



## Plastic bans in India – Addressing the socio-economic and environmental complexities

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### ABSTRACT

As one of the flagship amendments to the Plastic Waste Management (PWM) Rules, 2021, the pan-Indian ban on a group of single-use plastic products (SUPPs) introduced in mid-2022 provided a departure point towards more progressive plastic waste legislation. The amendments have mostly been welcomed, yet challenges persist to facilitate its implementation, assess potential environmental impacts of alternative materials, and socio-economic concerns raised by various stakeholders. Considering the recent amendments to the PWM Rules, we critically engage with and highlight key considerations and prevailing challenges with regards to phasing out SUPPs. We argue that to shape sustainable solutions that reduce plastic pollution, uncertainties related to the environmental fate of SUPP alternatives need to be better understood, whilst recognising and accounting for broader socio-economic impacts of SUPP bans, including industry concerns, impacts on socio-economically disadvantaged communities, and the informal recycling sector. A stronger knowledge base on these aspects can mitigate negative social and environmental externalities, including potentially harmful consequences of ambitious plastic pollution reduction measures.

### 1. Introduction

The global and transboundary challenge of plastic pollution poses major threats to the environment, human health, and sustainable development (Lau et al., 2020; Kumar et al., 2021; UNEP, 2021a). The impacts from plastic pollution span the entire life cycle of plastics (Lavers et al., 2022), whilst its repercussions on livelihoods, human well-being, and ecosystems are experienced and perceived differently across diverse socio-economic and geographical contexts (Orellana, 2021; Owens and Conlon, 2021). Governing plastic pollution has only become more complex, with growing production and consumption, international waste trade, and diversified pollution sources (Dauvergne, 2018).

Effective waste management is a key tool to reduce plastic pollution from land-based sources in rapidly growing and urbanizing areas (Kaza et al., 2018). Developing economies in Asia are often highlighted as the largest sources of plastic pollution to the marine environment (Jambeck et al., 2015; Lebreton et al., 2017). At the same time, plastic pollution is

not an isolated issue of developing economies with nascent waste management infrastructure. Wealthier countries are historically and presently considered significant contributors to plastic consumption and pollution (Law et al., 2020; Ocean Conservancy, 2022). Waste trade from higher to lower income economies is placing further strains on fragile waste management infrastructure in poorer countries, raising questions of environmental justice and post-colonial relationships (Liboiron, 2021; Fuller et al., 2022).

Considering these complexities, tackling plastic pollution demands both international and sub-national approaches to implement effective solutions (Hardesty et al., 2021). Policy interventions have oftentimes targeted fast moving consumer goods and littering through consumer-oriented reduction measures (Pathak, 2022), rather than pollution sources across the lifecycle of plastic products (from reducing production to end-of-life solutions). This narrative is shifting towards emphasizing more holistic life-cycle approaches, with the adoption of circular economy and extended producer responsibility (EPR) concepts (UNEP, 2022a). Within this broader context, there is a growing emphasis

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on enabling a just transition (Kantai et al., 2022; Adam et al., 2022). Such a transition prioritises questions of social justice and inclusion hand in hand with environmental sustainability through the promotion of broad stakeholder inclusion in decision-making processes, as well as protecting human and labour rights (ILO, 2015).

The relatively recent advent of plastic pollution as a priority area in international development has been followed by a surge in regional and national policy initiatives and regulatory measures, commonly targeting the manufacture and use of problematic types of plastic waste, including Single Use Plastic Products (SUPP)<sup>1</sup> (UNEP, 2018; EC, 2021; Diana et al., 2022). Whilst some studies have drawn attention to the environmental implications of SUPP bans (e.g., Herberz et al., 2020; Gomez et al., 2022), others have highlighted social and economic impacts of banning single-use plastic (SUP) bags (e.g., El Mekaoui et al., 2021) and straws (e.g., Jenks and Obringer, 2020), as well as constraints faced by micro, small, and medium enterprises (MSMEs) and informal workers (e.g., Nagarajan, 2022). There is, however, a limited appreciation of the interlinked environmental, social, and economic implications and consideration with regards to banning SUPPs. There is a need to consider bans in the context of broader sustainability dimensions to avoid potentially harmful consequences amidst rapidly evolving international and national policy, where bans are often promoted as a key tool to reduce plastic pollution (Godfrey, 2019).

India represents an interesting case to investigate these interlinkages, given the country's rapid economic growth, urbanization, and socio-political diversities, in addition to its important role in international negotiations. These trends and diversities provide a backdrop to explore priorities, stakeholder interests and socio-economic impacts of commonly promoted pollution reduction strategies, taking into consideration the recent pan-Indian ban on certain SUPPs.

In the Indian policy context, plastic pollution has largely been framed as a littering issue, particularly focusing on promoting 'cleanliness' and 'aesthetics' over larger concerns related to plastic waste management, such as improving source segregation and waste collection coverage and reducing toxic releases of chemicals, burning of waste, and fossil fuel dependence (Pathak and Nicher, 2022). Although India's target to combat plastic pollution has been enunciated through the Government of India's (GOI's) pledge to eliminate all SUP in the country by 2022, the implementation of related regulatory measures continues to face challenges. These link to health and environmental concerns of SUPP alternatives, industry interests, and social equity considerations.

This perspective article aims to critically examine and cast light on key considerations for enhancing the sustainability of a commonly applied policy tool to combat plastic pollution, particularly, the widely debated and publicized ban on SUPPs in India. We start by situating the use of bans as a policy tool within broader interventions to reduce plastic pollution, before examining how SUPP bans have been applied to manage plastic pollution in India. The following section reviews emerging debates around alternatives to SUPPs and argues that the contextual applicability of biodegradable and compostable plastic in India must be better understood before promoting these as sustainable alternatives. Lastly, we explore social and economic impacts of SUPP bans with respect to economic vulnerabilities amongst marginalised societal groups. We add to existing debates and narratives by considering the interlinked environmental, social, and economic implications of SUPP bans, and argue that these must be better understood in tandem to avoid unintended consequences and build increasingly sustainable pollution reduction strategies.

<sup>1</sup> Common types of SUPPs ending up as unmanaged waste and marine pollution include cigarette butts, food wrappers, beverage bottles, bottle caps, bags, straws, take-away containers, cutlery, and lids (Hardesty et al., 2022).

## 2. Methodology

The article draws on qualitative data gathered between 2020 and 2022. Due to the restrictions imposed by the COVID-19 pandemic, this material is largely sourced from digital sources and interviews. In our analysis, we have used both primary and secondary data to capture the most pertinent debates and prevailing challenges related to phasing out SUPP in India. Considering the recent amendments to India's Plastic Waste Management (PWM) Rules (2021), we analyse regulatory developments with respect to phasing out SUPP since the PWM Rules from 2016. The analysis was supplemented with recent academic and grey literature on environmental policy tools and alternatives to SUPPs, gathering data from Web of Science and Google Scholar using a combination of key search terms such as 'Plastic ban', 'Single-use plastic', 'policy', 'regulation' and 'India'. We attended over 20 webinars and online conferences between April 2020 and December 2021, focusing on plastic pollution, extended producer responsibility, PWM Rules and proposed solutions relevant to the Indian context (Appendix 1). Findings were substantiated by conducting six key informant interviews, with a selection of key stakeholders, including municipal government representatives, research institutions, private sector companies, and informal and private sector recycling industries (Appendix 2). The interviews were conducted digitally through a semi-structured interview guide. By triangulating data using a combination of qualitative research methods, we draw on experiences from phasing out SUPPs in India to complement broader national and international policy discussions surrounding SUPPs, plastic pollution, and marine litter.

