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Plastic lifecycle management: An insight into a plast-less economy

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Foreword

Our Centre of Excellence for Sustainable Development (CoE-SD) intends to provide insights on a comprehensive approach towards plastic lifecycle management.



“The choices that we make today will define our collective future”, stated our Honourable Prime Minister Mr. Narendra Modi at the UN World Environment Day 2018 on the theme of ‘Beat Plastic Pollution’. India, being the host nation, went big with an announcement to overthrow single-use plastics from the country by 2022, thereby becoming part of a global movement against plastic use.

Plastic use has long been under scrutiny due to its non-decomposing characteristic and consequent pollution. Despite being the material of choice for different sectors, its mounting negative impact has warranted for robust actions to manage the plastic lifecycle. In addition to probing about its business necessity, deliberations across the globe are now focusing on ways to handle plastic beyond its end-of-use phase. Additionally, finding economically viable and eco-friendly alternatives has become crucial for both consumers and businesses alike.

This paper by Grant Thornton India LLP focuses on the significance of a logical and progressive approach towards

plastic lifecycle management and the importance of multi-stakeholder interventions in generating a positive impact on society and economy. Using quintessential case studies, this paper explores the approach and methods adopted by governments and businesses across the globe. Furthermore, it provides a broader understanding of plastic lifecycle management and its linkage with the United Nations Sustainable Development Goals (UN SDGs).

Through this paper, our Centre of Excellence for Sustainable Development (CoE-SD) intends to provide insights on shifting from the conventional reduce-reuse-recycle principle towards a comprehensive plastic lifecycle management approach, thus helping government, businesses and global organisations to work towards sustainable development.

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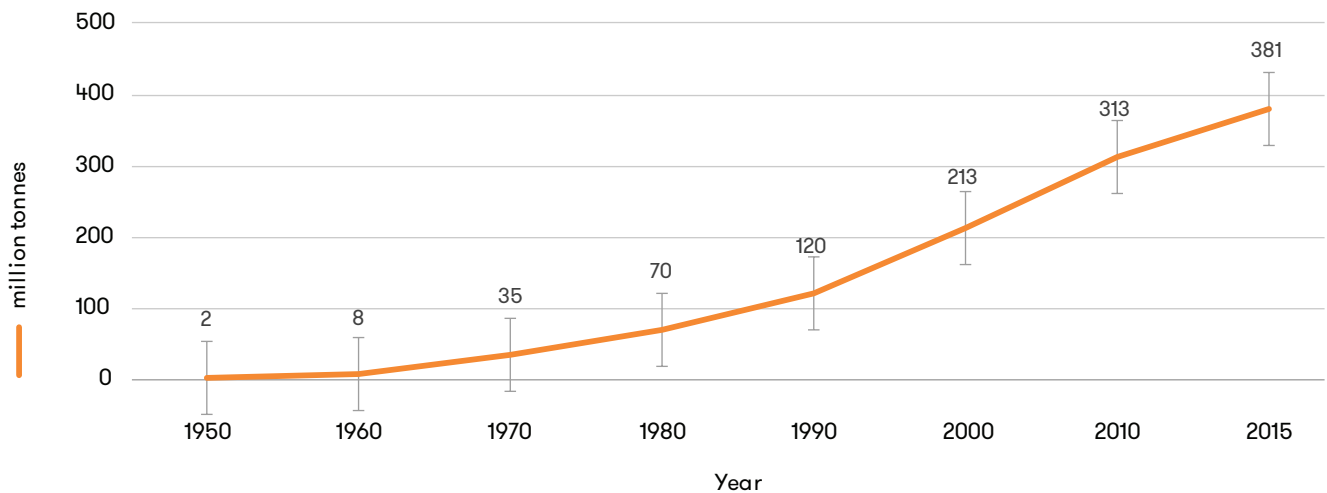
Source:

