



GLOBAL RULES IN A NEW GLOBAL TREATY:

ASIA'S OPPORTUNITY TO END SINGLE-USE PLASTIC POLLUTION

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EXECUTIVE SUMMARY

In March 2022, at the resumed fifth meeting of the United Nations Environment Assembly, UN Member States adopted the historic decision to start negotiating a global treaty to combat plastic pollution. As national delegations and relevant stakeholders in Asia start preparing for the upcoming negotiations, this report aims to provide an analysis of the region's opportunities to end single-use plastics (SUPs) pollution through the development of this new global treaty. SUPs are of particular interest in this regard, as they are the plastic type that is the most often produced and littered. Moreover, SUPs are used only very briefly, often only once, despite being made of a material that was invented to last. And SUPs are usually very difficult to recycle.



While most Asian countries have already started to implement measures that address problematic single-use plastic items, several challenges persist. In this light, the envisaged international treaty provides an opportunity for the region to leverage the potential global rules and governance arrangements to jointly address the problem through harmonised regulations and better coordinated efforts.

Firstly, the report identifies the top five most problematic SUPs in Asia. These were identified by a literature review focusing on information and material published in English during the last five years using the following eight criteria: prevalence, leakage volume, environmental harm, economic costs, lack of recycling potential, human health risks, social justice impacts, and ease of substitution. **The top five most problematic SUPs in Asia are 1) plastic bags, 2) sachets, 3) wrappers (multilayer packaging), 4) Styrofoam products, and 5) plastic bottles.**

Secondly, the report outlines policy pathways most often recommended to tackle the existing problems with these SUPs. **These include approaches**

1) to reduce the volume of plastic waste by product redesign, elimination of unnecessary items and over-packaging, expanding reuse options and, when necessary, substituting SUPs with plastic-free alternatives and

2) to enhance the recovery and the recycling of SUP waste for those items that cannot be eliminated.

For plastic bags, sachets, wrappers (multilayer packaging), and Styrofoam products, the focus should be on the elimination of unnecessary uses with the help of bans and phase-outs along reduction targets, product redesign, and subsidies or tax reductions for alternatives. The production and use of SUP plastic bottles can be reduced by SUP reduction targets, taxes on SUP bottles, subsidies or tax reductions for reusable alternatives, requirements for retailers, etc. to offer reusable/refillable options, and standardised reusable bottles and containers combined with deposit-refund schemes. To increase the recycling of plastic bottles, product design requirements, recycling targets, and recycled content targets can lead into the right direction, if investments in the required technology and infrastructure are undertaken at the same time.

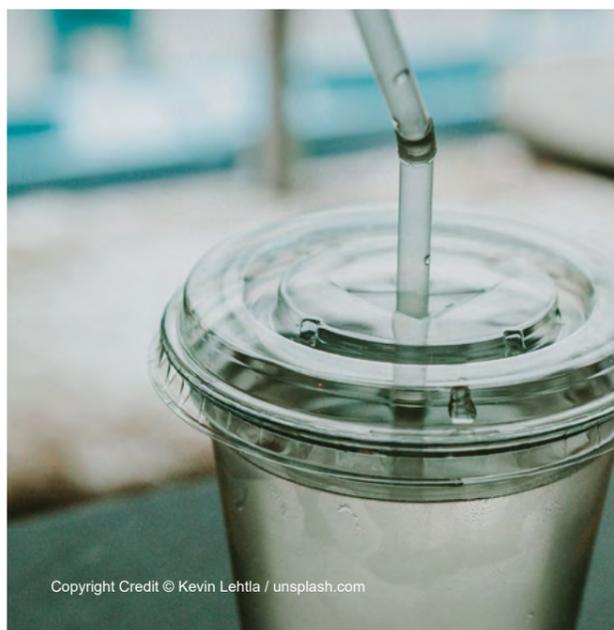
Overall, extended producer responsibility (EPR) schemes are the policy instrument most often recommended in the literature to tackle all kinds of SUPs. To install a functioning EPR system requires a comprehensive legal framework, a clear definition of roles and responsibilities of all stakeholders involved, political targets, a systematic and reliable waste management (infra)structure, the integration of the informal sector, as well as monitoring and enforcement structures.

Finally, the report provides recommendations for elements of a global plastics treaty that are key to help curbing pollution from SUPs in Asian countries. **These include**

- **Global goals and targets, coupled with compliance mechanisms, and focusing on the whole supply chain,**
- **Common global rules and obligations, for both,**
 - Upstream measures, as well as
 - Downstream measures;
- **Requirement for countries to prepare and implement national action plans with regard to global rules and targets, including additional country-specific measures;**
- **Co-operation on research and development;**
- **Capacity building, knowledge and technology transfer;**
- **Financial mechanisms;**
- **Scientific and innovation co-operation;**
- **Transparency requirements and compulsory labelling of material content and chemical additives;**
- **Common criteria for sustainable alternatives to SUPs;**
- **Regular assessments of the social and environmental impacts of alternative materials;**
- **Standardisation of key terms.**

INTRODUCTION

The decision taken by UN Member States at the United Nations Environment Assembly (UNEA-5.2) in March 2022 to develop an international legally binding instrument on plastic pollution has already been described as historic. It has opened up the possibility for an international treaty that addresses the full life cycle of plastics and brings about the necessary measures to sufficiently and effectively stem the tide of plastic pollution (WWF, 2022).