## 3. Key considerations of SUPP bans

### 3.1. Coupling bans with other policy tools

A multi-faceted combination of legislative and non-legislative interventions from various stakeholders is needed to address the use and management of SUPPs (Schnurr et al., 2018). Bans can achieve a reduction in emissions and pollution levels in previously unregulated markets, but the success of these largely depends on the degree of informality, availability of appropriate alternatives, public knowledge and awareness, and monitoring and enforcement mechanisms (Xanthos and Walker, 2017). Motivation, implementation and enforcement can also be linked to the countries' broader development goals and interests in being perceived as environmental leaders and regional economic hubs driving implementation (e.g., Kenya and Rwanda), in contrast to countries with interests in developing oil industries (e.g., Uganda) (Behuria, 2018).

Bans are part of top-down, command and control policy tools that have been widely used to govern environmental issues (e.g., the worldwide ban on ozone depleting chemicals in 1987 and the ban of several toxic industrial chemicals and pesticides for agricultural use under the Stockholm Convention since 2004). More recently, governments across the world have placed complete and partial bans on certain SUPPs that commonly target import and manufacturing of SUP bags (UNEP, 2021c). However, the effects of SUPP bans in practice are oftentimes hampered by insufficient focus on regulating plastic through its lifecycle (e.g., China), partial bans being favoured over blanket bans (e.g., Madagascar), multiple exemptions (e.g., Cambodia), and lack of restrictions on plastic bag production, and incentives for alternative materials (UNEP, 2018). A growing number of countries and regions across the world (e.g., India and the European Union) have also banned other commonly used SUPPs, including plastic cups, plates, and cutlery (EC, 2021). In countries without national legislation on SUPPs, many states, cities and municipalities have independently implemented local bans on certain plastic products (Karasik et al., 2020).

Top-down legislative interventions that ban plastic bags and other SUPPs can effectively trigger a so-called 'green policy-industry feedback spiral', where an initial policy stimulates adaptive industry responses,

catalysing a growing coalition for regulation which feeds back into policy making by increasing the political viability of more stringent regulation (Kelsey, 2014). Drawing on this theory, regulations on SUPPs can trigger producers to invest in waste handling infrastructure or the design of alternative products to gain a competitive advantage as beneficiaries of the policy at hand, whilst non-adaptive industries will bear the economic costs of stricter regulation. In the Indian context, it has been argued that larger corporations with a great degree of public visibility are more likely to engage in voluntary plastic control initiatives as part of their corporate social responsibility (CSR) to prevent reputational damage, comparatively to smaller businesses which often have limited financial capabilities to adapt to legislative changes (Pathak, 2021).

Bans can also effectively be coupled with economic instruments incentivizing behavioural change and associated information measures that raise awareness. Economic instruments may include taxes on certain problematic SUPPs or multi-layered plastics (MLPs), emissions trading schemes (as recently introduced in the context of tradable certificates under the Indian EPR Rules, 2022), subsidies for switching to more sustainable alternatives, and tax reductions or levies for products containing recycled materials. Raising public awareness through environmental education allows individuals to make informed decisions and may encourage environmentally sustainable behaviour, norms, and attitudes (Latinopoulos et al., 2018). In this instance, information measures may boost awareness towards enhanced public acceptance and compliance with the SUPP bans. On the contrary, when it comes to lower income segments of society, the number of consumer choices may be limited. Moreover, the complex trade-offs associated with consumer products, life-cycle assessments, and labelling and certification schemes are often not significantly mature to facilitate behavioural change. Similarly, there is a risk that a disproportionate attention towards awareness raising shifts the responsibility of an essential service – waste management – from the state to individuals, who may have little responsibility for causing plastic pollution in the first place.

Top-down market-based interventions may also be complemented with bottom-up non-legislative interventions to effectively reduce plastic pollution, including actions from citizens, non-government actors, and private sector (Schnurr et al., 2018). For instance, local level initiatives such as the ‘world’s largest beach clean-up project’, initiated on Versova beach in Mumbai, India (2015), has channelled considerable environmental stewardship locally, and attention globally. At the same time, such end-of-pipe solutions have received criticism for not addressing the root causes of littering and pollution, unjustly placing responsibility for waste and pollution on poorer sections of the society, and failing to close the gap on plastic production and leakages (Owens and Conlon, 2021). It may be noted that the question of what a ‘clean environment’ is, and who shapes this collective imagination, is also a question of power and class. The drive to clean a public beach like Versova for example, holds symbolic value of a clean environment used for a specific purpose (e.g., recreation and leisure), and tends to receive more attention and resources in relation to improving waste collection infrastructure and processes in Mumbai’s crowded, and poorer central areas.

### 3.2. India making a firm move on single use plastic products

On World Environment Day in 2018, India announced its

commitment to eliminate all SUPPs by 2022 and reiterated its commitment internationally by calling for a phase-out of SUPPs by 2025 at UNEA-4 in 2019. India’s Ministry of Environment, Forest and Climate Change (MoEFCC, 2021) subsequently notified two consecutive amendments to PWM Rules on August 12 (GOI, 2021a) and on September 22 (GOI, 2021b). The amendment introduced significant changes with a stepwise approach (see Fig. 1) including increases in single-use and non-woven plastic carry bags’ thickness and bans on 17 problematic SUPP categories<sup>2</sup> from July 1, 2022. SUPPs made from compostable plastics are exempt from the bans, but manufacturers are required to register with the Central Pollution Control Board (CPCB)<sup>3</sup> before manufacturing or selling compostable products. The amendment also pre-emptively proposes that any notification prohibiting the manufacture, import, stocking, distribution, sale and use of carry bags, plastic sheets, MLP packaging, and SUP commodities issued post the 2021 amendments will face a 10-year delay to enter into force. Following this, the GOI issued a draft notification on January 18, 2022, defining biodegradable plastics<sup>4</sup> and introducing a new protocol for compostable and biodegradable materials (GOI, 2022a).

In the first PWM Amendment Rules of 2021 (GOI, 2021a), SUPs were defined as “plastic commodities intended to be used once for the same purpose before being thrown away or recycled”. This aligns with the definition of the UNEP, whilst the European Union adds that the SUPP category also includes items which are used for a short period of time before being thrown away (UNEP, 2018; EU, 2019). National SUPP bans were initiated with the minimum requirements for SUP bag thickness, set to 50 µm under the PWM rules of 2016, and further increased to 75 and 120 µm under the 2021 amendments, with all below being banned from December 31, 2022. States and Union Territories (UTs) have also imposed partial bans and legal restrictions on certain plastic packaging, for example, in areas surrounding religious, historic or nature sites. However, bans and restrictions on SUPPs often lack uniformity and vary widely across the country, as illustrated in Table 1.

Table 1 is based on information submitted by each state to CPCB for their most recently available Annual Report of the year 2018–19 (CPCB, 2019). The states are listed alphabetically, and it must be noted that the situation in each state may have developed since this information was compiled by the CPCB.

The GOI has since taken several measures for effective enforcement of the SUPP ban. For instance, enforcement teams have been formed to check illegal manufacture, import, stocking, distribution, sale, and use of banned SUPPs. States and Union Territories have set up control rooms for better enforcement and border check points to stop inter-state movement of banned SUPP. In addition, non-legislative interventions to raise awareness and wider public engagement to curb SUPP have been pursued.