<https://www.unenvironment.org/news-and-stories/press-release/india-sets-pace-global-race-beat-plastic-pollution>

Current status of plastic in India and the world

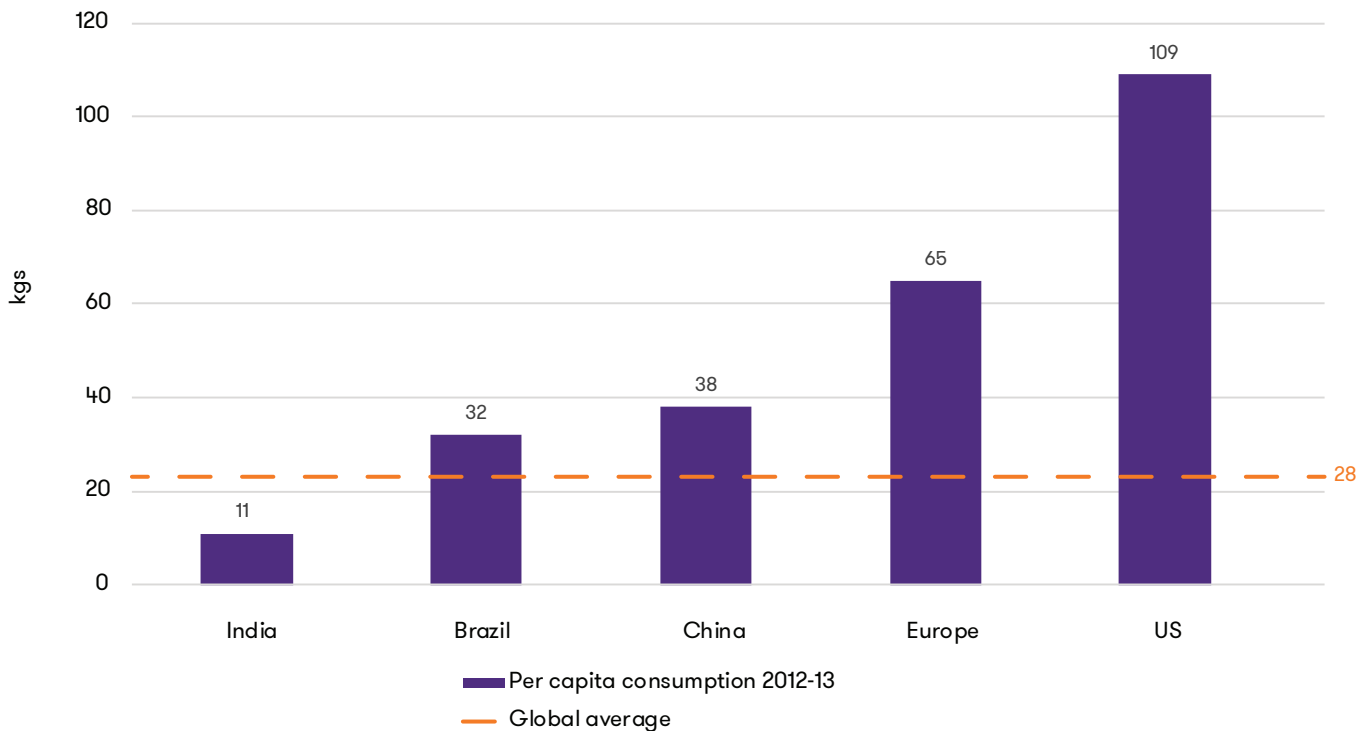


1) Global plastic production



In 1950, for a population of 2.5 billion people, around 2 million tonnes of plastic was produced. On the other hand, in 2016, for a population of 7 billion people, over 320 million tonnes of plastic was produced, and this is further set to double by 2034.