SUP consumption is booming worldwide, with Asia being no exception. In fact, “Asia is experiencing increasing consumption of single-use plastics due to its rapid economic growth, urbanization, and changing consumption and production patterns” (Akenji et al., 2020, p. 534). More specifically, preferences are shifting from traditional fresh food to processed and packaged food. E-commerce activities are increasing. And last but not least, a “sachet economy” has been established with small portions of products (e.g., instant coffee, shampoo) being sold for convenience and to target especially the large population groups with lower purchasing power (Akenji et al., 2020).

As the term already reveals, SUPs are made to be disposed after a short single use – often they are discarded after just a few minutes. While this is generally desired for hygienic reasons with regard to medical applications such as syringes, applicators, drug tests, and wraps, SUPs are avoidable in most other applications, including, for instance, small-format as well as multi-material plastic packaging. By their very design, these products are destined for landfill, incineration or energy recovery, as recycling is not an option. Thus, these products have no economic value but produce only costs in the post-use phase (Ellen MacArthur Foundation, 2017). Other SUPs, such as PET bottles do have an economic value, but still find their way into the environment in most Asian countries. This is because waste management systems in Asia have not kept pace with the increasing consumption of SUPs in the region. As countries lack the infrastructure and resources for effective waste services, inadequate waste management systems resulting in high shares of mismanaged waste are the primary cause of plastic pollution in Asian countries (WWF, 2020). Recent estimates concluded that in 2015 the Asian continent was the region generating the most mismanaged plastic waste with an average of 63% of inadequately disposed waste and a release of 52 (42–58) Mt of plastic waste into the environment, representing 65% of the global generation of mismanaged plastic waste. China and India dominate the waste generation figures for Asia, followed by the Philippines (Lebreton & Andrady, 2019, pp. 5–6). With regard to riverine plastic emissions that reach

No other plastic usage represents the problem of plastic pollution as much as single-use plastics (SUPs) do. A SUP product is “a product that is made wholly or partly from plastic and that is not conceived, designed or placed on the market to accomplish, within its life span, multiple trips or rotations by being returned to a producer for refill or re-used for the same purpose for which it was conceived” (Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the Reduction of the Impact of Certain Plastic Products on the Environment (Text with EEA Relevance), 2019, Article 3(2)). SUPs are the most common type of plastics produced, and, at the same time, the most littered in the environment. In 2019, more than 130 million metric tons of single-use plastics were discarded worldwide, of which about 19 per cent were dumped directly on land or into the ocean. Moreover, most SUPs are very difficult to recycle due to the products’ design (Charles et al., 2021; Ellen MacArthur Foundation, 2017).



the ocean, Meijer et al. (2021) found the Philippines to be the largest contributing country, followed by India, Malaysia, and China (see Table 1). While the specific numbers are somewhat debated and Law et al. (2020) also highlight the great responsibility of the US in terms of plastics leakage, the existing research nonetheless leaves no doubt that high levels of plastics leakage stem from many Asian countries. To tackle the severe problem of plastic pollution, most Asian countries have already started to implement measures that address SUP items (Akenji & Bengtsson, 2019; Stockhaus et al., 2021). Yet, several challenges persist which need to be addressed with a holistic life-cycle approach.

The decision to negotiate an international treaty tackling plastic pollution provides an opportunity for Asian countries to successfully tackle these issues by leveraging the global rules and governance arrangements that the treaty will provide.

This report

- identifies the top five problematic SUP items in Asia along the following eight criteria: prevalence, leakage volume, environmental harm, economic costs, lack of recycling potential, human health risks, social justice impacts, and potential for reduction.
- outlines the policy pathways most often recommended to tackle the existing problems with these SUPs based on the potential impact of the respective policies, the ease in implementing and enforcing a certain policy, and existing experiences and best practices to learn from.
- discusses potential content of the new international legally binding instrument to address the most problematic SUP items.

The report is based on a literature review of available information and materials published in English in the last five years.

	METRIC TONS (MT) PER YEAR	PERCENTAGE OF THE MISMANAGED PLASTIC WASTE GENERATED IN THE COUNTRY	NUMBER OF RIVERS
PHILIPPINES	356,371	8.9%	4820
INDIA	126,513	1.0%	1169
MALAYSIA	73,098	9.0%	1070
CHINA	70,707	0.6%	1309

Table 1. Countries with the highest annual plastic emissions into the ocean based on data from 2017 to 2020. Source: (Meijer et al., 2021, p. 5, see also table on p. 6)

MOSTLY LIGHT-WEIGHT AND OF LOW VALUE: THE TOP FIVE PROBLEMATIC SUP ITEMS IN ASIA

Existing research on single-use plastics in Asia focuses mostly on Bangladesh, India, Indonesia, the Philippines, Thailand, and Vietnam, with some publications on China, Japan, and Malaysia as well. This list of countries coincides closely with the list of Asian countries that are among the countries generating the highest amount of mismanaged plastic waste by coastal populations in 2016 (Law et al., 2020, p. 4).