### 3.3. Tracing the background for bans on certain SUPPs

The bans on certain SUPP were determined with the help of an expert committee, constituted by the Department of Chemicals and

<sup>2</sup> Including ear buds with plastic sticks, plastic sticks for balloons, plastic flags, candy sticks, ice-cream sticks, polystyrene [Thermocol] for decoration, plates, cups, glasses, cutlery such as forks, spoons, knives, straw, trays, wrapping or packing films around sweet boxes, invitation cards, cigarette packets, plastic or PVC banners less than 100 µm, and stirrers, plastic carry bags less than 75 µm thickness, and non-woven plastic with less than 60 GSM (grams per square metre) (GOI, 2021a, 5).

<sup>3</sup> CPCB is the prescribed authority for pollution control in India, responsible for the enforcement of regulations, providing technical guidance and conducting environmental assessments.

<sup>4</sup> Biodegradable plastic is defined as plastic ‘which undergoes complete degradation by biological processes under ambient environment (terrestrial or in water) conditions, in specified time periods, without leaving any micro plastics, or visible, distinguishable, or toxic residue [...]’ (GOI, 2022a).



Fig. 1. Stepwise approach implemented by the GOI to restrict or phase out selected SUPPs by 2022 (GOI, 2021a).

**Table 1**  
Status on implementation of bans on SUPPs and plastic carry bags across Indian States and Union Territories.

Ban-status on SUPPs and carry bags	States and Union Territories
<b>Ban on certain plastic products</b> including SUPP packaging and carry bags irrespective of thickness	Assam; Lakshadweep; Maharashtra; Manipur; Puducherry; Tamil Nadu; Uttarakhand; Uttar Pradesh.
<b>Partial ban on certain plastic products</b> including SUPP packaging and carry bags	Delhi; Odisha.
<b>Complete Ban on Plastic Carry Bags</b> irrespective of thickness	Andaman & Nicobar Islands; Bihar; Chandigarh; Chhattisgarh; Daman Diu & Dadra Nagar Haveli; Haryana; Himachal Pradesh; Jharkhand; Karnataka; Madhya Pradesh; Nagaland; Punjab; Rajasthan; Sikkim; Tripura.
<b>Ban on carry bags</b> > 50-micron thickness	Goa; Jammu & Kashmir; Meghalaya; Telangana; West Bengal.
<b>Partial ban on plastic carry bags</b>	Andhra Pradesh; Arunachal Pradesh; Kerala; Mizoram; Gujarat

Petrochemicals on ‘Single Use Plastic’, which assessed SUPPs based on criteria for utility and environmental impacts (Table 2) (MoCF, 2019). The SUPPs listed to be phased out by 2022 were all assessed as ‘problematic’ based on scores that consider their relative utility in terms of hygiene, product safety, essentiality, and social and economic impact. On the other end of the score line, SUPPs were assessed high on their environmental impacts in terms of recyclability, possibility of end-of-life solutions, environmental impact of alternate materials, and littering propensity. In other words, the targeted SUPPs were considered commonly littered, difficult or expensive to recycle with existing technology, non-essential to ensure human health, and not causing detrimental impacts on livelihoods and businesses. At the same time, items such as tea bags and cigarette filters were considered low on the utility scale and high on the environmental impact scale, yet these items have not or only partly been included in the ban, despite being commonly littered and non-biodegradable (Chevalier et al., 2018; Hernandez et al., 2019).

In contrast to the above examples, medical SUPPs, such as blood bags and plastic syringes were considered high on utility (hygiene, safety, essentiality, and social impact) but low on environmental impact, and are not considered problematic. Following the outbreak of the COVID-19 pandemic, medical SUPPs have added pressures on biomedical waste handling, with medical SUPP waste mainly being incinerated in facilities lacking adequate emission controls, causing less visible forms

**Table 2**  
Criteria for phasing out SUPPs in India (MoCF, 2019).

SUPPs scoring low on the utility index	SUPPs scoring high on environmental impact
Not important for hygiene	Low recyclability
Few problems with product safety	Few end-of-life solutions
Low essentiality of product	High environmental impacts of alternatives
Few social and economic impacts	Likelihood of items being littered

of hazardous air and water pollution (WHO 2022). Medical waste is however regulated through a different set of revised guidelines,<sup>5</sup> illustrating a rapidly evolving and complimentary policy landscape.

The ban on select SUPPs can arguably be traced to the complex process of policy making (Lindblom, 2018), in which industry actors within the plastic sector have varying influence and interests that usually promote consumption and business interests (Pathak, 2021). The push for regulating SUPPs in India can, however, also be traced to judicial activism. Nagarajan (2022) highlights 28 court cases across different benches of the High Courts of India since 2000, where environmentalists and civil society groups sought partial or complete bans on certain SUPPs. However, these petitions focused primarily on environmental impacts with little attention to socio-economic considerations, such as lost revenue and employment amongst MSMEs and the informal sector. The prioritization of certain forms of ‘cleanliness’, may in fact even adversely affect pollution levels (i.e., when informal settlements are displaced in favour of high-consuming and waste generating infrastructures) whilst excluding marginalised social groups (Baviskar, 2018). Linking ecology and justice by ensuring broad and informed stakeholder representation and participation are consequently indispensable aspects in discussions towards addressing plastic pollution.

#### 3.4. Environmental uncertainties related to compostable and biodegradable SUPP alternatives

Biodegradable materials are increasingly promoted as a sustainable alternative to SUPPs. Although the availability of biodegradable alternatives is growing, these are often expensive, and their environmental impacts are uncertain (Bolton, 2019). Part of the success of plastic bans relies on the access to viable alternatives (Xanthos and Walker, 2017), however, this has received insufficient attention (UN Environment, 2018; Fetner and Miller, 2021). The most recent PWM Amendment Rules incentivize the use of compostable and biodegradable alternatives through an exemption from the bans for SUP commodities made from compostable plastics (GOI, 2021b). The most pressing concern here relates to what degree alternative materials are more sustainable than SUPPs when applying a life-cycle perspective.

Understanding the requirements and implications of categorizing compostable and biodegradable plastic materials vary significantly, both nationally and internationally, and is part of an evolving debate, continuously challenged with new science, innovations, new market developments, and business interests. Internationally, compostable plastics typically refer to any plastic that can degrade under composting conditions, often through processes such as hydrolysis, thermal degradation, and photodegradation (EC, 2020). However, this does not mean that compostable plastic products will break down completely (i.e., with no residues <2 mm), degrade in all composting environments (e.g., home compost), or that this process will be without undesirable impacts (i.e., (micro)plastic particles and toxic additive releases). Moreover, it

<sup>5</sup> The Guidelines for Handling, Treatment, and Disposal of Waste Generated during Treatment/Diagnosis/ Quarantine of COVID-19 Patients – Rev. 5. (CPCB, 2022).

must be recognised that biodegradable plastic waste may be transported from an environment certified for biodegradability (e.g., soils) to another environment where it is not certified for biodegradability (e.g., water bodies), and may as such, not degrade. Thus, the potential rate of compostability and biodegradation in Indian soil contexts should be considered when looking into SUPP alternatives. Moreover, misperceptions around compostable and biodegradable materials is problematic considering the tendency to believe that these represent a ‘green choice’, whilst it may in fact encourage littering.