2) Global per capita plastic consumption

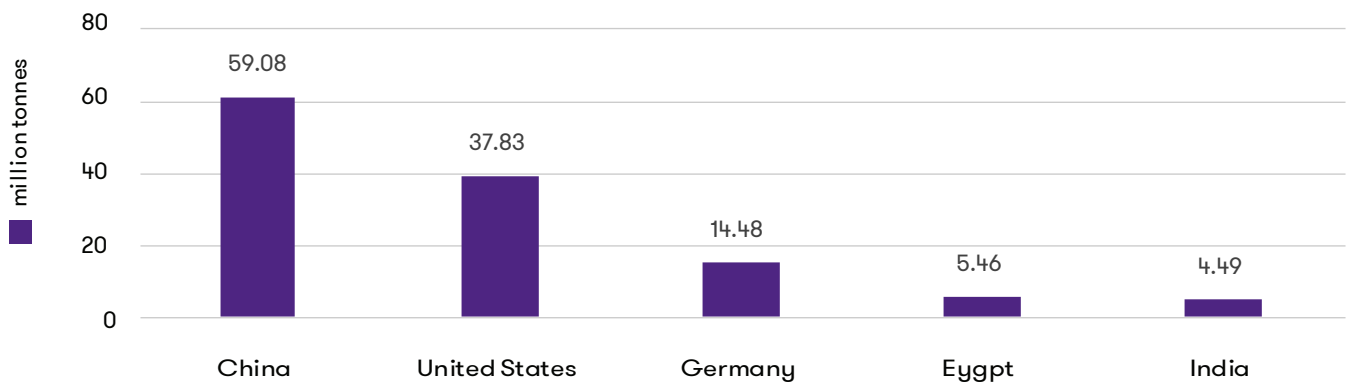


The global per capita consumption of plastic has also seen an upward trend with most of the developed nations leading the list. India's per capita consumption (among the lowest in the world) is much below the global average of 28 kg per year, but it continues to rise year-on-year.

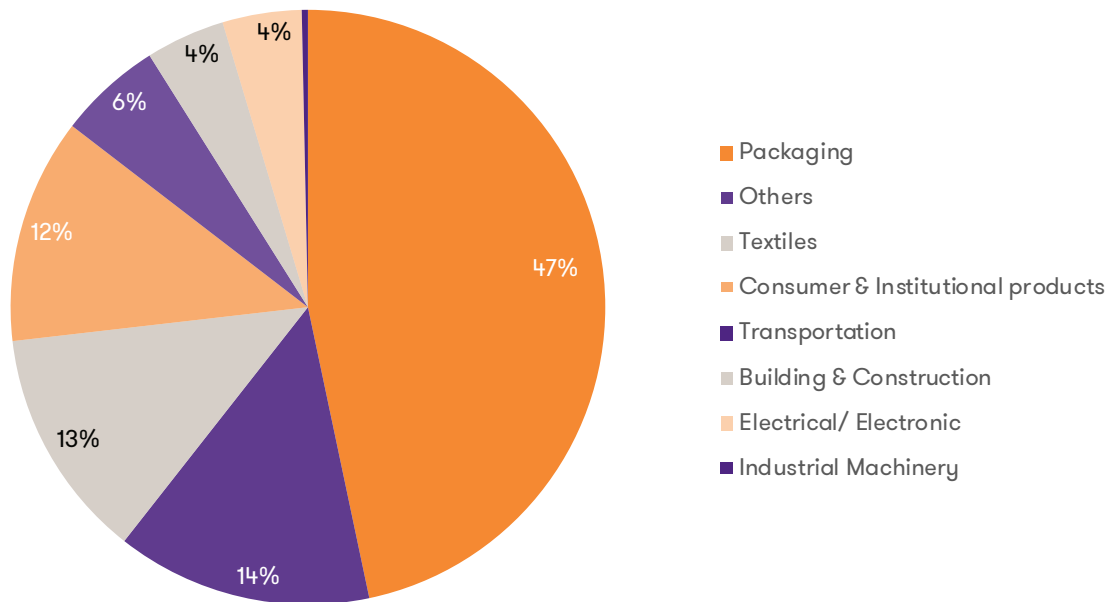
Sources:
<https://ourworldindata.org/>
<http://ficci.in/spdocument/20396/Knowledge-Paper-ps.pdf>

3) Global plastic waste generation

I. Country-wise (2010)










II. Industry-wise (2015)



As per the latest estimates, India's plastic waste generation has more than doubled to 9.46 million tonnes, of which 43% is used for packaging and most of it is single-use.

