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An Overall Review on Effect of Ban on Single Use Plastic

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ABSTRACT: India banned the manufacture, distribution, stocking, sale and use of selected 19 single-use plastic items with effect from July 1, 2022. The ban covered plastic items like cutlery, straws, sticks and thermocol (only for the purpose of decoration), while some single-use plastic items like carry bags and banners were regulated by the thickness of 120 microns and 100 microns, respectively.

Over a year after the ban came into force, single-use plastic items continue to be a challenge -- the banned items are reportedly still being sold and used in the country. It is evident that a lot more needs to be done to implement the single-use plastics ban.

Centre for Science and Environment (CSE) invites you to a webinar to discuss and understand how effective has the ban been, what are the challenges in implementation, and what should be the way forward.

KEYWORDS: single use plastic, ban, effect, India, CSE, challenges

I. INTRODUCTION

Single-use plastics are goods that are made primarily from fossil fuel-based chemicals (petrochemicals) and are meant to be disposed of right after use—often, in mere minutes. Single-use plastics are most commonly used for packaging and serveware, such as bags, bottles, wrappers, and straws.

Though plastic—a chain of synthetic polymers—was invented in the mid-19th century, it wasn't until the 1970s that its popularity skyrocketed. Manufacturers began replacing traditionally paper or glass staples with lighter, more durable, and affordable plastic alternatives, such as plastic jugs replacing milk jars.[1,2,3]

Since the 1950s, the world has produced more than nine billion metric tons of plastics, more than half of which was brought to market after 2000. And we can expect these materials to stick around for thousands of years.

There are many uses for plastic that are not only reasonable but important, such as surgical gloves or straws for people with disabilities. But these cases make up a small fraction of single-use plastic. More than half of non-fiber plastic, which excludes synthetic fabrics like polyester and nylon, comes from plastic packaging alone, much of which is for single-use items.

Single-use plastics are a glaring example of the problems with throwaway culture. Instead of investing in quality goods that will last, we often prioritize convenience over durability and consideration of long-term impacts. Companies bank on this desire for convenience, selling products wrapped in flashy packaging, which could easily be avoided, or designing cheap goods that only fuel more consumerism.

Our reliance on these plastics means we are accumulating waste at a staggering rate. According to the OECD (Organisation for Economic Co-operation and Development), the world produced more than 460 million metric tons of plastic in 2019—already double the amount produced in 2000.

Plastic litter

The most common types of plastic waste found in the environment are cigarette butts, followed by food wrappers, bottles and bottle caps, shopping bags, straws, and stirrers. And we're only just beginning to see the widespread

presence of small microplastics, which include things like threads that shed from synthetic clothing and the beads and glitter added to personal products.

Reducing plastic use is the most effective means of avoiding this waste. After that, recycle (or compost) what you can, being sure to follow the rules of your municipality, since systems vary widely by location.

Limited recycling

Recycling more plastic, more frequently, reduces its footprint. Polyethylene terephthalate, one of the most commonly recycled plastics and the material that makes up most water and soda bottles, can be turned into everything from polyester fabric to automotive parts.

But the OECD found that a whopping 91 percent of plastic isn't recycled at all. Some of it (about 19 percent) is incinerated but the vast majority ends up in landfills or in the environment. Single-use plastics in particular—especially small items like straws, bags, and cutlery—aren't easy to recycle because they fall into the crevices of recycling machinery. Many recycling centers won't even accept them.

Microplastic pollution

Left alone, plastics don't really break down; they just break up. Wear and tear and washing, as well as sun and heat, can slowly turn plastics into smaller and smaller pieces until they eventually become what are known as microplastics. These microscopic plastic fragments, no more than 5 millimeters long, are hard to detect—and are just about everywhere. (There are even plastic particles that measure less than a micrometer, known as nanoplastics.) Some microplastics are even small by design, like the microbeads used in facial scrubs or the microfibers in polyester clothing.

These microplastics quite easily end up in the water, on farmland, getting eaten by wildlife, and inside our bodies. They've even made their way up to the secluded Pyrenees mountain range and down to the bottom of the Mariana Trench.

For wildlife, microplastics can be particularly dangerous; when eaten, they can easily accumulate inside an animal's body and cause serious health issues, like punctured organs or fatal intestinal blockages.