Certain alternative materials may have a potentially higher environmental footprint than SUPPs (Spierling et al., 2018). One of the most pertinent examples relates to the popularity of polypropylene non-woven bags (PNB) as an affordable replacement to SUP carry bags after the thickness requirements set by of the PWM Rules, 2016. PNB bags are usually made of non-biodegradable plastic fabric, which is difficult to recycle below a certain thickness. The PWM Amendment Rules, 2021, required that PNB “shall be no less than 60 Gram Per Square Metre (GMT) with effect from 30th September [in 2021]” (GOI, 2021a p. 5). However, PNB (as well as other SUPP alternatives) may be equally harmful to the environment if littered or mismanaged, and products’ environmental footprint will be determined by potential negative impacts from production to their end-of-life management. A study from Singapore showed that a PNB must be reused 50 times to be more environmentally friendly than the typical SUP bag (made from HDPE plastic), but both alternatives had a lower environmental impact than kraft paper and cotton woven bags, in relation to global warming potential, toxicity, acidification and eutrophication potential (Ahmed et al., 2021). In the Indian context, studies have pointed to *kulhad* (earthen) cups baked in kilns and virgin cotton bags having a higher environmental footprint than the SUPPs they are replacing, so leaf cutlery and jute or upcycled cloth bags has been promoted as potentially more viable alternatives (Sambyal, 2019).

Despite the increasing availability of SUPP alternatives, it must be recognised that biodegradable and other alternatives often require separate waste streams, which place further pressure on waste management systems in areas where household segregation, collection systems, and awareness is at nascent stages. With limited awareness, poorly understood labelling systems, limitations in source segregation, and no established collection and recycling streams for biodegradable alternatives, existing recycling streams may become contaminated. Awareness raising initiatives amongst consumers, industries, and producers may partly contribute to reduce this risk and broader environmental consequences on the road towards developing guidelines, regulations, and contextually feasible alternatives to SUPPs. However, as mentioned, disproportionate emphasis on such initiatives forms an opportunity for the state to evade its responsibility by stressing instead the responsibility of individuals and pointing to the performative nature of the market to address a waste management issue (Pathak, 2022).

### 3.5. Industry opposition and inequitably distributed impacts of SUPP bans

Beyond unforeseen environmental impacts of alternatives, blanket bans on plastic products may have inadvertent consequences particularly for people living on the margins of informality. SUPP bans have also faced backlash from industry players on account of economic concerns. Recognising and counterbalancing these impacts is important to increase public acceptance and effective implementation of bans and other reduction policies. Moreover, it is key to facilitate a just transition towards ending plastic pollution, which meets broader sustainable development goals of decent work, social inclusion, and poverty eradication (ILO, 2015). In a populous and geographically vast country such as India, with significant regional wealth disparities and rural-urban gaps, centralised plastic pollution policies will face different implementation challenges and unequally distributed impacts.

Since the pan-Indian ban on SUPPs was first announced in 2018, it has provoked dissatisfaction amongst industry players across the plastic

production chain. For instance, many MSMEs and plastic industry representatives have opposed the SUPP bans due to their potential adverse impacts on economic revenue and employment (Appendix 2, Informant 1), on similar grounds as industry associations argued against the implementation of plastic bag bans in Kenya (Njeru, 2006). Other concerns highlighted by industry stakeholders relates to the cost of alternatives to SUPPs, lack of waste segregation systems for biodegradable and compostable waste, and limited uniform definition and understanding of these materials (Appendix 2, Informant 4 and 5). One informant highlighted that there is a lack of willingness to pay for alternative materials amongst brand-owners and consumers, and that the end-of-life solutions for these materials are limited (Appendix 2, Informant 4). Biodegradable materials may also contaminate the recycling waste stream and perceptions of compostable materials being environmentally friendly causes confusion and new environmental problems (Appendix 2, Informant 4 and 5).

Bans on SUPPs may aggravate existing vulnerabilities amongst workers directly or indirectly engaged in the plastic sector and the (informal and formal) waste management system, and may limit choices for price-sensitive consumers. For example, it is anticipated that bans on single-use sachet packaging may restrict access to low-value consumer goods that are commonly used by poorer segments of society, such as sachet packaged personal care and food items, if alternative packaging materials are more costly (Prahallad 2010). However, it should be noted that critical voices have also pointed out that it is in fact middle-class segments that prefer and consume SUPPs (Singh et al., 2009) with some poorer segments employing traditional and cheaper alternatives (Kay and Lewenstein, 2013). Thereby, the narrative of regulatory interventions restricting access to essential items is not straight forward. Sachets made from flexible and multi-layered materials are rarely recycled due to being time-consuming to collect and costly to recycle with available technologies, due to which these items are classified as problematic. EPR schemes developed with the active participation of informal recycling workers can increase the collection of multi-layered plastics whilst supporting livelihoods in the informal sector, as effectively trialled under the SWaCH model in Pune.<sup>6</sup> Scaling up such initiatives whilst assuring the accessibility to environmentally sound and accessible SUPP alternatives can contribute to ensure that standards of living does not collide with environmentally focused PWM goals.

### 3.6. Anticipatory changes in the market for recyclables and the informal sector

Concerns have been raised that a complete ban on SUPPs may drive informal recycling practices underground, making it harder to deliver technology improvements and health services to the communities involved in plastic waste recycling (Bailey, in IKHAPP, 2021). The informal recycling sector (IRS)<sup>7</sup> significantly contributes to collect and recycle municipal waste across India (Singh, 2021), decreasing the amount of waste sent to landfills by up to 70 %, according to recent mapping technology (Hande, 2019). In line with arguments by industrial actors, advocates for workers in the IRS have raised concerns that a ban on SUPPs can significantly impact waste pickers and collector’s

<sup>6</sup> SWaCH Pune is India’s first wholly owned waste picker cooperative, with a current membership of 3800 wastepickers. Since 2008, SWaCH has a memorandum of understanding with the Pune Municipal Corporation to provide door to door waste collection in the city on a user fee recovery basis.

<sup>7</sup> Broad term encompassing informal waste collection and recycling activities that are not part of municipal services or a registered private entity. Data on the scale and recycling capacity of the IRS in India is scarce, but it is generally believed that the sector consist of 2–4 million people, often referring to one preliminary yet comprehensive study (Annepu 2012, in Oates et al., 2018). Estimates of informal collection vary from 20% to 60% of the total recyclable waste (Chikarmane, 2014; Chandran et al., 2018).

income (Chintan, 2021). There is some tension centring around this, because most of the informally collected waste is of high recycling value (such as PET bottles), and most of the banned SUPPs are low-grade and non-recyclable (which typically would go to landfills or be left unmanaged in the environment). Nevertheless, regulatory changes and market uncertainties leading up to the SUPP bans pose risks to recycling businesses and IRS workers, such as seen in the instance of the introduction of a goods and services tax on recycled plastics, which negatively influenced IRS workers' income (Karelia, 2017; Narayanan et al., 2019). Whilst larger businesses may smoothen temporary drops in prices and income, adapting to sudden market fluctuations is more difficult for smaller businesses and IRS workers, particularly informal waste pickers and collectors at the lowest levels of the IRS, whose income typically consist of meagre margins and daily wages (Singh, 2020; WIEGO, 2021). Added to these uncertainties, COVID-19 induced impacts (health, market fluctuations, and lockdowns) significantly impacted IRS activities and reduced the availability of high-quality waste (INOPOL, 2020).