4) Types of plastic and their recyclability

There are different types of plastics based on the polymer used to make them; these are further used to produce various kinds of products. Numerical coding (from 1 to 7) is typically provided on plastic items to identify them for recycling. Plastic recycling refers to the process of recovering waste or scrap plastic and reprocessing the materials into functional and useful products.

Symbol	Polymer	Common uses	Properties	Recyclable?
 PETE	Polyethylene terephthalate	Plastic bottles (water, soft drinks, cooking oil)	Clear, strong and lightweight	Yes, widely recycled
 HDPE	High-density polyethylene	Milk containers, cleaning agents, shampoo bottles, bleach bottles	Stiff and hard-wearing; hard to break down in sunlight	Yes, widely recycled
 PVC	Polyvinyl chloride	Plastic piping, vinyl flooring, cabling insulation, roof sheeting	Can be rigid or soft via plasticisers; used in construction, healthcare, electronics	Often not recyclable due to chemical properties; check local recycling
 LDPE	Low-density polyethylene	Plastic bags, food wrapping (eg, bread, fruits, vegetables)	Lightweight, low-cost, versatile; fails under mechanical and thermal stress	No, rarely recycled but check local recycling
 PP	Polypropylene	Bottle lids, food tubs, furniture, houseware, medical use, ropes, automobile parts	Tough and resistant; effective barrier against water and chemicals	Often not recyclable; available in some locations; check local recycling
 PS	Polystyrene	Food takeaway containers, plastic cutlery, egg tray	Lightweight; structurally weak; easily dispersed	No, rarely recycled
 Others	Other plastics (eg, acrylic, polycarbonate, polyactic fibres)	Water cooler bottles, baby cups, fibreglass	Diverse in nature with various properties	No, diversity of materials risks contamination of recycling

5) Negative impact of plastic usage



Oceans

Marine plastic pollution has affected over 700 species worldwide as a result of ingestion, starvation, suffocation, drowning and entanglement. Sea birds unintentionally feed their chicks plastic, mistaking it for food, and about one million of them are killed by plastic pollution each year. 50% to 80% of all sea turtles found dead have ingested some form of plastic. There are several accounts of various whale species dying after consuming plastic. According to the World Economic Forum, it is estimated that “there will be more plastic than fish in the ocean by 2050.”



Land

Majority of plastic waste, about 6,100 tonnes in India, is dumped into landfills. Plastic toxins from the litter seep into the groundwater, and the chemical released affects soil fertility. The toxic emissions and foul gases from landfills pollute the environment and lead to adverse effects on human health. Furthermore, open burning of plastic disperses the toxic chemicals, which get deposited on soil, surface water and plants.



Air

Open burning of plastic generates microplastics that contaminate the air. The wind becomes a carrier, and when inhaled by humans and animals, it causes respiratory problems. In addition to this, as per estimates, plastic production and incineration will contribute greenhouse gases equivalent to 850 million tonnes of carbon dioxide (CO₂) to the atmosphere in 2019.



Life

Through microplastics, plastic has found a place in the food chain by contaminating water; researchers have found that more than a quarter of all fish now contains plastic. The toxins in microplastics can disrupt hormones crucial for healthy existence and also cause problems like asthma, cancer, congenital disabilities, genetic changes, chronic bronchitis, ulcers, skin diseases and liver dysfunction.