Health harms from microplastics

When we ingest microplastics, as well as the chemicals that are added to plastics during processing, we face myriad health risks. Many of the chemicals in plastics are known endocrine disruptors, and research has suggested that human exposure to them could lead to hormonal imbalances, reproductive problems like infertility, and even cancer. The phthalate DEHP, as just one example from dozens, is often added to plastic goods like shower curtains and garden hoses to make them more flexible—but it was also found to be a probable human carcinogen by the U.S. Environmental Protection Agency.

We're also just beginning to understand how microplastics are contaminating our food supply. One study that examined 16 types of commonly consumed proteins—including beef, shrimp, and tofu—found microplastics present in 90 percent of samples, with higher rates in more processed foods.

Though microplastics have been found throughout the human body, scientists are still unpacking the short- and long-term effects of this contamination.

II. DISCUSSION

Single-use plastics and pollution

Although plastic pollution accumulates most visibly on our streets, [4,5,6]aquatic ecosystems are also suffering. Plastic litter tossed on the ground is easily washed away by rain, or it travels via storm drains into rivers and streams. It's estimated that eight million metric tons of plastic make their way into waterways every year—an amount that could triple by 2040 unless the industry changes how plastic is created, used, and disposed.

The majority of this pollution—dominated by single-use plastic waste—comes from countries lacking the infrastructure to properly manage waste, particularly those in Southeast Asia.

But it's important to remember that waste management is just one part of the global materials cycle. For instance, a lot of the plastic produced in Asian countries is for products that serve U.S. demand—and the United States and other high-income countries often send plastic waste back to these countries for processing.

The sheer amount of plastic waste can inundate communities with pollution. Not only does the waste destroy the land itself, but when plastic is incinerated, which can sometimes be the case, its toxic fumes quickly become a health hazard for nearby residents, leading to everything from skin rashes to cancer. The ash and other toxins released during combustion may travel long distances, spreading these impacts even farther.

Marine animals also bear the burden of this influx of garbage into their habitats, and millions die each year because of plastic entanglement and other impacts. Beached whales have been found with stomachs full of plastic trash—as have dead seabirds, turtles, and many other creatures. In fact, at least 1,565 wildlife species have been found to have accidentally ingested plastic.

Single-use plastics and climate change

Because nearly all plastics (99 percent) are made from fossil fuels, our addiction to plastic also impacts the climate. In fact, the plastics industry (which includes many companies that have invested in or are operating in oil and gas) is currently responsible for four times more greenhouse gas emissions than the airline industry. And even if production were to stay level, plastics are projected to account for 15 to 19 percent of the global carbon budget by 2050.

Plastic production emits greenhouse gases at every point in its life cycle. This begins with the process of drilling for the building blocks of plastic: oil and gas. At the next stage, the industry relies on highly polluting and energy-intensive “cracker plants,” where ethane molecules from natural gas are cracked into the chemical building blocks of plastic. Finally, corporations are trying to sell the public on a greenwashing scheme for plastic's “end of life” phase—the deceptively named “chemical recycling” process, in which facilities incinerate plastic waste and contaminate the air.

In the United States, many of these polluting facilities—whether they make plastic or burn it—are built in low-income communities and communities of color, which often have the fewest resources to block them. Community-based organizations and groups like NRDC are raising the alarm as the number of these facilities rises, due in part to the unprecedented glut of gas from fracking and liquefied natural gas booms.

In 2022, 175 nations gathered at the United Nations Environment Assembly to solve the global crisis of plastic pollution. There, the nations agreed to draft a legally binding treaty that would identify actions to reduce the production of plastics, particularly its most toxic forms, by the end of 2022.

We don't yet know what the final U.N. plastics treaty will contain—or how the United States, one of the world's biggest contributors to plastic waste, will engage—but we do know that this is an opportunity to block the endless stream of unnecessary single-use plastics into our markets, prevent microplastics from entering our water and food supplies, reduce environmental destruction, and cut greenhouse gas emissions (all popular ideas).

NRDC's health experts have also been advocating to phase out the most toxic and problematic plastic products, eliminate chemicals of concern, block the expansion of "chemical recycling," and mandate that manufacturers disclose the chemicals in their plastic products.

Should we ban single-use plastics?

In response to the strain that plastic puts on communities, a wave of single-use plastic bans is sweeping the country and the globe—most often on plastic bags, straws, stirrers, and take-out clamshells. Dozens of U.S. cities and many institutions (from schools to theme parks) have decided to outlaw plastic straws. Plastic bag bans—ideally accompanied by a fee on paper bags—are also catching on, with at least 12 states (and hundreds of cities) having passed such laws so far.