Despite its significant societal contribution, the IRS is often excluded in the development of strategies to reduce plastic pollution, leading to an exacerbation of existing socio-economic vulnerabilities, including inter-generational poverty, limited access to social security schemes, health and education, the absence of labour protection, and hazardous and exploitative working conditions (Gill, 2010; ESCAP, 2019). Unregulated recycling practices are often also associated with limited access to environmentally sound recycling technologies, causing further pressures on environments and health (Chakraborty et al., 2022; Powrie et al., 2021). Including the IRS in strategies to reduce plastic pollution can contribute to reduce unmanaged waste and pollution and improve end-of-life PWM solutions, whilst promoting broader environmental, economic, and social sustainable development goals (Singh, 2020; Barde 2020). Broadening the scope of solutions to reduce plastic pollution, from SUPP bans towards officially recognising and including the IRS and its role in PWM, calls for IRS stakeholder representation when developing future PWM strategies, particularly in the context of the development and implementation of EPR schemes, expanding waste collection coverage, and privatising and decentralising waste management systems.

#### 4. Conclusion

Bans as a policy tool can be considered a resolute and decisive way to limit inputs of plastic pollution into the environment. They have some degree of shock value and stringency, and have also generated a considerable degree of public awareness. At the same time, they only address a few aspects of a complex challenge and may not always have the desired outcome on which they are premised.

In a rapidly changing world, we also need to be prepared to adapt to emerging research and future challenges. It is therefore problematic that the 2021 Amendment Rules specify that any future ban on SUPPs will face a 10-year delay to enter into force (GOI, 2021a). Although predictability is key for industry adaptation, a decade delay on a ban to combat potentially urgent issues are likely to have severe long-term implications.

Current debates surrounding biodegradable and compostable plastics emphasize that uncertainties persist regarding their environmental impacts, and that these differ across geographical contexts. It is key to consider the potential rate of biodegradation and compostability in Indian climatic conditions and soil types. Adding to these uncertainties are challenges that are associated with biodegradable plastic which may create additional waste streams and contaminate existing recycling value chains in places where waste segregation is still in nascent stages. Awareness raising and education can contribute to public awareness about contextually and environmentally sound disposal of biodegradable and compostable materials. However, this comes with caveats when considering the role and responsibility of the state in managing an environmental problem.

Since SUPPs that are produced from alternative materials are exempt from the bans, caution is also needed whilst assessing the potential environmental impacts of mismanaged alternatives to SUPPs in the Indian context. In line with the 'green policy-industry feedback spiral', it could be anticipated that such regulatory actions, in spite of their deficiencies, should be seen as a step that may trigger industry adaptation and progress (Kelsey et al., 2014).

Our article has also underlined that complete bans on plastic products may have adverse social and economic impacts, if these lack sensitivity for local realities, including MSMEs, marginalised communities, and the IRS. Understanding and counterbalancing these impacts whilst promoting broad stakeholder engagement is key to increase the public acceptance and large-scale implementation of bans and broader reduction policies.

Whilst we focus on specific elements and measures of policy in this piece - instrumental in nature - we also acknowledge the limitations and possible risks within the current, mainstream discourse surrounding plastic pollution. There are larger political economy questions at play with respect to how to govern the environmental challenges of our time (e.g., green growth vs de-growth; market-based vs state) and what shape a 'green' transformation takes. Bans can also be viewed critically as a symbolic and highly visible action by the state to address an issue of environmental concern through 'techno-bureaucratic' means (e.g., see Ferguson, 1994). In doing so, root causes that are more systemic and relate to larger questions of production and consumption, wealth distribution, infrastructure and access to it, as well as environmental justice are potentially side-stepped or intentionally deflected from.

Bans are thus only one potential instrument in a diverse toolbox to tackle plastic pollution. Alternative legal, economic and information measures could effectively complement regulatory control measures, whilst prioritizing the interests of socially vulnerable sections of society. The suitability of measures will differ regionally and locally based on resource availability and existing institutional practices. A combination of contextually appropriate measures that considers the aforementioned environmental, social, and economic aspects is necessary when addressing plastic pollution in a more just and effective manner. The experience in India with respect to addressing plastic pollution may thus also hold important lessons for countries pursuing similar strategies, considerations which are important in deliberations of a forthcoming global agreement to prevent plastic pollution (UNEP, 2022b).

#### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

#### Data availability

Data will be made available on request.

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## Appendix 1

Nr.	Date	Title	Relevant topics
1	16.04.2020	Covid-19 and the Informal Economy: Responses, Relief and Research	Informal recycling sector, plastic policy, socio-economic impacts, Covid-19.
2	27.04.2020	Sanitation and urban poor in the context of Covid-19	Public services and sanitation, informal economy, marginalized societal groups.
3	07.05.2020	Single Use Plastic and Extended Producers Responsibility in India	Plastic Waste Management Rules, Extended Producer Responsibility.
4	08.05.2020	Covid-19 and the Developing World	Socio-economic livelihood impacts, informal livelihoods, lockdown, unemployment.
5	22.05.2020	Caught in a pincer: India's migrants: Between corona and climate change	Informal sector, worker's rights, migrant workers, resilient communities.
6	22.05.2020	Re-Imagining the Future: Peoples' Agenda for a Post Covid Economy	Decentralization, food distribution, resilient communities, empowerment.
7	03.06.2020	International Developments in Single-Use Plastics Bans	Extended Producer Responsibility, lack of plastic alternatives, long-term sustainability concerns, waste-to-energy infrastructure, deposit return schemes.
8	04.06.2022	Effects of Covid-19 on Plastic Recycling markets and possibilities	SUPP consumption, plastic recycling challenges, Basel Convention.
9	04.06.2020	Webinar on the eve of World Environment Day: E-Launch of WSDS 2021	Climate change, biodiversity decline, Green, clean, circular and inclusive economy, resilient technology, private sector finance.
10	05.06.2020	Covid-19, Justice and Sustainability in Cities	Locally adapted solutions, urban transformations, citizen empowerment, knowledge transfer.
11	08.06.2020	Marine Litter and UNEA-5	Digital tools, business driven solutions, structural change, holistic solutions, circular economy, new pollution challenges, multilateral agreements.
12	24.09.2020	Safeguarding the Plastic Recycling Value Chain – Insights from Covid-19 Impact in South and Southeast Asia	Low-value plastics, multi-layered plastics, value chain perspective, investment, informal sector, market driven interventions, locally adapted policies.
13	24.09.2020	Managing plastic waste in India: An agenda for action	Single-use plastics, extended producer responsibility, de-coding recycling, informal economy, source segregation.
14	30.09.2020	Trade and policy in the fight against plastic pollution:	Plastic trade flows, trade policy, international cooperation and agreements, Basel Convention, global agreement on plastic pollution.
15	23.01.2021	Closed Door Meeting on Extended Producer Responsibility with International Experts	Principles of Extended Producer Responsibility, Complexity of circumstances in India.
16	27.04.2021	EPR and Informal Sector	Extended Producer Responsibility, inclusive waste management, plastic governance, policy implementation, impacts on informal recyclers.
17	02.07.2021	Webinar on Evolution of Plastic Waste Policy	Plastic Waste Management Rules Amendments, circular economy, end-of-life management, extended producer responsibility, single-use plastics.
18	22.07.2021	Managing Solid Waste in India: Integration of the Informal Sector	Social inclusion, informal recycling industry, recycling hierarchy, models for integration, decentralized waste management, ecosystem approach.
19	05.08.2021	Plastic Recycling Decoded	Plastic waste generation, informal recycling sector, waste value chains.
20	15.12.2021	Regulation on Extended Producer Responsibility for Plastics: Stakeholder Dialogue	Industry perspectives, civil society perspectives, state's perspectives.