Sources:
<https://www.wfindia.org/?18581/UNEP-CII-and-WWF-India-launch-Un-plastic-Collective>
<https://www.triplepundit.com/story/2018/our-plastic-problem-plastics-marine-life-and-beyond/11841>
<https://www.conserve-energy-future.com/causes-effects-solutions-of-plastic-pollution.php>
<https://ecologycenter.org/factsheets/adverse-health-effects-of-plastics/>
<https://ecologycenter.org/factsheets/adverse-health-effects-of-plastics/>

Addressing the risk of plastic in the economy



1. Initiatives of the Government of India

The Indian government has set a goal to wipe out single-use plastic from India by 2022 and thus has exhorted municipalities, NGOs and businesses to come up with ways for reducing and safely disposing of plastic. Hon'ble Prime Minister urged start-ups and experts to find ways and develop technologies to recycle plastic. Furthermore, he reiterated his stand against single-use plastic while delivering his 2019 Independence Day speech and also in the recent United Nations General Assembly (UNGA) in New York, urging people to come forward and be part of the movement.

Plastic Waste Management Rules 2016 were adopted and later revised in 2018 to take into account ease of doing business for producers, recyclers and manufacturers. These rules address the plastic use issue comprehensively through progressive methods, at the same time ensuring that all stakeholders are involved.

India is also firming up a plan to make its 7,500 km of coastline plastic pollution-free. As the first step, sensor-equipped floating buoys will be deployed in the ocean to measure marine plastic footprint. The government will establish a national and regional marine litter action campaign as well as a programme to measure the total marine plastic footprint in India's coastal waters.

There are several initiatives taken by state governments and ministries in line with the central government's vision to manage plastic use. Some of them are as follows:

- I. **Department of Promotion and Industry and Internal Trade (DPIIT):** DPIIT under the Ministry of Commerce and Industry launched the 'Swachhta hi Sewa 2019' campaign on 11 September 2019 as part of the Hon'ble Prime Minister's call to action against plastic waste from industrial estates, parks and other areas by all states and union territories. DPIIT will start by ensuring recycling of plastic waste collected on 2 October 2019 in cement kilns and collecting plastic waste through a nationwide 'Shramdaan' on 2 October 2019 in and around industrial areas all across the country.
- II. **Maharashtra government:** In March 2018, the Maharashtra government issued a notification imposing a statewide ban on plastic products. The ban is on the manufacture, use, transport, distribution, wholesale and retail sale, and storage and import of plastic bags (both with and without a handle) and single-use disposable dishes, cups, plates and glasses, plastic packaging to wrap or store products, and thermocol containers and decoratives.

Sources:

<https://www.investindia.gov.in/team-india-blogs/indian-marine-sector-catering-global-platter>, <https://www.thehindubusinessline.com/news/mann-ki-baat-pm-calls-for-mass-movement-against-plastic-waste-from-oct-2/article29252589.ece>
<https://www.dailypioneer.com/2018/page1/indias-7500-km-coastline-aims-to-be-plastic-free.html>
https://dipp.gov.in/sites/default/files/pressRelease_09September2019.pdf
<https://www.firstpost.com/india/maharashtras-plastic-ban-a-bold-initiative-that-needs-phase-wise-implementation-subsidised-alternatives-for-success-4626211.html>

2. Global initiatives

United Nations (UN)

The UN has been instrumental in bringing the attention of various countries towards the mismanagement of plastic and its impact on the world. The theme for the 2018 edition of the World Environment Day was 'Beat Plastic Pollution', and on that occasion, 170 countries took the pledge to reduce plastic consumption by 2030. The UN Environment Programme (UNEP) also released the first-ever 'state of plastics' report, which offers the first comprehensive global assessment of government action against plastic pollution.

The UN has been engaged in campaigns as well for bringing in awareness about plastic use:

Clean Seas Campaign: UNEP launched the Clean Seas Campaign in 2017 to engage stakeholders from all sectors to fight the pollution of plastics in the ocean. The goal is to address the root causes of plastic pollution, primarily the production and consumption of single-use plastics. Till date, more than 40 countries have signed on to the campaign.