Based on the available literature, the top five problematic SUP items in Asia according to the eight underlying criteria (cf. Table 2) are:

1. PLASTIC BAGS
2. SACHETS
3. WRAPPERS (MULTILAYER PACKAGING)
4. STYROFOAM PRODUCTS
5. PLASTIC BOTTLES

In addition, cigarette butts have been mentioned as very problematic in several sources but have probably not been considered as SUP items in other publications. This is because the categorization of cigarette butts as plastic items is still not harmonised across different protocols to categorize litter items (Binetti et al., 2020).

Table 2. Top five problematic single-use plastics in Asia. Source: Own presentation.

CRITERIA	TYPE OF MOST PROBLEMATIC SUPs
<p>PREVALENCE (percentage of plastic waste, i.e., highest consumption)</p>	<p>Throughout Asia, plastics waste resulting from Fast Moving Consumer Goods is exacerbated by single-use ‘sachet’ size product distribution, with sachets forming a large portion of the FMCGs market (Phelan et al., 2020, p. 2). Estimates suggest that sachets account for as much as 95% of industry sales in terms of volume and 60% in terms of value in India and South East Asian countries (Williams et al., 2019, p. 38).</p> <p>India: most plastic waste is dominated by multi-layered plastics (wrappers for chips, biscuits, chocolate, etc.) (19%), followed by bottle caps and lids (12%), as well as PET bottles (10%) (Johannes et al., 2021, p. 695).</p> <p>Philippines: the most commonly found SUP items in solid waste are sachets and multilayer packaging, followed by plastic bags (shopping bags with handles and thin bags without handles) (Global Alliance for Incinerator Alternatives, 2019, p. 23). Other SUPs commonly used and discarded are PET water bottles; harder HDPE plastic bottles used for shampoo or milk; food containers, spoons, and forks (PS); bottle caps, drink lids, straw, and stirrers (Villarin & Cuaresma, 2020, p. 10).</p> <p>Japan: household plastic consumption is dominated by plastic packaging and containers, mostly for the sale of primary products, beverages, and foods (Nakatani et al., 2020, p. 19846).</p> <p>Vietnam: In households in Hanoi, plastic shopping bags are the most frequently used type of single-use plastics (~ 27 items per week), followed by plastic wrap and film (~ 20), plastic straws (~ 14), coffee cups with plastic lids (~ 9), plastic cutlery (~ 9), plastic takeout containers (~ 8), plastic packaging (pots, tubs, trays, and boxes) for food (~ 8), plastic party cups (~ 7), and plastic bottles for water and beverages (~ 6) (Liu et al., 2021, p. 425).</p> <p>Malaysia: The majority of generated plastic waste in 2007 comprised single-use plastic films (74%), with rigid plastics and foam plastics, constituting 17% and 9%, respectively (Chen et al., 2021, pp. 2–3).</p>
<p>LEAKAGE VOLUME</p>	<p>Wrappers, plastic bags, and plastic bottles are, together with fishing-related litter, the top litter items found in the nearshore seafloor in South Asia and East Asia and Pacific (East Asia and Pacific: Wrappers 18,2%, plastic bags 14%, plastic bottles, 11,1%, fishing-related litter 7,2%; South Asia: plastic bottles 12,9%, fishing-related litter 12,2%, plastic bags 7,1%, wrappers 6,4%) (Morales-Caselles et al., 2021, p. 490).</p> <p>Indonesia: the most prevalent type of plastics found in waste sampled from waterways were plastic bags (on average 16% across the sampled cities), followed by plastic packaging (5%). 21% of the waste was comprised of disposable diapers, which were not considered “plastics” in the assessment, but do contain plastics components. (Shuker & Cadman, 2018, p. 21).</p> <p>Observations in trash-racks in Jakarta indicate that SUPs (e.g., sachets, plastic bags, but also plastic bottles with a high recycling value) are among the top items carried by waterways that run through Jakarta. Similar patterns are found on beaches (World Bank, 2021, pp. 94–95). Waste samples at the Citarum River estuary were dominated by thin plastic wraps and Styrofoam products (disposable food packaging products and electronic wrappings) (Pamungkas et al., 2021, p. 106).</p> <p>India/Bangladesh: Of the plastic proportion recorded in the litter leaked in the Ganges River Basin, tobacco products (typically, tobacco sachets made of film plastic in India and cigarette butts in Bangladesh), food wrappers, and plastic fragments were found across all sites. Film and multi-material items are predominant in the litter (including tobacco sachets, plastic food wrappers, sheetlike (flexible, such as film) plastic fragments, plastic bags, blister packs, personal care product sachets) (Youngblood et al., 2022, pp. 4035–4036).</p> <p>Thailand: bags are leaked most often, followed by other packaging including snack bags, pouches, etc. (often multilayer materials), and boxes, cases, crates (Pucino et al., 2020, p. 27).</p> <p>Philippines: the marine litter items most commonly found in the Philippines are plastic wrappers and bags (SEA Circular, 2020, p. 3). The dominant wastes found at Philippine’s coasts are plastic</p>