What do the bans accomplish? They prevent millions of tons of plastic from entering the waste stream each year. And when it comes to waste that lasts forever[7,8,9], every ton counts.

But beyond these impacts, the bans have cultural effects. Companies are forced to innovate, rethinking their designs and sourcing sustainable materials. And they help shift consumer mindsets, as people recognize that this waste is both unsustainable—and needless.

III. RESULTS

Major corporations and single-use plastics

Large producers of single-use plastics can make a big environmental impact. As part of the Break Free from Plastic movement, Greenpeace volunteers conduct annual audits of plastic pollution along coastlines, sifting through hundreds of thousands of individual pieces across 41 countries to identify the pollution's sources. In 2022, they discovered that Coca-Cola, Nestlé, and Unilever products were found most often.

Coca-Cola on its own produces three million metric tons of plastic packaging each year, equivalent to a terrifying 200,000 plastic bottles per minute. Unfortunately, that number continues to rise, as it does across many global brands.

In response to calls for change and shifting consumer habits, some companies are taking the initiative and experimenting with designs that reduce waste or utilize reusable or compostable components. But it's clear that much more needs to be done.

Policies and government frameworks, like the forthcoming global plastics treaty, can spur action from private industry. Bottle bill laws, for example—which generally require retailers to add a fee on individual bottles (that customers can partially recoup when they recycle)—are a way to increase corporate responsibility for waste while providing a monetary incentive to consumers to recycle. Even better are incentives that support a zero-waste, circular economy: promoting completely reusable or easy-to-repair components.

Avoiding single-use plastics

Individual choices—and the collective shifts they bring about—add up quickly. Making just one simple change, like resolving to avoid bottled water whenever possible, can spare the environment of hundreds of plastic bottles each year. Here are a few more tips for ridding your life (and your community) of single-use plastics for good.

- Always pack a reusable bag when shopping. (And yes—reusable totes are better than plastic.)
- Cook more often—and store leftovers in your freezer—to reduce your use of plastic-heavy take-out containers.
- Compost your food waste, which has many benefits, including shrinking your personal waste stream.
- Buy in bulk. Avoid individually packaged goods, like snack packs. Zero-waste shops, which are becoming more popular, even encourage you to bring in and fill your own containers.

- Though buying online sometimes has a lower carbon footprint than shopping in a store (skip the express delivery option, if you can), online shipments are still chock-full of plastic. Your best bet for reducing your footprint and plastic waste? Walk, bike, or take public transit to buy products in person.
- Avoid plastic wrap altogether by storing leftovers in reusable containers. Or try reusable and compostable beeswax wrap as one easy alternative.
- Buy a metal or glass reusable straw. Pack it alongside reusable cutlery for sustainable eating on the go.
- Talk to the owners of the restaurants you frequent. Ask if they have nonplastic alternatives to plastic straws, stirrers, or bags.[10,11,12]
- Speak out in support of local plastic bans, whether by calling your local government representative, submitting an op-ed to your city's newspaper, or simply starting conversations with neighbors.
- Let companies that make your favorite products know that you care about the packaging. Tweet, call, or send letters to these companies to ask them to switch to more durable, recyclable, compostable, renewable, or recycled-content packaging.

Impact of Single-use Plastics

Plastics had various new uses; initially, plastics were used and encouraged because they were found as alternative to natural resources and thereby conserving those natural resources.³

Production of plastic has outnumbered any other material due to the increase in consumption and with a consequence of globalization, the production of durable plastics had shifted toward increase in production of single-use plastics.¹² According to Geyer et al., the largest sector to use SUP is packaging industries; about 36% of SUP are used in packaging, 16% by building and construction, 14% by textiles, consumer and institutional products use 10% SUP, 7% by transport industries, 4% by electrical and electronic industries and rest by others.⁹

Increase in consumption in turn had led to increased utilization of nonrenewable resources like fossil hydrocarbon. The global estimates suggest that by 2050, the plastic production may consume 20% of total world's oil consumption. It has not just stopped in depleting the valuable resource but has gone further by causing ill effects to humans as well. The ubiquitous use of plastics and daily exposure have facilitated continuous contact of plastic and its ingredients to human body, and studies have suggested the presence of these ingredients in the human body which has reflected the constant exposure as well as its metabolism and excretion of some harmful product of plastics.¹³