Beat Plastic Pollution Campaign: The Beat Plastic Pollution Campaign was the focus of the 2018 World Environment Day organised by the UN. It overlaps with the Clean Seas Campaign, and likewise targets single-use plastics and pushes consumers to follow the motto: "If you can't reuse it, refuse it."

In another report, UNEP examined the potential of replacing conventional plastics with a range of natural materials such as paper, cotton, wood, algae and fungi. It also featured companies, from multinationals to start-ups, that are innovating and using alternative technologies such as new generation bio-polymers made from biomass sources. The UN report concluded that corporations must include sustainability in their business models, sometimes taking their lead from local communities to find available plant and animal alternatives to plastics.

European Union (EU)

EU directives encourage member states to set reduction targets or adopt economic instruments to achieve a sustained reduction of lightweight carrier bags. EU member states are, for instance invited, among other options, to reduce the amount of lightweight plastic bag consumption to a maximum of 90 per person a year by the end of 2019, and to a maximum of 40 by the end of 2025.

Policy: In January 2018, the European Commission adopted the first-ever European Strategy for Plastics in a Circular Economy. The plan seeks to eliminate plastic pollution and change the way plastics are produced and consumed in the EU with a focus on plastic bags, other single-use plastics and fishing materials and restricting the intentional use of microplastics. The plan also seeks to improve the economic benefit of recycling, to create jobs through engaging businesses and producers, and to invest in innovation.

Impact: The European Commission has begun to introduce regulations and measures to the European Parliament, including a proposal on the regulation of single-use plastics, packaging waste and port waste management. The Commission has laid out an ambitious goal which says that by 2030, all plastic packaging produced and sold in Europe should be reusable or recyclable. The strategy included has the potential to create 200,000 jobs if recycling capacity is multiplied fourfold.

Also, as part of its strategy, EU will develop new rules on packaging to improve the recyclability of plastics and increase demand. It wants to see improved and scaled up recycling facilities and a more standardised system for the separate collection and sorting of waste.

Other countries

China

Policy: The Chinese government responded to widespread plastic pollution by banning the distribution of single-use plastic bags in grocery stores and shops around the country. Companies now face a strict fine of 10,000 yuan, or roughly USD 1,593 for illegal plastic bag distribution.

Impact: The NRDC estimates that China has seen a 66% reduction in plastic bag use since the rollout of the ban. In response to allegations of inconsistent enforcement, 600,000 regulators have been sent to grocery stores around the country to make sure that they comply.

The reduction in recyclable plastic imports in 2018 has created a supply void for China's plastic processing industry, and to fill it, the government is focusing on responsibly processing the tons of plastic waste China produces domestically.

China's Ministry of Ecology and Environment announced a pilot scheme to establish 10 zero-waste cities. The purchasing habits, including sales of single-use plastics, and recycling infrastructure for the 10 undisclosed cities will be overhauled and tightly controlled in a bid to create a blueprint that can be rolled out across China from 2020. The emergence of this anti-plastic pollution trend goes beyond a push for greater public awareness.

Australia

Policy: The Australian Capital Territory (ACT) banned plastic bag usage in 2011. Banned plastic bags include all single-use polyethylene polymer bags that are less than 35 microns thick. The Australian government encouraged citizens to bring reusable bags when shopping to reduce their environmental impact.

Impact: The ban has been widely successful in eliminating plastic waste sent to landfills. It has also become popular among Australian citizens, who, rather than feeling inconvenienced by the ban, support it. A study conducted by ACT shows that roughly 70% of citizens do not want the ban being rescinded.

