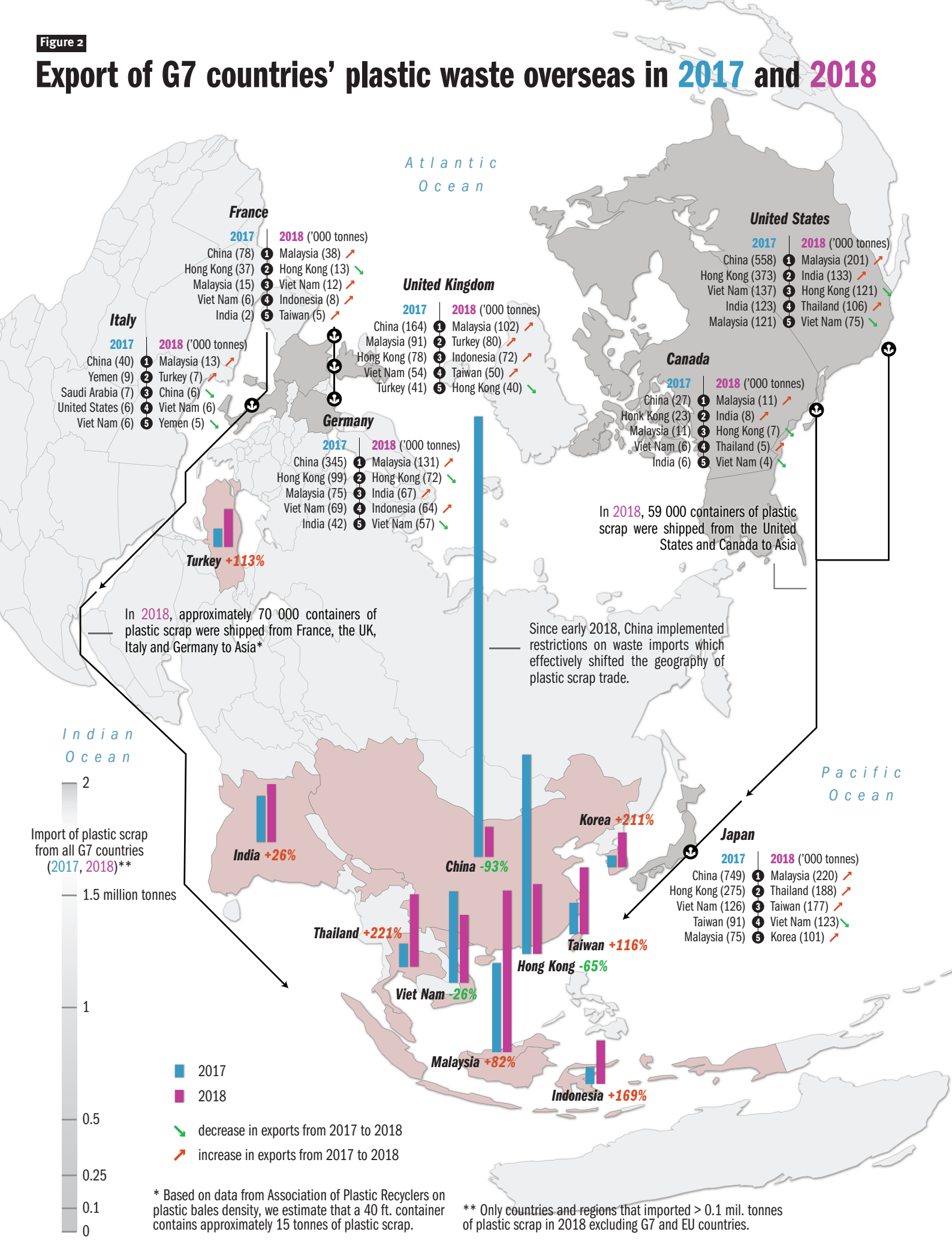
One of the most tangible consequences of China's trade barriers is the spill-over effect of scrap plastic in the region. Minor players in the global arena such as India, Indonesia, Malaysia, Taiwan, and Thailand are now increasingly receiving scrap plastic imports. The most significant case may be Thailand. In 2017, the United Kingdom (UK) shipped 2,420 tonnes of scrap plastic to Thailand. This drastically increased to 14,379 tonnes in 2018 (European Commission, 2019). Despite the increase in the uptake of scrap plastic by neighbouring countries, there is still a global deficit in traded waste (Figure 2).