By biomonitoring, it is found that multiple sources of plastics had contaminated humans; this approach further showed that various chemicals used in the manufacture of plastics are present in the human population and producing potential adverse effects on health because of these chemicals.¹⁴⁻¹⁷ Inhalation, ingestion and dermal contact all are considered as important routes by which plastics get exposure in humans and thereby causing harmful effects.^{18,19}

Lang et al., in his recent study among the general adult population of the United States, found a significant relationship between the harmful chemicals from SUP and its byproducts causing cardiovascular diseases, abnormalities in liver, type II diabetes and carcinomas in adults who were exposed to it, and Stahlhut et al. and Calafat et al. found similar results in their studies.^{17,20,21}

However, the problem has not limited itself to just human life; it has also extended its impact to the wildlife and marine species by ingestion and entanglement. It is reported that over 260 species, including mammals, turtles, fish, seabirds and invertebrates, are affected by single-use plastics and causing harmful effects like impaired movement restriction in feeding, reduced reproductive output, multiple wounds, and death.²²⁻²⁷

Consequence and the incidence of ingestion are found to be extremely high; about 95% of fulmars were found to be dead and washed in the North Sea; it is reported that the cause of death was ingestion of plastic bags as an enormous amount of SUP were found in the gut of those birds.²⁸

Single-use plastics accounts for widespread contamination of soils with macroplastics or by microplastic fragments and subsequently contaminating municipal solid waste, though sludge into streams, rivers, and ultimately to the sea, as it takes decades to decompose; it is roughly estimated that it may take 1,000 years to decompose.²⁹⁻³¹

The extent of these problems is so high such that the deepest point of the sea, 10,898 meters in the Mariana Trench, was observed to be contaminated by 17% of plastic debris images; it includes mostly entanglement of plastic bags.³² Impacts of SUP are well documented in many studies, but very few studies examine policies pertaining to SUP in the environment. The lack of standard global policy aimed to reduce SUP accumulation in the environment was the need for this study.

Various strategies were implemented worldwide to reduce single-use plastic. Littering is one of the major issues by SUP and add up to only a small percentage of all litter but the impact of these bags is significantly high; hence, various measures have to be taken, among those measures are ban or levy by the governments of various nations. First country to ban thin plastic bags was Bangladesh and nearly a decade later similar or different ban was imposed on SUP by many developing countries.

In 2001, legislation was passed in Bangladesh to ban the manufacture and sale of SUP; the disastrous floods of 1989 and 1998 were the major drivers for the ban. As SUP were found to exacerbate these major floods due to clogging of underwater drainage by single plastic bags because excessive use and lack of proper disposable system thereby preventing drainage and prolonging the flood; after a period of 3 years, the ban was reversed as there was lack of enforcement and minimum fine was enforced; later regulatory systems were incorporated such as price-based charges which included deposit or refund schemes, and recycling subsidies.^{33,34}

In the same year, Ireland became the country to impose tax (levy) on SUP bags and found to be successful in reducing the consumption of SUP bags. Convery et al. analyzed the success story of a plastic bag levy in Ireland; they imposed tax on sale of SUP bags in retail stores with the exception of reuse plastic. It was first aimed to reduce littering in the rural region and later to maintain consumer behavior and increased the levy on SUP-based on per capita increase in consumption. It was possible due to integrated reporting system and collection of tax into already existing value[13,14,15] added tax; further, it provided insights, planning, and guidelines for other similar proposals.³⁵

In 2002, South Africa enforced the plastic bag ban, but the response was poor. Hasson et al. recommended it is not possible to have one successful policy to reduced SUP, as the demand of SUP was relatively the price of inelastic and not just utilizing price. Therefore, the combination of standards and pricing can successfully curb plastic bag use.³⁶

Further, the study of Dikgang et al. supported the finding of Hasson et al. that the initial sharp fall in use of SUP was noticed in South Africa because the plastic bags were charged; later, the consumers got used to paying for bags which slowly rose the demand to a much higher level.³⁷

In order to curb single-use plastic waste, various initiatives have been adopted by government of India and one such initiative is the ban on SUP. Plastic manufacture sale and usage rules 1999 (amended in 2003) was implemented to regulate the manufacture, sale and use, and recycling of plastic bags. Further in 2011, the Ministry of Environment and Forests had notified another plastic waste rules for management and handling purpose in supersession of the earlier rules as it is a partial ban. Some of the most noticeable features of the new rules are that no food stuffs will be allowed to be packet in compostable plastics or recycled plastics and imposed ban on use of plastic materials as sachets for packing, storing or selling tobacco products. In addition, enforcement on standards for recycles SUP bags like mandatory to follow Bureau of Indian Standards (BIS) and to use colors prescribed by the BIS. Thickness should not be less than 40 microns in carry bags, etc.³⁸