CRITERIA	TYPE OF MOST PROBLEMATIC SUPs
	<p>food wrappers/containers, cups, and sachets (Galarpe et al., 2021, p. 5). Cigarette butts are the most common type and voluminous among plastics found in the general environment (Villarin & Cuaresma, 2020, p. 10).</p> <p>Regarding the types of plastics that are leaked into the environment low-value plastics (including LDPE and flexible HDPE) make up nearly 50% of the total leakage to the environment. High-value plastics follow, with PP, PET, and rigid HDPE making up a total of about 37%. Medium-value plastics such as PS and PVC comprise ca. 15% of the total plastic leakage (WWF Philippines 2020, p. 41).</p> <p>Japan: SUPs are the dominant type of debris found at Kuroshio Extension recirculation gyre and Kuroshio Extension (seafloor off Japan) consisting mostly of fragments of plastic bags, and other films and packages (Nakajima et al., 2021, pp. 4–5).</p> <p>Vietnam: plastic bags are leaked most often, followed by other packaging (including snack bags, pouches, etc. (often multilayer materials)), lids and caps are considered a hotspot application as well (Pucino et al., 2020, p. 27).</p> <p>Malaysia: most common SUPs found in the Malaysian shore are plastic grocery bags, cigarette butts, and plastic bottles (Ma et al., 2020, p. 2). Sachets and multilayer/multimaterial flexibles (such as for shampoo and condiment portions, chips, and sweets packets) have a disproportionate rate of leakage because they have the least material value (and hence lowest collection rates and are rarely recycled) (International Resource Panel, 2021; The Pew Charitable Trusts & SYSTEMIQ, 2020).</p>
ENVIRONMENTAL HARM	<p>Apart from fishing-related debris, balloons and plastic bags pose the greatest risks of entanglement for marine species. Plastic bags and balloons are most likely to be ingested according to expert estimates, although many other SUP items are misinterpreted as food by marine wildlife as well. Contamination effects are estimated to be especially high for cigarette butts, hard plastic containers, and food utensils (Wilcox et al., 2016, p. 109). Plastic containers on beaches can entrap organisms (Tekman et al., 2022, p. 56).</p> <p>Turtles in Korean waters ingest mostly SUPs, mainly filmed packaging (19%) and plastic bags (19%) (Moon et al., 2022, p. 4).</p>
ECONOMIC COSTS	<p>Plastic pollution causes direct economic costs in the sectors of (1) fisheries and aquaculture, (2) tourism, and (3) shipping (United Nations Environment Programme, 2021b, pp. 38–39). It also affects food production on land due to cattle and sheep dying from eating plastic bags in countries, where livestock graze in areas with significant plastic bag waste (United Nations Environment Programme, 2021b, p. 92).</p> <p>For 2015, the economic costs of marine plastics to the tourism, fishing, and shipping industries in APEC countries were estimated to amount to US\$10.8 billion of damage per annum (with nearly 60% of the total damage costs in the tourism industry, 27% in the shipping industry, and about 13% in fisheries and aquaculture) (McIlgorm et al., 2020, p. 29).</p> <p>As an example, plastic pollution in the form of plastic bottles, shopping bags, and Styrofoam cups is inundating the beaches of Bali and is producing costs in terms of clean-up as well as potential losses of income from tourism (United Nations Environment Programme, 2021c, p. 34).</p>
LACK OF RECYCLING POTENTIAL	<p>Types of SUPs that cannot be recycled and thus only produce costs in the post-use phase (Ellen MacArthur Foundation, 2017; see also Johannes et al., 2021, p. 694f. for multi-layered plastics and Styrofoam; and Schachter et al., 2022 for sachets):</p> <ul style="list-style-type: none"> • small-format packaging, such as sachets, tear-offs, lids and sweet wrappers; • multi-material packaging, that is several materials stuck together to enhance functionality; • uncommon plastic packaging materials with relatively low volumes put on the market, such as polyvinyl chloride (PVC), polystyrene (PS) and expanded polystyrene (EPS, also known under the brand names Styrofoam or Thermocol); and • highly nutrient-contaminated packaging, such as fast-food packaging.