Transportation hubs around the world report increasing rates of abandoned containers. Some studies link abandoned containers and illegal scrap plastic activities, where waste containers are abandoned when importers are not licensed, have expired licenses, or have mis-declared containers. For example, UK P&I (2018) estimate there are approximately 1,600 and 1,400 containers of scrap or waste cargo at Laem Chabang Port and Bangkok port respectively. When inspected by customs officials, the majority of these were abandoned and illegal. In 2018 Viet Nam reported that surging waste imports caused a backlog of 6,000 containers at its entry ports (Vu, Sipalan, & Stanway, 2018). In February 2019, Malaysian customs services announced that out of a shipment of 120 containers of waste to Penang Port, many were undeclared or falsely declared (Dermawan, 2019). As a result, these containers were stranded in Malaysia.

China's trade restrictions are causing ripple effects in global scrap plastic markets. As the industry adjusts to China's import barrier, new waste destinations are in demand as countries place new restrictions on imports. New markets will likely evolve following these changes. For example, Malaysia has become the top importer of scrap plastic from G7 countries (Figure 3). To mitigate this sudden uptake of foreign scrap plastic, Malaysian officials announced plans to phase out imports within three years. The Malaysian government has implemented tariffs on scrap plastic, tightening requirements for waste processing permits and intensifying searches for illegal waste operators (Rosengren & Pyzyk, 2018). Similar trends are emerging throughout Asia. Importers such as Viet Nam, India, Taiwan and Indonesia are actively trying to reduce scrap plastic imports (Figure 4). As a result, recyclers are looking at new locations like Central America and the Caribbean to process and export scrap plastic (Toloken 2019). While countries such as Ghana and Nigeria are established e-waste importing countries, Africa is a relatively unexplored market for scrap plastic. While there are attempts to seek new destinations for scrap plastic, the market remains fragile and stagnated. As such, certain emerging economies are rapidly expanding their capacity to process plastic waste domestically.

Figure 2

Export of G7 countries' plastic waste overseas in 2017 and 2018



* Based on data from Association of Plastic Recyclers on plastic bales density, we estimate that a 40 ft. container contains approximately 15 tonnes of plastic scrap.

** Only countries and regions that imported > 0.1 mil. tonnes of plastic scrap in 2018 excluding G7 and EU countries.

Sources: Eurostat, Japan e-Stat, Statistics Canada, Swiss Statistical Office, US Census Bureau, Blood (Financial Times, 2018). By Levi Westerveld & Philippe Rivière. GRID-Arendal (2019).