Despite all these efforts, still India is ranked in 12th position in mismanaging plastic waste management, and this poor outcome in India was due to weak implementation of SUP ban, partly because of irresponsible individual behavior and poor waste management systems.³⁹

Tanzania banned single-use plastic in 2005; an initial ban was made in Zanzibar and later extended to the rest of the country for single-use plastic bags. Legislation even extended on imposing ban to the tourist visiting was passed. According to the latest UN environment report, ban is found to be effective in curbing single-use plastic but has led to increase in air pollution as 40% of SUP were burned as a plastic waste management.⁴⁰

First in 2007, Kenya imposed a ban on SUP bags less than 30 μm , and a levy was imposed on SUP bags more than 30 μm 25; not much of difference was noticed after the ban and levy on plastic bags.^{34,41} El-Habr and Hutchinson in their study reported that the majority of marine littering of SUP was contributed by Kenya; even the animals were

affected by SUP as study done by Lange et al. reported that SUP bags found in the stomach of slaughtered livestock.^{42,43}

All those alarming situations made Kenya in 2017 to impose toughest ban so far which include 4 years jail or a \$40,000 fine. It took 10 years and three attempts to finally impose the toughest ban even at the cost of 60,000 jobs lost and facing 176 manufacturers to shut down as Kenya was a major exporter of SUP bags to the region, and 8 months after the ban was introduced, Kenya has drastically reduced SUP waste and the ban was found to be success.⁴⁴ The mayor of North America and Municipal Council unanimously approved By-Law 462 and formulated a legislation to ban SUP shopping in 2007, and the ban was enforced in only two municipalities and Leaf Rapids, Canada, and Manitoba were the first towns in North America to ban plastic bags, but later the government tended to opt for more effective and voluntary stewardship strategies which focused on reusable bags and individual responsibility. As these policies recognize that SUP bags are not the only major component of littering, these bags were a necessity to manage household waste and analyzed that the ban will not be able to eliminate SUP bags from the waste system rather focused toward eliminating plastic kitchen catchers, as they contain up to 76% more plastic and paper which is 5–7 times heavier, thereby increasing the waste system overall and producing more environmental impact. The initiative was taken to switch people's attitude toward reusable bags and to reduce the number of SUP bags by carrying their own bags and found to be effective.^{45,46}

In China, legislation was passed by The General Office of the State Council in December 31, 2008 to ban shops, sales outlets, and supermarkets from providing free SUP bags that are less than 25 μm thick and for bags more than 25 μm , levy was implemented with the exemption in places where these SUP bags need to be used for hygiene issues, viz., storage and handling of fresh food. But adherence to the ban was lacking. More than 80% retail stores continued to provide SUP bags free of charge but still China managed to reduce SUP bags by 66% initially.⁴⁷

However, in the long run, the ban was not found to be not effective because of continuous production of SUP plastic bag illegally and lack of an effective measure to control and regulate the quantity of consumers. The other reasons behind the failure of the ban were lack of understanding about the ban among people and lack of self-discipline practices among manufacturers[16,17,18]

In 2011, Wales was the first country among the other countries in UK to pass a Legislation to compact SUP pollution by charging a levy on plastic bags; the money raised from the levy on plastic bags were used to improve the environment, and levy on SUP was found to be effective in reducing the SUP. Reports released by Welsh Government in 2012 suggested 96% reduction in SUP after the levy; further study done by Poortinga et al. on the attitude and behavioral impact of people toward the levy found a positive behavioral spillover effect toward not using SUP because the support for the carrier bag charge was already high before its introduction.^{49,50}

In 2015, European Union imposed a legal act (Directive 94/62/EC was amended) on single-use plastic bags with the main objective of reducing the amount of single-use plastic carrier bag consumed thereby limiting the environmental damage. The ban has been found successful in reducing SUP waste generated and production; the reason behind is the extension of the law to the producers to clean up litter and various initiatives like installing free clean drinking water fountains.⁵¹

In 2016, Israel introduced a levy on SUP bags, as an effect of the ban more than 70% of the public supported and a noticeable reduction in SUP was found; the success was partly because bags were charged and the law motivated people to use environmental friendly reusable bags by providing subsidies.⁵²