CRITERIA	TYPE OF MOST PROBLEMATIC SUPs
HUMAN HEALTH RISKS	<p>Mismanaged waste and plastic pollution, including through SUPs, harm people's health in Asian countries – especially in low and middle-income countries – in the following ways:</p> <ul style="list-style-type: none"> • Plastic bags block waterways, drainage and wastewater systems, which threatens the livelihood and sanitation of residents as floods are exacerbated, and people might die by drowning, waterborne diseases are spread due to clogged drains which provide breeding grounds for disease-carrying flies and mosquitos (Schachter et al., 2022 for the Philippines; United Nations Environment Programme, 2018, p. 55 for Bangladesh and 13-14 with a general statement on developing countries). • Discarded SUP items that can hold water, such as Styrofoam fast food boxes, can also create excellent habitats for mosquitos and other disease-bearing invertebrates near rivers or after flooding or rainfall. Similarly, floating plastic items can create pockets where mosquito larvae find shelter from predators (Boelee et al., 2019, p. 222). • Styrofoam items contain toxic chemicals such as styrene and benzene. Both are considered carcinogenic and can lead to additional health complications, including adverse effects on the nervous, respiratory, and reproductive systems. Toxins in Styrofoam containers can transfer to food and drinks, especially when people reheat the food while still in the container (United Nations Environment Programme, 2018, pp. 13–14). • Many communities with inadequate waste management services and infrastructure burn waste residentially or in open dumpsites. This releases harmful chemicals such as dioxins and other persistent organic pollutants into the air, water, and land and generates particulate matter (including microplastic particles) (Lau et al., 2020, p. 1459; United Nations Environment Programme, 2018, pp. 13–14). The released pollutants increase the risk of diseases such as heart disease and cancer, respiratory ailments, skin and eye diseases, nausea and headaches, and damage to the reproductive and nervous systems (Williams et al., 2019, p. 5). • In low-income regions, domestic waste – including plastics – is often burnt for heating and/or cooking purposes, exposing largely women and children to prolonged toxic emissions (United Nations Environment Programme, 2018, pp. 13–14). • Large informal dumpsites pose a direct risk to human lives due to landslides. In 2017, landslides at waste dumps accounted for more than 150 known deaths worldwide (Williams et al., 2019, p. 5). • SUPs disintegrate into micro- and nanoplastics. Upon ingestion, internalization, and potential translocation, these particles may cause particle toxicity and associated oxidative stress and inflammation. Whether internalised plastic particles bring associated toxic chemicals into the human body, resulting in bioaccumulation in certain organs with consequent chemical risks, is still to be studied. Plastic-derived chemicals include a range of toxic substances often with endocrine disrupting, immunotoxic, or other toxic potency (Boelee et al., 2019, p. 222). • Waste workers, waste pickers, and people living among mismanaged waste can contract diseases when handling debris with germs, e.g., diarrhoeal disease which is one of the leading causes of death for children under five years (Kretchy et al., 2020; Williams et al., 2019, p. 5).
SOCIAL JUSTICE IMPACTS	<p>Many countries in the Global North ship their plastic waste to poorer countries in the Global South such as Malaysia, Thailand, and Indonesia. Here, the waste is often dumped on low-income, already marginalized communities, where low pay and hazardous working conditions persist. The methods available for waste disposal (incineration, etc.) impact the health and quality of life of marginalized communities in the receiving countries.</p> <p>In general, petrochemical and waste management facilities, such as incinerators and landfills, are disproportionately built in low-income and heavily minority communities, further deepening social disparities with environmental degradation, health costs, and wasted public investments.</p> <p>Plastic waste burning also exacerbates inequalities: due to inadequate or non-existent waste management systems open burning is widespread in countries in the Global South. It transforms plastic waste into toxic ash and air pollution, harming the health of nearby communities (United Nations Environment Programme, 2021c, pp. 20, 33).</p>

CRITERIA	TYPE OF MOST PROBLEMATIC SUPs
	<p>The marketing and distribution of sachets is mainly directed towards low socio-economic communities and low-income families, which are unable to afford standard sizes of new (often internationally owned) branded products, so sachets offer a possibility for them to access these products. However, in some countries, such as Indonesia, the long-term costs of multiple sachets are considerably higher than buying the full-sized item (Williams et al., 2019, p. 38). As sachets are targeted at low socio-economic communities and low-income families, sachet packaging is also particularly prevalent in remote and rural communities which have less sophisticated waste management infrastructure (Phelan et al., 2020, p. 2).</p>
<p>POTENTIAL FOR REDUCTION</p>	<p>According to a study by Pew Charitable Trusts and SYSTEMIQ (2020), sachets and multilayer/multimaterial flexibles (such as for shampoo and condiment portions, chips, and sweets packets) have the highest reduction potential in terms of the absolute mass of plastic that could be avoided, followed by business-to-business packaging such as crates and pallet wrap, monomaterial films, bottles, carrier bags, and food service items. (The Pew Charitable Trusts & SYSTEMIQ, 2020, p. 51)</p>

A HOLISTIC LIFE CYCLE APPROACH IS NEEDED TO END SUP POLLUTION IN ASIA

Today, there are considerable differences in the way governments in Asia seek to address the challenges related to single-use plastics pollution.



Several countries have introduced bans or charges on single-use plastic items (often targeting shopping bags) and some governments have developed national strategies or plans on plastics to better coordinate actions by related ministries and stakeholders. Yet, so far, extended producer responsibility (EPR) schemes or deposit-refund systems to boost collection rates of postconsumer packaging (Akenji & Bengtsson, 2019, p. 23) are still quite uncommon in Asian countries (Stockhaus et al., 2021, pp. 21–22).

To successfully tackle the top five problematic SUP items in Asia, a holistic life cycle approach with a policy mix that encompasses both, downstream and upstream measures is required (cf. Liu et al., 2021, p. 430; United Nations Environment Programme, 2021a). Yet, downstream measures are only appropriate for SUP applications that cannot be eliminated by upstream measures. In other words, effective waste management alone cannot solve the plastic pollution problem (The Pew Charitable Trusts & SYSTEMIQ, 2020).

Upstream measures include product redesign, elimination of unnecessary items and over-packaging, expanding reuse options and, when necessary, substituting SUPs with plastic-free alternatives.