Environmental Implications

Process indicators

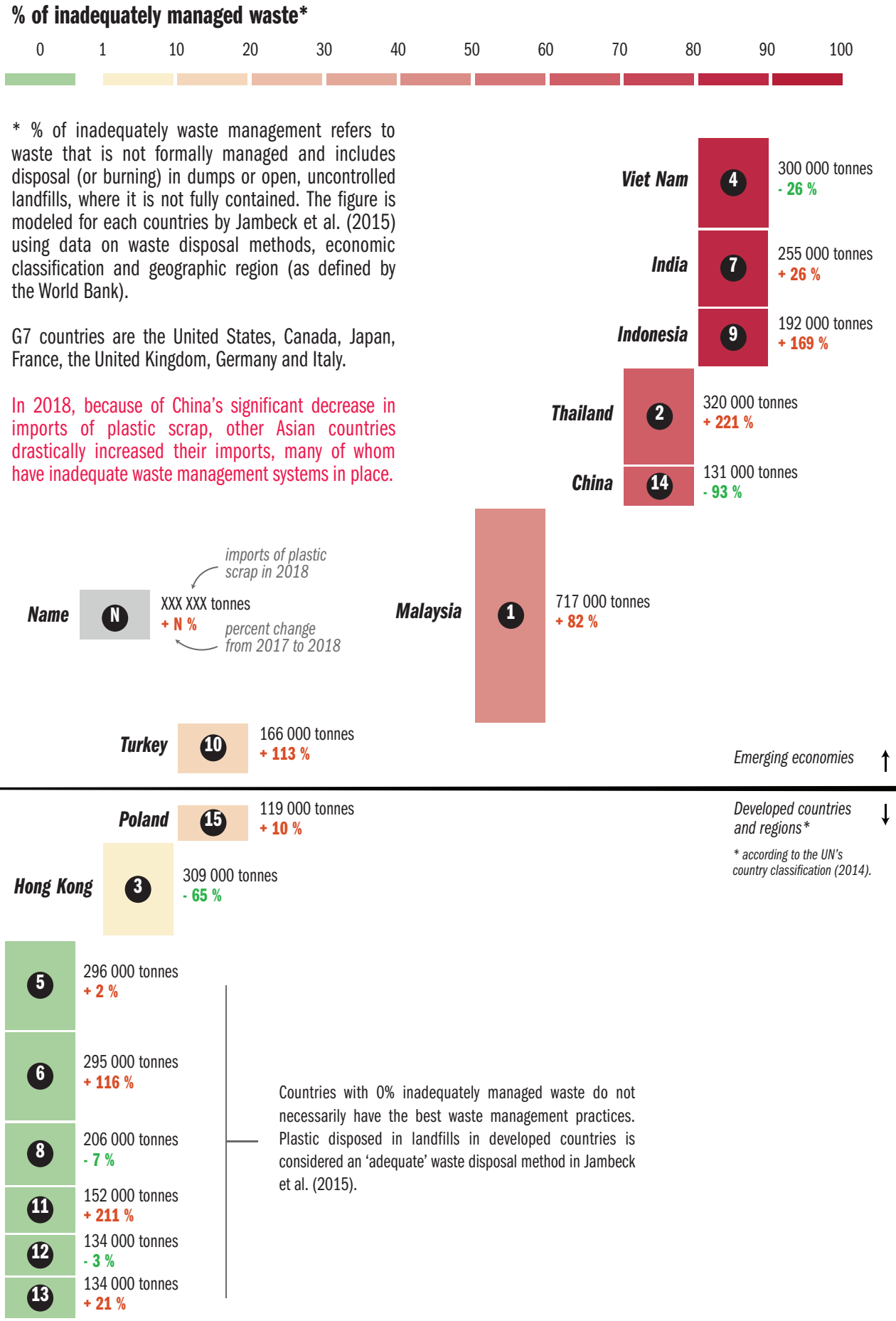
Ocean Conservancy (2015) estimated that 25% of all marine plastic litter is leaked from within waste management systems. Recycling is an intensive process in the value chain of scrap plastic. Leakage into the environment is possible at all steps. Generally, rather than sorted bales that are ready for processing, recyclers in importing countries receive shipments of mixed waste. As a result, sorting is an important component of recycling processes where all unwanted components are removed. It should be noted that approximately 5% to 20% of imported scrap plastic in emerging economies has little or no market value (Chenkee, 2008; Retamal, 2019) and therefore, are often inappropriately disposed (Bing, et al., 2015). Overburdened, informal waste operators that operate under weak regulations and enforcement often illegally dispose of or burn unwanted plastic waste. Unregulated, open-air burning poses environmental health risks as the emissions are highly toxic.

After sorting, selected plastic is washed. Washing plastic waste has the potential to contaminate water systems. Washing processes are typically mechanical and water-intensive. As well as leaking visible macro plastics, unknown amounts of microplastics and chemicals are released into wastewater systems or directly into streams. Once plastic is sorted and cleaned it is finally shredded, melted and reformed into granules. Innovative recyclers in developed countries have begun employing advanced methods such as chemical recycling. Chemical recycling, also called feedstock recycling, uses innovative technologies that convert post-consumer plastic into valuable chemicals. Before chemical recycling can be upscaled to an industrial scale, its environmental, social and economic impacts must be assessed. Moreover, as a fairly new process, chemical recycling firstly needs to be regulated (Plastic Recylers Europe, 2018).