In January of 2019, more than half of India, i.e., 29 states and 7 territories had crafted legislation to ban on SUP and state government officials were ordered to reduce the manufacturing of SUP, further refining an effort which began in 2016 to establish an extended producer responsibility (or EPR guidelines that require manufacturers to pay for the collection and recycling of waste their products). Moreover, local administrations at the city, town, and village levels have been asked to ensure that consumption, distribution, and sale of banned plastic are prevented,⁵³ though the impact of the recent initiatives is yet to be evaluated in India



Table 1: Global plastic bag policy interventions and its impact

S. no.	Country	Year of ban	Policy framework and products ban	Impact of ban	Reason
1	Bangladesh	2002	The Bangladesh Environment Conservation Act was revised in 2002. Rule 6ka of Clause-5 under Section-9, states ban imposed in the production and uses of thin SUP (polythene shopping) bag. Penalty and punishment include imprisonment, fine	Initially reduction in SUP bags was noticed but later it increased (from 5.56 kg per person in 2005 to 14.9 kg per person in 2014) waste concern, 2014)	Lack of continuous enforcement and proper management for deposited in recycling centers, or burners and removal from landfills
2	Ireland	2002	“Bag tax” was passed which imposed a levy for sale of plastic bags in retail stores and tax to be paid by consumers also. Levy was collected only for SUP bags; reuse bags were exempted from the tax	Overall reduction in SUP and progressive track record of less SUP consumed	Tax was imposed from production of SUP bags to consumers utilizing it and increase in tax based on the increase in consumption
3	India	2003	A legislation was passed in 2003 to ban bags less than 20 µm thick later in 2019, the Ministry of Environment and Forests had notified another plastic waste rules for management and handling purpose in supersession of the earlier rules; partial ban on SUP items was imposed	India continue to be major contribution of waste generated in world despite of the ban	Irresponsible individual behavior, poor waste management systems, and lack of proper enforcement of the ban
4	Tanzania	2005	Ban was imposed for bags made up of less than 100 µm thickness later banning bags less than 30 µm	Ban found to be effective in controlling SUP used and produced	Effective because of continuous monitoring
5	Kenya	2007	First in 2007, Kenya imposed a ban on SUP bags less than 30 µm and for SUP bags more than 30 µm a levy was imposed. Due to lack of effectiveness of the ban and levy later in 2017, Kenya enforced world toughest ban on SUP, which was imprisonment and fine for using SUP bags less than 30 µm	Effectively reduced consumption and production of SUP	Imprisonment, fine, and continuous monitoring played a role
6	Canada	2007 and 2011	In 2007, a ban was imposed on plastic bags less than 30 µm, and a levy was imposed on bags more than 30 µm and continue with a levy for thicker bags	Effective in reducing SUP and increased reuse bags	Peoples attitude toward curbing plastic pollution help to reduce SUP
7	China	2008	Legislation was passed by The General Office of the State Council to impose ban in shops, sales outlets and supermarkets from providing free SUP bags that are less than 25 µm thick and for bags more than 25 µm; levy was implemented with the exemption in places where these SUP bags need to be used for hygiene issues, i.e., storage and handling of fresh food	Initially reduced in consumption; later increase in use of SUP were noticed	Lack of monitoring and illegal production were the reasons the SUP bags are still prevailing in China
8	Wales	2011	Legislation to charge a levy on plastic bags	96% reduction in SUP	The attitude and



Table 1: Global plastic bag policy interventions and its impact

S. no.	Country	Year of ban	Policy framework and products ban	Impact of ban	Reason
				after the levy	behavioral impact of people toward the levy found a positive behavioral spillover effect toward not using SUP
9	European Union	2015	Imposed a legal act (directive 94/62/EC was amended) on single-use plastic bags	The ban has been found successful in reducing SUP waste generated and production	The extension of the law to the producers to clean up litter and various initiatives like installing free clean drinking water fondants
10	Israel	2016	Introduce a levy on SUP bags	As an effect of the ban, more than 70% of the public supported and noticeable reduction in SUP	Partly because bags were charged and the law motivated people to use environmental friendly reuse bags

IV. CONCLUSION

Reasonably charging of plastic bags, imposing high levy on SUP from starting point of production, encouraging innovate measures, tough enforcement, and personal behavior have shown impact in reducing SUP whereas lack of continuous vigilance, self-regulation by industries, and illegal SUP production had led to failure to create impact by various bans and levy. Hence, this article emphasizes that tougher enforcement, vigilance, and self-regulation along with motivations of the public may help to curb SUP pollution.[19,20]

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