In terms of policy pathways, the following instruments could be implemented by governments in Asia to prevent the production and use of avoidable SUPs:

- Plastic product/application bans**, for SUP products for which viable alternatives exist, including single-use bags, sachets, multilayer films, and Styrofoam products (cf. Abueg, 2019, pp. 10–11; Akenji & Bengtsson, 2019, p. 14; Global Alliance for Incinerator Alternatives (Philippines), 2020, p. 8; Villarín & Cuaresma, 2020, p. 15; World Bank Group, 2021d, p. 16; Xuan Son, 2021, p. 6). In contrast to plastic bag bans, for sachets and multilayer/multimaterial flexibles a very limited number of bans exists. However, Sri Lanka has banned sachets that are under the weight of 20ml/g and which do neither contain edible nor medical products. This ban covers approx. 30% of all sachets on the market in Sri Lanka (Katuwawala, 2021). In cases, where plastic bans exist, but are only partially effective, governments should identify implementation gaps and what it would take to make the ban work effectively. Resources should be made available to local governments to allow for sufficient training on how to enforce the plastic ban.

Additionally, consistent monitoring and strict enforcement of fines are key to ensuring plastic bans are effectively implemented (Kapinga & Chung, 2020, p. 39).

- **Legal requirements for retailers, etc. to offer reusable/refillable options**, take-back services or other substitutes (Busch et al., 2022).
- Introducing non-brand-specific **standardised reusable bottles and containers** for beverages and dry or conserved food (Akenji & Bengtsson, 2019, p. 33).
- **SUP reduction targets** (overall reduction/prevention targets or reduction targets for specific items or sectors) (Liu et al., 2021, p. 430), coupled with a monitoring or review mechanism and measures that allow for stringent enforcement.
- **Product design requirements and labelling standards** (with regard to durability, reparability, use of single materials instead of multilayer materials, size of packaging in comparison to the content, etc.). (cf. Akenji & Bengtsson, 2019, pp. 14, 18; Villarin & Cuaresma, 2020, p. 15; Wichai-utcha & Chavalparit, 2019, p. 19; World Bank Group, 2021c, p. 103; Xuan Son, 2021, p. 6). With regard to the most problematic SUPs, this is especially relevant for multi-material plastics, particularly sachets and multilayer packaging (World Bank Group, 2021d, p. 71).

Asian governments could also incentivize the use of alternatives and business models that reduce or eliminate single-use plastics or enable the use of reusable plastic items. Promising policy instruments in this regard focus on rebalancing the current economic advantage of using SUPs for avoidable plastic products/applications and for products that could easily be made of different materials. Such policy instruments are:

- **Levies/Taxes on SUP products**, including pay-for-use systems for plastic bags (Abueg, 2019, pp. 10–11; Global Alliance for Incinerator Alternatives (Philippines), 2020,



p. 11; Liu et al., 2021, p. 430; Wichai-utcha & Chavalparit, 2019, p. 19; World Bank Group, 2021d, p. 16).

- **Subsidies** (grants or special interest rate loans) or **reduction of taxes** for reusable products, new delivery models, substitutes or zero packaging business models (cf. Akenji & Bengtsson, 2019, p. 10; Global Alliance for Incinerator Alternatives (Philippines), 2020, pp. 10–11; Liu et al., 2021, p. 430; World Bank Group, 2021d, p. 78).
- **Green Public Procurement** that favours reusable items and substitutes (Liu et al., 2021, p. 430).
- **Extended producer responsibility (EPR)**-type schemes with modulated fees for different packaging formats (cf. Laubinger et al., 2021).

Governments can also address citizens directly via:

- **Information and education campaigns** to reduce the demand for and use of SUPs, especially on-the-go plastics and to promote reusable options (e.g., reusable bottles and bags) (Global Alliance for Incinerator Alternatives (Philippines), 2020, p. 10; Pucino et al., 2020, p. 40), with special attention on low-income urban and rural populations. These communities mainly shop and buy products in residential markets, where plastic bags are still distributed widely. (Liu et al., 2021, p. 430).
- **Promotion (e.g., funding) of social solutions** that enable reuse, repair, and product sharing (Akenji & Bengtsson, 2019, p. 14, cf. also p. 18).

The main aim of downstream measures is to enhance the recovery and the recycling of SUP waste. This requires a functioning waste management system. The following measures and policy instruments could lead the way in the desired direction:

- **Developing a comprehensive plastic waste policy** (Liu et al., 2021, p. 430). This can also take the form of general waste management strategies, roadmaps, or specific strategies for single-use plastic management (Akenji et al., 2020, pp. 559–560). These policies should state clear obligations and well-defined responsibilities for those responsible for their implementation (Garcia et al., 2019, p. 41; Shuker & Cadman, 2018, p. 35).
- Adopting **recycling targets** (Liu et al., 2021, p. 430), **recycled content targets** or **collection targets** for packaging, especially multilayer flexible packaging and sachets (World Bank Group, 2021c, p. 103), which are monitored (Glanowski et al., 2020, p. 91). This also includes the assessment and standardization of (SUP) waste and leakage data (cf. Shuker & Cadman, 2018, p. 35; Villarin & Cuaresma, 2020, p. 15).
- Providing **funding for research and development** in cases where waste management technology is not yet available (Kapinga & Chung, 2020, p. 39) as well as for substitute materials (Global Alliance for Incinerator Alternatives (Philippines), 2020, p. 11).