Recycling in waste importing countries is done in low-cost and low-technology processing facilities with poor safety standards. For example, part of Viet Nam's scrap plastic imports are sold to craft villages to be processed. Viet Nam's craft villages are settlements with economies that predominantly rely on production and processing. Craft villages have been a reliable livelihood source for many households for decades. There are approximately 2,800 craft villages in Viet Nam (CREM, 2018). In 2015, 70 craft villages processing metal, paper, rubber and plastic wastes were identified. Retamal et al. (2019) identifies a case in one craft village where 900 households rely predominantly on scrap plastic processing to secure livelihood.

Figure 3

The 15 largest importers of G7 plastic waste



Sources: Eurostat; Japan e-Stat; Jambeck et al. (2015); Statistics Canada; Swiss Statistical Office; US Census Bureau. By Levi Westerveld & Philippe Rivière. GRID-Arendal (2019).

Waste management in Viet Nam's craft villages is informal and waste inputs are sporadic and mixed. Informal plastic recycling leads to serious degradation of air and water around craft villages (Chenkee, 2008; CREM, 2018; Retamal et al., 2019).

Global indicators

According to Velis (2014) plastics leakage results from three systemic failures. Firstly, poor waste collection and management infrastructure in the global South, coupled with insufficient monitoring and law enforcement mechanisms. Secondly, unstable markets for scrap plastic do not incentivize polluting stakeholders to fully utilize scrap plastic. Thirdly, the plastic recycling industry in emerging economies lacks understanding of the technical challenges, the effects of social consumption patterns and littering behaviours on solid waste generation. As a result, impacts of plastic pollution are far-reaching. In marine environments, these include impacts such as ingestion by marine coastal birds, entanglement, and the effects of microplastics on marine life. Moreover, by acting as a raft, marine plastic pollution can also spread pathogens and non-native species (UNEP and GRID-Arendal, 2016). On a molecular level, contamination through the plastisphere remains somewhat unknown. Plastic additives with low molecular volumes can be absorbed into living tissues, entering the food chain, affecting human health and food safety. Yet, while the impacts of marine plastic litter are well-documented, determining how transboundary plastic trade contributes to these impacts remains unresolved.

Analysing certain macroeconomic indicators gives some insight into which regions are major marine plastic pollution contributors. In 2015, three regions dominated global plastic production and consumption. According to Mavropoulos and Newman (2015) China, North America, and Europe consumed the most plastic, respectively 20%, 21%, and 18%. These regions also produce most of the world's plastic, 28%, 19% and 19% respectively. While consumption and production trends among these countries are somewhat balanced, their waste mismanagement trends are significantly more one-sided. For example, in a modelling study of the leakage of plastic from mismanaged waste in the coastal zone (up to 50 kms from the coastline) in 192 countries, Jambeck et al. (2015) estimated that China, North America and Europe leaked 28%, 1% and 0.9% of the world's plastic litter in 2010 respectively. In fact, Ocean Conservancy (2015) calculates that 55% to 60% of all plastic leakage into the ocean originates in five Asian states: China, Indonesia, the Philippines, Thailand and Viet Nam.

Brooks et al. (2018) estimated that 80% to 90% of all marine plastic litter originates from land-based sources. Therefore, stemming marine plastic litter requires that we understand the terrestrial pathways that transport scrap plastic into the ocean. Jambeck et al. (2015) estimated that between 5–12 million tonnes of plastic enter the ocean each year. Harbours and ports are commonly identified hotspots for marine plastic pollution. However, considering the transboundary nature of scrap plastic networks, process-leakages in waste importing countries warrant consideration. Recycling facilities in waste importing countries are usually in the vicinity of trading hubs; typically, short distances from ports to be reached by trucks or sometimes by boats. This increases the likelihood of plastic litter reaching the ocean. As many recycling facilities are located on river banks leakage can also lower the quality of drinking water. Additionally, dumpsites used by informal recyclers are typically near rivers which transport waste to the ocean.

Human and Social Welfare

Plastic recycling provides economic opportunities through job creation, typically in the informal sector. The short-term economic opportunities of unregulated plastic recycling contribute to the development of informal recycling facilities. As such, poverty traps within affected communities are reinforced as their natural environments continue degrading. For example, livelihoods created from informal waste processing in Viet Nam support thousands of households and contribute to developing rural areas (Chenkee, 2008).