## Appendix 2

Nr.	Date	Informant representative for:	Key features
1	08.07.2021	International organization	UNEP India
2	08.03.2021	Environmental consultancy	Sustainability and waste management focus
3	24.01.2022	Industry association	Confederation of Indian Industries (CII)
4	16.03.2022	Plastic recycling company	Private
5	18.03.2022	Plastic recycling company	Private
6	06.04.2022	Large plastic producer	National

## References

- Adam, H.N., Pille-Schneider, L., Enge, C., Nøklebye, E., Bharat, G.K., Abraham, M., Dkhar, N., 2022. Important but ignored? The role of the informal recycling sector in a prospective international agreement on plastic pollution. IKHAPP Policy Brief Series. Int. Knowl. Hub. Plast. Pollut. (Available from: <https://ikhapp.org/news-and-event/the-role-of-the-informal-recycling-sector-in-a-prospective-international-agreement-on-plastic-pollution>).
- Ahmed, A., Vallam, P., Iyer, N.S., Veksha, A., Bobacka, J., Lisak, G., 2021. Life cycle assessment of plastic grocery bags and their alternatives in cities with confined waste management structure: a Singapore case study. J. Clean. Prod. 278, 123956 <https://doi.org/10.1016/j.jclepro.2020.123956>.
- Barde, in Be Waste Wise. 2020. Informal Waste Recycling in India [Webinar]. Available at: <https://wastewise.be/event/informal-waste-recycling-in-india/#.XyWaji2ZNN0> (Accessed: 6th August 2020).
- Baviskar, A., 2018. City limits: looking for environment and justice in the urban context. In: Lele, et al. (Eds.), Rethinking Environmentalism: Linking Justice, Sustainability, and Diversity. Strüngmann Forum Reports. 23. MIT Press, Cambridge, MA. ISBN: 9780262038966.
- Behuria, P., 2021. Ban the (plastic) bag? Explaining variation in the implementation of plastic bag bans in Rwanda, Kenya and Uganda. Environ. Plan. C: Polit. Space 39 (8), 1791–1808. <https://doi.org/10.1177/2399654421994836>.
- Bolton D. 2019. Tea bag manufacturers respond to microplastic particle study. 8th October. World Tea News. Available from: (<https://www.worldteanews.com/Insights/tea-bag-manufacturers-respond-microplastic-particle-study>) (Accessed 5th November 2021).
- Chakraborty, P., Chandra, S., Dimmen, M.V., Hurley, R., Mohanty, S., Bharat, G.K., Steindal, E.H., Olsen, M., Nizzetto, L., 2022. 'Interlinkage Between Persistent Organic Pollutants and Plastic in the Waste Management System of India: An Overview'. Bulletin of Environmental Contamination and Toxicology. 2022 Feb 18; 1-10. Doi: 10.1007/s00128-022-03466-x.
- Chandran, P.; Arora, K.; Abubaker, M.; Shekar, N. 2018. Valuing urban waste: the need for comprehensive material recovery and recycling policy. June. Hasiru Dala, Bengaluru, India.
- Chevalier, Q., Hadri, H.E., Petitjean, P., Bouhnik-Le Coz, M., Reynaud, S., Grassl, B., Gigault, J., 2018. Nano-litter from cigarette butts: environmental implications and urgent consideration'. Chemosphere 194, 125–130. <https://doi.org/10.1016/j.chemosphere.2017.11.158>.
- Chikarmane, P. 2014. City report - informal economy monitoring study: waste pickers in Pune, India'. April. Women in Informal Employment Globalising and Organising.