- **Investments in technology and infrastructure** for collection and recycling, as well as high-standard, engineered disposal- and storage facilities are the foundation for a functioning waste management system in general and systems of extended producer responsibility, more particular (Busch et al., 2022; Johannes et al., 2021, pp. 690, 694; Kapinga & Chung, 2020, p. 40; Liu et al., 2021, p. 430). To tackle SUPs, the focus needs to be on resins with wide-ranging single-use applications (PP, PE, PET) (World Bank Group, 2021a, p. 80, 2021c, p. 92, 2021b, p. 91).
- Increasing **technical capacity**, for instance, through training of young industrial designers on design-for-reuse, recycling processes, and on the use of recycled materials and the promotion of eco-industrial parks or recycling clusters (Akenji & Bengtsson, 2019, p. 31; for the latter, see also Johannes et al., 2021, p. 690).
- Adopting mandatory **EPR systems** which place the responsibility for financing the collection, sorting, and recycling (or disposal) of SUPs on plastic producers (Akenji et al., 2020, p. 560; Akenji & Bengtsson, 2019, p. 28; Duan et al., 2019, p. 141; Glanowski et al., 2020, p. 91; Johannes et al., 2021; Liu et al., 2021, p. 430; Shuker & Cadman, 2018, p. 35; Wichai-utcha & Chavalparit, 2019, p. 19). EPR schemes covering the full end-of-life costs make recyclable rigid plastic packaging less expensive than sachets (The Pew Charitable Trusts & SYSTEMIQ, 2020, p. 52). Moreover, shifting waste management costs to producers levels the playing field for new business models and zero-packaging solutions (Busch et al., 2022).
- **Deposit-refund schemes**, e.g. for bottles and beverage containers (Shuker & Cadman, 2018, p. 35; World Bank Group, 2021c, p. 98).
- Adopting **Pay-as-you-throw mechanisms** to reduce (single-use) plastic waste generation (Liu et al., 2021, p. 430).

- Providing **subsidies and performance bonuses for the recycling industry** (Kapinga & Chung, 2020, p. 39).
- **Information and education campaigns** on separating waste and the consequences of littering and plastic pollution for the general public, but including also structured learning programs for students (Pucino et al., 2020, p. 40; Shuker & Cadman, 2018, p. 37), implementation of community-based clean-ups (Liu et al., 2021, p. 430; Shuker & Cadman, 2018, p. 38).

Overall, EPR schemes are the policy instrument most often recommended in the literature to tackle SUPs. In fact, EPR schemes are in practice a mix of different policy instruments under one umbrella name (Busch et al., 2022). Several of the measures mentioned above such as a legal framework, political targets, a systematic and reliable packaging waste management (infra)structure, as well as monitoring and enforcement structures are required to install a functioning EPR system. Moreover, successful EPR systems require clear roles and responsibilities for all stakeholders involved, including enforcing ministries, monitoring agencies, plastic producers, but also suppliers, retailers, and consumers (see World Bank, 2022 for more details and specific recommendations for APEC countries). Apart from EPR systems, several other options have been suggested widely for Asian countries. These involve; (i) product redesign (ii) plastic product/application bans for SUP products that can be avoided altogether and/or for which viable alternatives exist, and (iii) economic incentives rebalancing the current economic advantage of using SUPs for products that can be avoided or substituted. With regard to waste management, the need to invest in technology and infrastructure has been highlighted by many authors. Which measures and policy instruments are most suitable depends on the type of SUP item (see Table 3).

Throughout, it has been emphasized that effective change requires a multisectoral and multi-stakeholder approach, including governments (national to local), industry (i.e.,

plastic producers), retailers, consumers, informal workers (i.e., waste pickers), and relevant businesses such as the tourism industry (e.g., Akenji et al., 2020, p. 560; Akenji & Bengtsson, 2019, p. 28; UN.ESCAP, 2022, p. 19). It is thus crucial to establish mechanisms that support collaboration and engagement among and across different stakeholder

groups, including, for instance, the establishment of platforms for dialogue between upstream and downstream businesses, cooperatives linking informal plastic waste collectors and formal collection systems or inter-ministerial working groups between national and local authorities (Akenji & Bengtsson, 2019, p. 28).

Table 3. Suitability and relevance of different measures and policy instruments to tackle the five most problematic SUPs in Asia. Source: Own presentation.

	PLASTIC BAGS	SACHETS	WRAPPERS (MULTILAYER PACKAGING)	STYROFOAM PRODUCTS	PLASTIC BOTTLES
Plastic product/application bans	X	X	X	X	
Requirements for retailers, etc. to offer reusable/refillable options				X	X
Standardised reusable bottles and containers				X	X
SUP reduction targets	X	X	X	X	X
Product design requirements and labelling standards	(X)	(X)	X	X	X
Levies on SUP products	(X)	(X)	X	X	X
Taxes on SUP products	(X)	(X)	X	X	X
Subsidies or tax reductions for alternatives	X	X	X	X	X
Information and education campaigns	X	X	X	X	X
Promotion (e.g., funding) of social solutions	X	X		X	X
Recycling targets	(X)		X		X
Recycled content targets	(X)		X		X
Collection targets	X	X	X	X	X
Mandatory EPR systems	X	X	X	X	X
Deposit-refund schemes					X
Pay-as-you-throw mechanisms	X	X	X	X	X
Subsidies and performance bonuses for the recycling industry	(X)				X

x policy pathway is relevant for the respective product

(x) policy pathway is only relevant for certain sub-categories of the respective product, if they are not banned or are in the process of phasing-out

GLOBAL RULES UNDER AN INTERNATIONAL TREATY ON PLASTIC POLLUTION WILL ACCELERATE NATIONAL EFFORTS BY ASIAN COUNTRIES AGAINST SUP POLLUTION

Plastic pollution is a transboundary problem, especially since rivers carry plastic waste across countries (UN.ESCAP, 2022, p. 19) and the wind carries particularly light-weighted plastics from one place to another, sometimes far from their source. Among the top five SUP items in Asia, four are particularly light-weighted (plastic bags, sachets, wrappers, Styrofoam products), and thus relevant for far, i.e., transboundary leakage. Moreover, the sources of plastic debris do not necessarily overlap with the sinks of plastics pollution. Global cooperation is thus needed to support the national efforts to reduce and ultimately end single-use plastics pollution.