The long-term costs of unregulated plastic recycling industries to human and environmental health outweigh short term benefits. In certain areas of China, informal plastic recycling operations have critically polluted surface and ground waters. This makes safe drinking water for local inhabitants scarce (Jing, 2010). For example, Wen'an county used to be the centre of scrap plastic recycling in China. Before shutting down all unlicensed recycling facilities in 2010, surface and groundwater had been contaminated to such a level that the local community had to pump drinking water from 500 meters underground (Jing, 2010).

Informal plastic recycling facilities are often family-run businesses. Informal recyclers include part-time workers and former farmers from rural areas, who process waste in their private homes lacking appropriate equipment and adequate access to running water and electricity. As informal recycling is commonly practiced at the household level, children work and play around scrap plastic and informal incineration sites (Wang, 2016). This poses great risks to their human health and welfare. Moreover, the income households receive after sorting, cleaning, processing, melting and pelleting recycled plastic might keep informal recyclers in the poverty-cycle.

Typically, recyclers in the informal scrap plastic sector can only afford low-technology processing facilities. These achieve sub-optimal performance levels and contribute significant impacts on the environment through elevated heat, noise and emissions to air, soil and water. Informal recycling settlements do not only burn plastics to dispose of unwanted wastes, but also to ignite and fuel the machinery necessary to melt and pelletise the scrap into recycled plastic. Incineration of plastic occurs in open air, or semi-open rooms in which the toxic fumes and airborne pollutants are concentrated and inhaled by workers without any protective equipment. Unregulated incineration releases chemicals into the air, causing serious lung damage and other long-term health problems to the local communities (Verma et al., 2016).

Regulations and Enforcement

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal is currently the only global environmental treaty regulating trade in hazardous and other wastes. The Basel Convention requires its contracting parties to ensure that hazardous and other wastes are managed and disposed of in an environmentally sound manner. Moreover, all parties are obliged to prevent and punish illegal traffic in hazardous and other wastes. In summary, the Basel Convention regulates the global flow of waste.

The Basel Convention contains provisions that control transboundary movement of household and hazardous scrap plastic. By requiring Prior Informed Consent between exporting and importing parties, the Convention seeks to ensure that competent authorities consent to the trade. Prior Informed Consent is determined by a waste shipment's classification. This forms the heart of the Basel Convention control systems and is based on four key stages: (1) notification; (2) consent and issuance of movement document; (3) transboundary movement; and, (4) confirmation of disposal (Basel Convention, 2011). By strengthening procedures for mixed and low-grade plastic, the Basel Convention would better regulate movement among its parties and in special agreements between party and non-party states.

When considering plastic waste, different sub-categories may trigger notification processes. For example, transboundary movement of hazardous plastic waste and household plastic waste requires that trading nations are notified. Comparatively, all other scrap plastic is currently considered a "green waste". As such, it is traded freely and without any particular control. It can cross borders without any notifications or special agreements. On June 8th, 2018 the Secretariat of the Basel Convention communicated to all its parties a proposal for the addition or removal of waste