- Available from: <https://www.wiego.org/publications/city-report-informal-economy-monitoring-study-waste-pickers-pune-india>.
- Chintan, 2021. Plan the ban: roundtable on report release by chintan. [Webinar]. *Chintan Environmental Research and Action Group*. 30th June. Available from: (<https://www.facebook.com/ChintanIndia.org/videos/972240770237167>).
- CPCB, 2019. Annual Report for the Year 2018-19 on Implementation of Plastic Waste Management Rules. Central Pollution Control Board., New Delhi (Available from). ([https://cpcb.nic.in/uploads/plasticwaste/Annual\\_Report\\_2018-19\\_PWM.pdf](https://cpcb.nic.in/uploads/plasticwaste/Annual_Report_2018-19_PWM.pdf)).
- CPCB, 2022. Guidelines for handling, treatment, and disposal of waste generated during treatment/diagnosis/ quarantine of COVID-19 patients – Rev. 5. Retrieved from: <https://cpcb.nic.in/uploads/Projects/Bio-Medical-Waste/BMW-GUIDELINES-COVID-2.pdf>.
- Dauvergne, P., 2018. Why is the global governance of plastic failing the oceans? *Glob. Environ. Change* 51, 22–31. <https://doi.org/10.1016/j.gloenvcha.2018.05.002>.
- Diana, Z., Vegh, T., Karasik, R., Bering, J., Caldas, J.D.L., Pickle, A., Rittschof, D., Lau, W., Viridin, J., 2022. The evolving global plastic policy landscape: an inventory and effectiveness review. *Environ. Sci. Policy* 134, 34–45. <https://doi.org/10.1016/j.envsci.2022.03.028>.
- EC, 2020. Scientific Opinion No. 10.: Biodegradability of plastics in the open environment. 18th December. Group of Chief Scientific Advisors, Directorate-General for Research and Innovation. European Commission. <https://op.europa.eu/en/web/eu-law-and-publications/publication-detail/-/publication/0c0d6267-433a-11eb-b27b-01aa75ed71a1>.
- EC, 2021. Turning the tide on single-use plastics. European Commission. Available from: 'Turning the tide on single-use plastics - Publications Office of the EU (europa.eu).
- El Mekouli, A., Benmouro, Y., Mansour, H.A., Ramirez, O.B., 2021. Plastic bags ban and social marginalization: evidence from Morocco. *Pol. J. Environ. Stud.* 30 (5), 4587–4595. <https://doi.org/10.15244/pjoes/132981>.
- ESCAP, 2019. Closing the Loop: Innovative partnerships with informal workers to recover plastic waste, in an inclusive circular economy approach. Economic and social commission for Asia and the Pacific. Available from: (<https://www.unescap.org/resources/closing-loop-regional-policy-guide#>).
- EU, 2019. 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. *Off. J. Eur. Union*. (<http://data.europa.eu/eli/dir/2019/904/oj>).
- Ferguson, J., 1994. The Anti-politics Machine: "development," Depoliticization, and Bureaucratic Power in Lesotho. University of Minnesota Press. ISBN 0816624372.
- Fetner, H., Miller, S., 2021. Environmental payback periods of reusable alternatives to single-use plastic kitchenware products. *Int. J. Life Cycle Assess.* 26, 1521–1537. <https://doi.org/10.1007/s11367-021-01946-6>.
- Fuller, S., Ngata, T., Borelle, S.B., Farrelly, T., 2022. Plastic pollution as waste colonialism in Te Moananui. *J. Political Ecol.* 29 (1), 534–560. <https://doi.org/10.2458/jpe.2401>.
- Gill, K., 2010. *Of Poverty and Plastic: Scavenging and Scrap Trading Entrepreneurs in India's Urban Informal Economy*. Oxford University Press, Oxford UK.
- Godfrey, L., 2019. Waste plastic, the challenge facing developing countries – ban it, change it, collect it? *Recycling* 4 (1). <https://doi.org/10.3390/recycling4010003>.
- GOI, 2021b. 'Plastic waste management rules, 2021'. Notification. 22nd September. Available from: (<https://cpcb.nic.in/rules-4/>) (Accessed 2nd October 2021).
- GOI, 2021a. 'Plastic waste management rules, 2021'. Notification. 12th August. Available from (<https://cpcb.nic.in/uploads/plasticwaste/Notification-12-08-2021.pdf>).
- GOI, 2022a. Plastic waste management rules, 2022'. Draft Notification. 18th January. Ministry of Environment, Forest and Climate Change. Gazette of India. Available from: <https://cpcb.nic.in/uploads/plasticwaste/draft-pwmrules-2022.pdf>.
- Gomez, I.D.L., Escobar, A.S., 2022. The dilemma of plastic bags and their substitutes: a review on LCA studies. *Sustain. Prod. Consum.* 30, 107–116. <https://doi.org/10.1016/j.spc.2021.11.021>.
- Hande, S., 2019. The informal waste sector: a solution to the recycling problem in developing countries'. *Field Actions Science Reports* [Online]. Special Issue 19: 28–35. <http://journals.openedition.org/factsreports/5143>.
- Hardesty, B.D., Roman, L., Leonard, G.H., Mallos, N., Pragnell-Raasch, H., Campbell, I., Wilcox, C., 2021. Socioeconomic effects of global hotspots of common debris items on land and the seafloor. *Glob. Environ. Change* 71, 102360. <https://doi.org/10.1016/j.gloenvcha.2021.102360>.
- Hardesty, B.D., Willis, K., Vince, J., 2022. An imperative to focus the plastic pollution problem on place-based solutions. *Frontiers in Sustainability* 3, 963432. <https://doi.org/10.3389/frsus.2022.963432>.
- Herberz, T., Barlow, C.Y., Finkbeiner, M., 2020. Sustainability assessment of a single-use plastics ban. *Sustainability* 12 (9), 3746. <https://doi.org/10.3390/su12093746>.
- Hernandez, L.M., Xu, E.G., Larsson, H.C.E., Tahara, R., Maisuria, V.B., Tufenkji, N., 2019. Plastic teabags release billions of microparticles and nanoparticles into tea. *Environ. Sci. Technol.* 53 (21), 12300–12310. <https://doi.org/10.1021/acs.est.9b02540>.
- IKHAPP, 2021. 'Important but ignored? The role of the informal sector in a future international agreement on plastic pollution' [webinar]. 2nd December. Available from: [https://www.youtube.com/watch?v=OZeZLK\\_kGIw](https://www.youtube.com/watch?v=OZeZLK_kGIw).
- ILO, 2015. Guidelines for a just transition towards environmentally sustainable economies and societies for all. *Int. Labour Organ.* 978-92-2-130628-3. ISBN 978-92-2-130627-6 (print).
- INOPOP, 2020. Pilot study for plastic and biomedical waste management during the COVID 19 pandemic in Surat and Delhi. Norwegian Institute for Water Research (NIVA), Toxics Link & Mu Gamma Consultants (MGC).
- Jambeck, J., Geyer, R., Wilcox, C., Siegler, T., Perryman, M., Andrady, A., Naryan, R., Law, K., 2015. Plastic waste inputs from land into the ocean. *Science* 347 (6223), 768–771. <https://doi.org/10.1126/science.1260352>.
- Jenks, A.B., Obringer, K.M., 2020. The poverty of plastic bans: environmentalism's win is a loss for disabled people. *Crit. Soc. Policy* 40 (1), 151–161. <https://doi.org/10.1177/0261018319868362>.
- Kantai, T.; Allan, J.; Templeton, J., 2022. Summary of the Ad hoc open-ended working group to prepare for the intergovernmental negotiating committee to develop an international legally binding instrument on plastic pollution, including in the marine environment: 30 May -1 June 2022. *Earth Negotiations Bulletin*. 6th Jun. 36:1. Available from: <http://bit.ly/plasticsoewg>.
- Karasik, R.; Vegh, T.; Diana, Z.; Bering, J.; Caldas, J.; Pickle, A.; Rittschof, D.; Viridin, J., 2020. 20 years of government responses to the global plastic pollution problem: the plastics policy inventory. Nicholas Institute for Environmental Policy Solutions. Available from: (<https://nicholasinstitute.duke.edu/sites/default/files/publications/20-Years-of-Government-Responses-to-the-Global-Plastic-Pollution-Problem-New-1.pdf>) (29th December 2021).
- Karelia, G., 2017 'Ragpickers heave a sigh of relief AS GST on recycling waste comes down'. 10th October. SwachhIndia NDTV Convergence Limited. Available from: (<https://swachhindia.ndtv.com/ragpickers-heave-sigh-relief-gst-recycling-waste-comes-13269/>) (3rd May 2020).
- Kaza, S., Yao, L.C., Bhada-Tata, P., Van Woerden, F., 2018. What a Waste 2.0 : A Global Snapshot of Solid Waste Management to 2050. Urban Development. Washington, DC: World Bank. <https://openknowledge.worldbank.org/handle/10986/30317>.
- Kay, E.; Lewenstein, W., 2013. The Problem with the "Poverty Premium". *Harvard Business Review*. April. Available from: (<https://hbr.org/2013/04/the-problem-with-the-poverty-premium>) (25.09.2022).
- Kelsey, S., 2014. *The Green Spiral: Policy-Industry Feedback and the Success of International Environmental Negotiation* (Ph.D. disser.). University of California,, Berkeley (Available from). (<https://escholarship.org/uc/item/67j3h2hn>).
- Kumar, R., Verma, A., Shome, A., Sinha, R., Sinha, S., Jha, P.K., Kumar, R., Kumar, P., Shubham, Das, S., Sharma, P., Vara Prasad, P.V., 2021. Impacts of plastic pollution on ecosystem services, sustainable development goals, and need to focus on circular economy and policy interventions. *Sustainability* 13, 9963. <https://doi.org/10.3390/su13179963>.
- Latinopoulos, D., Mentis, C., Bithas, K., 2018. The impact of a public information campaign on preferences for marine environmental protection. The case of plastic waste. *Mar. Pollut. Bull.* 131, 151–162. <https://doi.org/10.1016/j.marpolbul.2018.04.002>.
- Lau, W., Shiran, Y., Bailey, R., Cook, E., Stutchey, M., Koskella, J., Velis, C., Godfrey, L., Boucher, J., Murphy, M., Thompson, R., Janokwska, E., Castillo, A., Pilditch, T., Dixon, B., Koerselman, L., Kosior, E., Favoino, E., Gutberlet, J., Baulch, S., Atreya, M., Fischer, D., He, K., Petit, M., Sumaila, R., Neil, E., Berhofen, M., Lawrence, K., Palardy, J., 2020. Evaluating scenarios toward zero plastic pollution. *Science*. <https://doi.org/10.1126/science.aba9475>.
- Lavers, J.L., Bond, A.L., Rolsky, C., 2022. 'Far from a distraction: plastic pollution and the planetary emergency. *Biol. Conserv.* 272, 109655 <https://doi.org/10.1016/j.biocon.2022.109655>.
- Law, K.L., Starr, N., Siegler, T.R., Jambeck, J., Mallos, N.J., Leonard, G.H., 2020. The United States' contribution of plastic waste to land and ocean. *Sci. Adv.* 6 (44) <https://doi.org/10.1126/sciadv.abd028>.
- Lebreton, L.; Van der Zwet, J.; Damsteeg, J., Slat, B.; Andrady, A.; Reisser, J., 2017. 'River plastic emissions to the world's oceans'. *Nature Communications*. DOI: 8. 10.1038/ncomms15611. Leberon, L.; Andrady, A., 2019. 'Future scenarios of global plastic waste generation and disposal'. *Palgrave Communications*. 5:6. DOI: <https://doi.org/10.1057/s41599-018-0212-7>.
- Liboiron, M., 2021. *Pollution is Colonialism*. Duke University Press, UK.
- Lindblom, C., 2018. *The science of "muddling through. Classic readings in urban planning*. Routledge, pp. 31–40.
- MoCF, 2019. 'Report on single use plastics'. September. Ministry of Chemicals and Fertilizers, Department of Chemicals and Petrochemicals, Government of India. Available from: [https://chemicals.nic.in/sites/default/files/SUP\\_Expert\\_Committee\\_Report.pdf](https://chemicals.nic.in/sites/default/files/SUP_Expert_Committee_Report.pdf).
- MoEFCC, 2021. 'Ban on Single-use Plastic' Starred Question No. 173. Ministry of Environment, Forest and Climate Change, Government of India. MoEFCC ban on SUP 2021.pdf.
- Nagarajan, A., 2022. The governance of plastic in India: towards a just transition for recycling in the unorganized sector. *Local Environ.* <https://doi.org/10.1080/13549839.2022.2084721>.
- Narayanan, L.; Schröder, P.; McCluskey, R., 2019. 'Taxing plastic production: a solution to India's plastic waste crisis?'. International Centre for Tax and Development. Available from: (<https://www.ictd.ac/blog/taxing-plastic-production-a-solution-to-indias-plastic-waste-crisis/>) (3rd May 2020).
- Njeru, J., 2006. The urban political ecology of plastic bag waste problem in Nairobi, Kenya. *Geoforum* 37 (6), 1046–1058. <https://doi.org/10.1016/j.geoforum.2006.03.003>.
- Oates, L.; Sudmant, A.; Gouldson, A.; Gillard, R., 2018. 'Reduced waste and improved livelihoods for all: Lessons on waste management from Ahmedabad, India'. Coalition for Urban Transitions. London and Washington, DC. Available from: (<http://newclimateeconomy.net/content/cities-working-pa>).
- Ocean Conservancy 2022. 'Stemming the Tide Statement of Accountability'. 10th July. Available from: (<https://oceanconservancy.org/trash-free-seas/take-deep-dive/stepping-the-tide/>) (21.09.2022).
- Orellana, M., 2021. Report of the Special Rapporteur on the implications for human rights of the environmentally sound management and disposal of hazardous substances and wastes. A/76/207. United National General Assembly. 22nd July. New York. Available from: (<https://www.ohchr.org/en/documents/thematic-reports/a76207-implications-human-rights-environmentally-sound-management-and>).