Chile

Policy: Chile has expanded the previously proposed plastic bag ban to apply beyond coastal cities to the entire country making it the first country in South America to ban plastic bags. As part of the ban's enforcement, Chile will issue fines of up to \$300 USD on businesses that continue to distribute plastic bags. The government is also planning to coordinate beach cleanups, specifically during peak vacation times when the most plastic waste is accumulated on the beach.

Impact: The policy is in effect from August 2019. Larger businesses will have six months to stop using plastic bags while smaller businesses will have two years to adapt to a total ban. In the meantime, they will only be allowed to hand out two carry bags per customer. With rising awareness on the impacts of plastic pollution on marine life, this policy aims to reduce plastic pollution in the ocean and waterways.

Ireland

Policy: Ireland was the first country to place a significant tax on plastic bags, now 22 euro cents — at checkout in 2002. For the few bags that are used, the government has ensured that the revenue from the tax goes into different programs aimed at environmental protection.

Impact: The country saw a significant impact almost instantly with plastic bag consumption dropping by 94%, making the practice of using plastic bags unacceptable by the end of the year. Having inspired other countries to address this issue, Ireland proves to be one of the leading countries tackling plastic bag consumption.

3. Initiatives by businesses

With perils of plastic usage coming in the limelight globally, companies have taken cognisance of plastic mismanagement being a potential risk to the environment as well as business itself. Thus, companies around the world have started including sustainable practices to manage their plastic usage and set ambitious goals that are in line with the global movement against plastic waste.

FMCG and retail industry

- **By 2025, ALDI** – the German supermarket chain, aims to achieve 100% recyclable, reusable or compostable packaging across all products and to reduce packaging by 50%. It has already replaced 265 tonnes of hard-to-recycle black plastic from fresh fruit and vegetable lines and switched pizza disks from polystyrene to cardboard, thus eliminating about 180 tonnes of plastic.
- **Hindustan Unilever (HUL)**, as part of Unilever Sustainable Living Plan (USLP), aims to globally reduce its environmental footprint by half in the making and use of their products. The USLP commits to ensure 100% of the plastic packaging is reusable, recyclable or compostable by 2025. Also, 25% of plastics HUL uses will be sourced from post-consumer recycled sources.
- **Swedish furniture chain IKEA** has pledged to phase out single-use plastic products from its stores and restaurants by 2020. The firm says it is committed to phasing out oil-based plastics and ensuring that all its plastic products are made using recycled materials.
- **Coca-Cola** launched its World Without Waste campaign in January, saying it would recycle a used bottle/can for every new one sold by 2030. It has also pledged to increase the amount of recycled content in plastic bottles to 50% by 2030.
- **McDonald's** will make all its packaging from renewable and recyclable sources by 2025.
- **FMCG major ITC Ltd.** is planning to make 100% of its product packaging reusable, recyclable or compostable in over a decade.

E-commerce

- As of 1 August 2019, **Flipkart** had achieved a 25% reduction in single-use plastic through the packaging value chain. It aims to move towards 100% recycled plastic consumption in its supply chain by March 2021. Flipkart is working on eco-friendly paper shreds, replacing poly pouches with recycled paper bags, replacing bubble wraps and airbags with carton waste shredded material and 2 ply rolls.
- **Amazon's** environment-friendly packaging material will be entirely recyclable. It would replace all single-use plastic in its packaging with paper cushions by June 2020.

Pharmaceuticals

- **Sun Pharmaceutical Industries Ltd.** initiated setting up of treatment and recycling plants through registered recyclers and engaged scrap vendors for materials like plastic and high-density polyethylene (HDPE).
- **GlaxoSmithKline** has several initiatives in place to reduce plastic use, increase use of recycled plastic content and encourage the recycling of plastic components.
- **Pfizer** has established Green Packaging Design Guidelines to assist in the development or modification of a package to reduce its environmental impact. It has formed a Sustainable Packaging Team, which works with brand managers and packaging designers to advance sustainable packaging throughout the company.