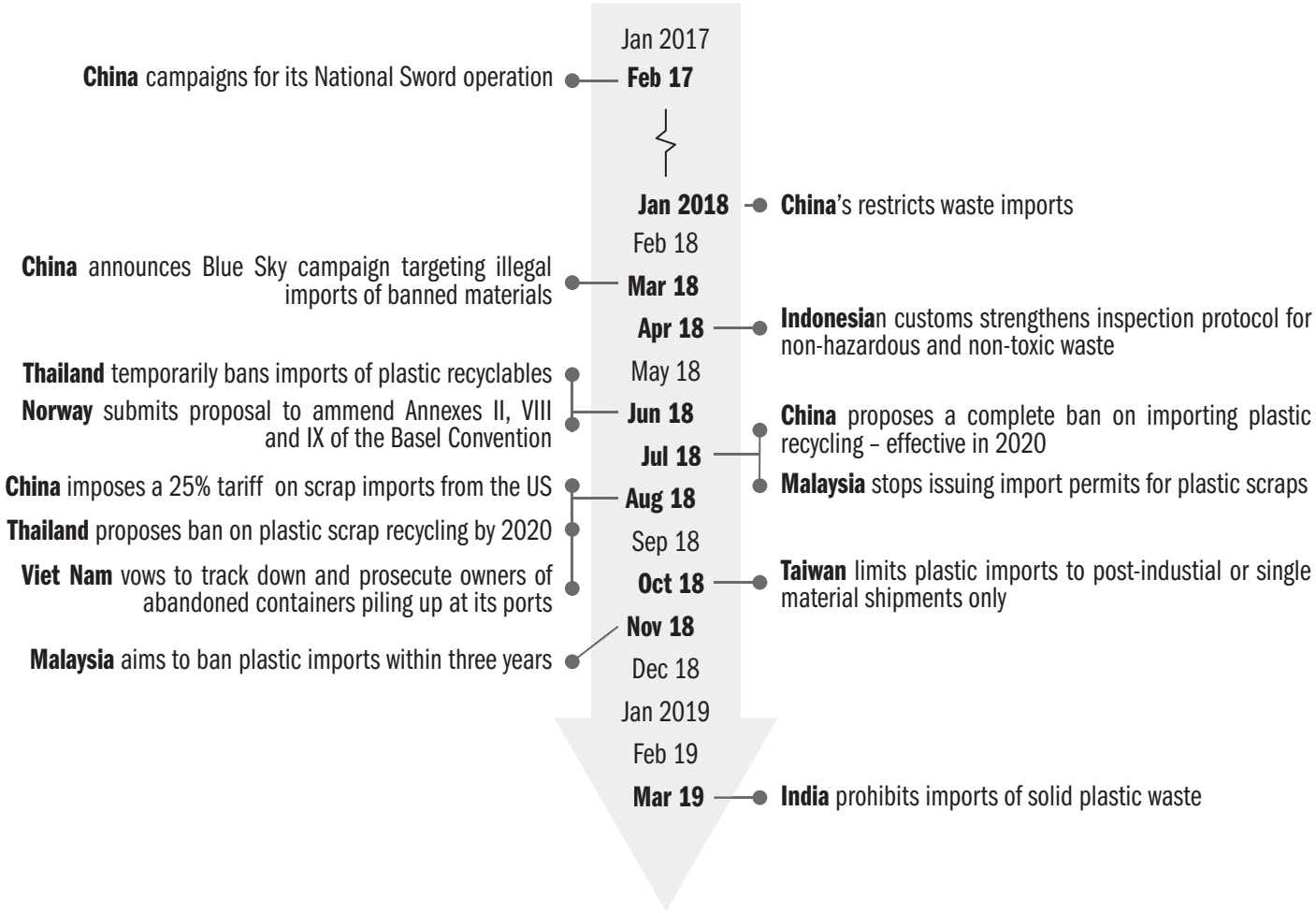
categories within Annexes II, VIII and IX as communicated by the Government of Norway. The amendments are proposed to increase the effectiveness of the Convention with regard to the trade in scrap plastic.

Currently, unsorted and contaminated scrap plastic are traded without any specific control or Prior Informed Consent. According to the European Union Network for the Implementation and Enforcement of Environmental Law (IMPEL), plastic is among the most common materials involved in violations of the waste shipment regulation. For instance, during a European inspection project carried out in 2014 and 2015, scrap plastic streams accounted for 13% of total transport violations (IMPEL, 2015). It is however difficult to monitor and control waste shipments. The trade routes for such waste may be very complex with many traders, mediators and transport companies involved. These complexities promote waste shipment violations. For example, establishing waste trading and recycling companies is relatively simple, despite requiring highly technical knowledge to ensure operations take place in an environmentally sustainable manner. Paradoxically, it is extremely challenging for competent authorities to monitor numerous, potentially incompetent actors. These complexities promote waste trade violations possibly in each step of the value chain (Ručevska et al., 2015).

In response to China's import restrictions, shipping ports in neighbouring countries are facing over-capacity and containers of foreign waste are not being handled appropriately. As a result, a number of countries have introduced temporary trade restrictions for scrap plastic or have temporarily stopped issuing import permits (Figure 4). This has resulted in global market fragility and uncertainty, placing the end-of-life treatment of many tonnes of scrap plastic at risk annually.