In 2022, a historic opportunity arose, to start negotiations for an international treaty that addresses the full life cycle of plastics and brings about the necessary measures to sufficiently and effectively stem the tide of plastic pollution (WWF, 2022). Addressing the plastic pollution of SUPs is key in these efforts. Some measures can and should be taken at the national level (see above). However, a global treaty is not only key in overcoming the governance challenges related to the transboundary nature of the problem, but also provides strong support for national policy efforts. Many countries, both, in Asia and worldwide, have set measurable, time-bound targets to reduce marine litter or raise recycling rates at the national level (Stockhaus et al., 2021). A global treaty could make such national targets comparable by defining the kind of targets, or by providing the methodology for measuring progress towards these targets (ibid.)

Furthermore, targets are necessary for a global treaty, but not sufficient if stated alone because even the most ambitious targets can only be reached if they are supported by tools and measures to actually achieve them (WWF, 2022). To end plastic pollution, the global treaty has to focus on immediately ending the production, retail, and use of avoidable plastics (mainly SUPs) and circulating unavoidable plastics through reuse and recycling.

Furthermore, in a globally interconnected economy, individual economies need to co-operate. For instance, if one state bans the production of certain plastics, this production is most likely shifted to a different country. Even more so because products are usually consumed in countries different from the economies in which they are produced (Busch et al., 2022). Ultimately, actions by individual countries

can also lead to blooming black markets. This was for instance observed for SUP items in Rwanda, where plastic bags were illegally imported, after the country adopted an ambitious plastic bag ban (Nwafor & Walker, 2020; Pilgrim, 2016). Global rules would make such measures more predictable for the industry and at the same time easier for states to enforce (Stockhaus et al., 2021). Consequently, scattered bans, or individually defined technical requirements for product designs not aligned across countries, would not work effectively to end plastic pollution worldwide. Even ambitious actions in individual countries are thus not sufficient if they are not coordinated at the global level. A global treaty is key for providing a framework to elevate national policies to be mandated at the global level. Only then can regulation be effective on a global scale.

The following elements – if included in a global treaty – are key to help curbing pollution from SUPs in Asian countries:

- **Global goals and targets**, coupled with compliance mechanisms, focusing on the whole supply chain.
- **Common global rules and obligations for both**
 - **Upstream measures**, (i.e., focusing on bans and phase-out requirements, product redesign and reuse similar to the Montreal Protocol that has ultimately led to an effective regulatory ban of products containing ozone-depleting substances), as well as
 - **Downstream measures**, like requirements on waste collection and management or restricting disposal methods.
- **Requirement for countries to prepare and implement national action plans** with regard to global rules and targets, including additional country-specific measures.
- Co-operation on **research and development** of substitutes (new materials, packaging, product design, new business models, etc.).
- **Capacity building, knowledge and technology transfer** (e.g., regarding new materials, composting infrastructure, waste management, deposit systems for re-usable bottles, global mechanisms for global producer responsibility, mechanisms to fund and operate investments in countries with high-leakage and low waste management capacity, etc.).
- **Financial mechanisms** (e.g., funding for the additional costs that occur when implementing the global treaty, and also costs for cleaning up beaches – eventually funded by those (industries) profiting from plastics use).
- **Scientific and innovation co-operation** (e.g., monitoring, routes, impacts, guidance on prioritisation of action, transparent value-chain data exchange, global innovation co-operation and funding to develop lower-cost waste management options with higher economic and environmental benefits for lower-income nations, etc.).
- **Transparency requirements and compulsory labelling** to ensure traceability of material content and chemical additives in plastic products and secure the possibility to hold producers responsible for their products' content.
- Common **criteria for sustainable alternatives to SUP**.
- Regular **assessments** of the social and environmental impacts of alternative materials.
- Standardisation of **key terms**.

The pressure from plastic pollution on the environment, on nature, biodiversity, terrestrial as well as marine flora and fauna is severe and real. And so it is for us humans. It is therefore of utmost urgency that both, nation states as well as the global community, define and implement interventions against plastic pollution.



IN CONCLUSION

The “challenge is to align regional, national, and local planning for short-term interventions with long-term solutions” (Busch et al., 2022). Consequently, co-ordination across and interaction between political departments and political levels would be most effective, if there were structures that institutionalize cooperation so that its success would depend neither on personal relationships, nor on individual political leaders (Abril Ortiz et al., 2020).

The new international legally binding agreement holds the potential to build the necessary basis for a globally orchestrated action towards reducing and ultimately ending SUP pollution.

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