- Owens, K.A., Conlon, K., 2021. Mopping up or turning off the tap? Environmental injustice and the ethics of plastic pollution. *Front. Mar. Sci.* <https://doi.org/10.3389/fmars.2021.713385>.
- Pathak, G., 2022. Plastic politics: industry stakeholders and the navigation of plastic control policy in India. *Environ. Polit.* <https://doi.org/10.1080/09644016.2021.2025301>.
- Pathak, G., Nichter, M., 2021. Ecocommunicability, citizenship, and discourses on plastic control in India. *Geoforum* 125, 132–139. <https://doi.org/10.1016/j.geoforum.2021.04.027>.
- Powrie, W., Velis, C., Cook, E., Ingham, H., 2021. Open uncontrolled burning of solid waste undermines human health: Time to act'. *Waste Manag. Res.: J. a Sustain. Circ. Econ.* 39 (1) <https://doi.org/10.1177/0734242x20981800>.
- Prahalad, C.K., 2010. *The Fortune at the Bottom of the Pyramid: Eradicating Poverty Through Profits*. Wharton School Pub. ISBN 10: 0137009275.
- Sambyal, S., 2019. 'India needs a strategic direction on single-use plastics'. 2nd October. Down to Earth. Available from: (<https://www.downtoearth.org.in/blog/waste/india-needs-a-strategic-direction-on-single-use-plastics-67062>).
- Schnurr, R.E.J., Alboiu, V., Chaudhary, M., Corbett, R.A., Quanz, M.E., Sankar, K., Srain, H.S., Thavarajah, V., Xanthos, D., Walker, T.R., 2018. Reducing marine pollution from single-use plastics (SUPs): a review. *Mar. Pollut. Bull.* 137, 157–171. <https://doi.org/10.1016/j.marpolbul.2018.10.001>.
- Singh, R., 2021. 'Integration of informal sector in solid waste management: Strategies and approaches'. Centre for Science and Environment. Available from: (<https://www.cseindia.org/integration-of-informal-sector-in-solid-waste-management-10886>).
- Singh, S., 2020. 'Effects of COVID-19 on Plastic Recycling markets & possibilities. [Webinar] 4th June. Waste & Recycling Middle East and Africa. Available from: (<https://www.wasterecyclingmea.com/virtual-forum>).
- Singh, Ramendra, Rodolfo Ang, and Joseph Sy-Changco. 2009. 'Buying less, more often: an evaluation of sachet marketing strategy in an emerging market' *Marketing Review* 9:3–17.
- Spierling, S., Knüppfer, E., Behnsen, H., Mudersbach, M., Krieg, H., Springer, S., Albrecht, S., Herrmann, C., Endres, H., 2018. 'Bio-based plastics – a review of environmental, social and economic impact assessments'. *J. Clean. Prod.* 185, 476–491. <https://doi.org/10.1016/j.jclepro.2018.03.014>.
- UNEP 2022b. 'Draft resolution from india on framework for addressing plastic product pollution including single-use plastic product pollution'. 31st January. *United Nations Environment Programme*. Available from: (<https://wedocs.unep.org/20.500.11822/37988>).
- UNEP 2021a. *From Pollution to Solution: A global assessment of marine litter and plastic pollution*. 21st October. United Nations Environment Programme, Nairobi. Available from: (<https://www.unep.org/resources/pollution-solution-global-assessment-marine-litter-and-plastic-pollution>).
- UNEP 2021c. Policies, regulations and strategies in Latin America and the Caribbean to prevent marine litter and plastic waste. Draft, 13th January. United Nations Environment Programme. Available from: ([https://wedocs.unep.org/bitstream/handle/20.500.11822/34931/Marine\\_EN.pdf?sequence=1&isAllowed=y](https://wedocs.unep.org/bitstream/handle/20.500.11822/34931/Marine_EN.pdf?sequence=1&isAllowed=y)).
- UNEP 2022a. 'Progress in the implementation of resolution 4/6 on marine plastic litter and microplastics: Note by the Executive Director'. Item 5 of the provisional agenda. UNEP/EA.5/INF/24. 11th February. *United Nations Environment Assembly of the United Nations Environment Programme*. Available from: (<https://wedocs.unep.org/xmli/bitstream/handle/20.500.11822/38103/UNEP.EA.5.INF.24.pdf?sequence=1&isAllowed=y>).
- UNEP 2018. Legal limits on single-use plastics and microplastics: a global review of national laws and regulations. United Nations Environment Programme. Available from: (<http://www.unep.org/resources/report/legal-limits-single-use-plastics-and-microplastics>).
- WIEGO 2021. 'Waste Pickers'. Available from: <https://www.wiego.org/informal-economy/occupational-groups/waste-pickers> (Accessed on 8.11.2021).
- Xanthos, D., Walker, T., 2017. 'International policies to reduce plastic marine pollution from single-use plastics (plastic bags and microbeads): a review'. *Mar. Pollut. Bull.* 118 (1–2), 17–18. <https://doi.org/10.1016/j.marpolbul.2017.02.048>.