Figure 4

Important milestones in the transboundary trade of plastic scrap



Sources: Cotecna (2018); Maile (2019); Rosengren & Pyzyk (2018); Staub (2018); Szczepanski (2018); Thai Public Broadcasting Service (2019). By Levi Westerveld. GRID-Arendal (2019).

Conclusions

The potential for growth in the plastics recycling industry is enormous. Plastic recycling rates are estimated to be only 9% (Brooks et al., 2018). Some regions such as the EU have set high recycling targets to reduce waste and create a pathway for sustainable production and consumption towards a new paradigm of circular material use. Meeting these targets depends on soundly managed transboundary movement of scrap plastic for the foreseeable future. To better deal with the environmental consequences of the global scrap plastic trade, this movement needs to be better regulated and adequate systems must exist in recipient countries to deal with imported waste.

While plastic recycling minimizes pressure associated with natural resource exploitation and reduces waste being discarded in landfills or leaked to the environment, it carries risks. The economic feasibility of recycling many wastes greatly depends on transboundary movement which is regulated by the Basel Convention. Low grade scrap plastic is often traded to emerging economies for recycling at a lower cost, which increases profitability at the expense of poor environmental, human health and safety compliance. Recycling facilities in destination countries are often located short distances from large trade hubs mostly situated on riverbanks and coastal lowlands. Consequently, leakage of unwanted plastics and processing residues and chemicals into freshwater and marine environments is particularly concerning.

Recommendations

Over the last decade, global efforts to shed light on the challenges and opportunities in the global plastic recycling industry have increased. China's trade barriers have drastically impacted global trade patterns of scrap plastic.

Better control over transboundary movement of scrap plastic streams is critical to addressing pollution issues including marine plastic litter. In the current global model, waste exporting countries have little knowledge of their shipments' fate once they depart their ports. Thus, enhancing traceability and accountability throughout the global plastic end-of-life value chain is essential. Reaching this objective requires the strengthening of global scrap plastic trade policies and regulation.

Strengthening global scrap plastic trading policies requires more exhaustive Prior Informed Consent procedures for mixed and low-grade plastics. Strengthening procedures under the Basel Convention would ensure scrap plastic exports are monitored to increase environmental accountability of plastic recycling. To avoid overburdening customs officials at entry and exit points, fast track notification systems for approved categories of waste should be developed in parallel with stronger control mechanisms that fully integrate with the Basel Convention's directives.

Improving domestic plastic recycling processes in high waste generating countries will alleviate environmental burdens on emerging economies. Enhancing technologies or installing advanced sorting processes at plastic recycling facilities in exporting countries will increase the industry's efficiency globally and minimize leakages into the environment. Norway's proposed amendments to Annexes II, VIII and IX of the Basel Convention aim to reduce sorting in importing countries by obligating exporting countries to sort scrap plastics and remove contaminants.

Enhancing end-markets for secondary materials will motivate increased efforts to better collect and process scrap plastic. Strengthening global contamination standards, converting scrap plastic into granules for recycled products will be more economically viable. Furthermore, regulations that favour products manufactured from recycled materials can boost the market of secondary materials.

Finally, the transboundary and complex nature of scrap plastic trade need to be better monitored and the economic, social and environmental impacts of the plastics recycling sector on local and global levels be analyzed. Improved information and data gathering will promote informed decision making.

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Plastics consumption per capita is rapidly growing. Global plastic production has steadily increased to almost 350 million tonnes per year in 2017, growing three times faster than the global gross domestic product. When properly managed, plastic recycling minimizes resource pressures and reduces plastic leakages into the environment. It is fundamental towards pursuing a circular economy and mitigating plastic pollution. Indeed, almost all types of plastics are technically recyclable.

Many countries are increasing plastic recycling targets. For instance, a number of countries in Europe and the USA have ambitious recycling targets that heavily rely on transboundary movement of scrap plastic. Low grade scrap plastic is often traded to emerging economies for recycling at a lower cost, which increases profitability at the expense of poor environmental, human health and safety compliance. Better control over transboundary movement of scrap plastic streams is critical to addressing pollution issues including marine plastic litter.

However, the extent to which they are recycled depends upon available technology, sorting and logistics. Just as any other globally-traded commodity, macroeconomic indicators and market conditions influence plastics recycling and scrap trade.