Sources:

<https://www.aldi.co.uk/about-aldi/corporate-responsibility/environment/waste-and-recycling>
<https://www.hul.co.in/about/start-a-little-good/start-a-little-good-with-plastic-waste-mangement/>
https://www.business-standard.com/article/companies/from-its-to-dabur-plastic-waste-control-top-priority-for-fmcg-firms-118061300024_1.html
<https://www.unenvironment.org/news-and-stories/story/what-are-businesses-doing-turn-plastic-tap>
<https://www.thisisplastics.com/environment/the-purpose-of-single-use-plastics/>
<https://www.livemint.com/industry/retail/flipkart-outlines-vision-to-eliminate-single-use-plastic-1567080723111.html>
<https://www.livemint.com/industry/retail/amazon-india-to-weed-out-single-use-plastic-packaging-by-june-2020-1567579715375.html>
<https://indiacsr.in/sun-pharmas-initiative-to-recycle-plastic/>
<https://www.gsk.com/en-gb/responsibility/environment/environmental-stewardship/>
<https://www.pfizer.com/purpose/workplace-responsibility/green-journey/packaging>

Building and construction

- **ACC Ltd.**, a cement-producing company, is also looking to reduce its plastic waste volumes through co-processing the plastic in its cement kilns. From managing around 25,000 tonnes of plastic waste in 2012, ACC is likely to increase the volume from the current 82,000 tonnes to about 1.20 lakh tonnes a year.

Others

- **Dell** aims to make its packaging entirely waste-free by 2020, using materials from sustainable sources. It already uses recycled ocean plastics as well as other sustainable materials such as bamboo. It wants all packaging to be ultimately suitable for home composting or household collection.
- Around World Environment Day, **Volvo** announced its plan to replace at least 25% of all the plastics used in every newly launched Volvo from 2025 with recycled material.



Sources:

<https://www.thehindubusinessline.com/companies/more-corporates-join-war-on-plastic/article25438733.ece>

<https://www.thehindubusinessline.com/specials/auto-focus/volvo-to-use-recycled-plastic-in-its-cars/article24223048.ece>

<https://www.unenvironment.org/news-and-stories/story/what-are-businesses-doing-turn-plastic-tap>

4. Partnership initiatives

Alliance to End Plastic Waste (AEPW)

AEPW is made up of nearly 30 major global companies. They have committed over USD 1.0 billion with the goal of investing USD 1.5 billion over the next five years to develop, deploy and bring to scale solutions that will minimise and manage plastic waste and promote post-use solutions. These can be recycling, reuse and repurposing of plastic to keep it out of the environment.

The aim is to develop solutions to mitigate plastic pollution and promote a circular economy by utilising used plastics. Member companies include those that make, use, sell, process, collect and recycle plastics, as well as chemical and plastic manufacturers, consumer goods companies, retailers, converters, and waste management companies, also called the plastics value chain. From India, Reliance Industries will advance efforts towards a sustainable future. The alliance has been working with the World Business Council for Sustainable Development as a founding strategic partner.

UK Plastic Pact

The UK Plastics Pact is a collaborative initiative that will create a circular economy for plastics. It brings together businesses from across the entire plastics value chain, UK government and NGOs to tackle the scourge of plastic waste. The UK Plastics Pact is the national implementation by WRAP. It was made possible by the support provided by the Ellen MacArthur Foundation. By 2025, the UK Plastics Pact will transform the UK plastic packaging sector by meeting four world-leading targets:

- 100% of plastic packaging to be reusable, recyclable or compostable
- 70% of plastic packaging effectively recycled or composted
- Take action to eliminate problematic or unnecessary single-use packaging item through redesign, innovation or alternate delivery models
- 30% average recycled content across all plastic packaging

It aims to inspire members and supporters to act and to galvanise broader action by governments, funders, investors, NGOs and businesses who are not members of the UK Plastics Pact.

The UN-plastic Collective

The UN-plastic Collective (UPC) is co-founded by the Confederation of Indian Industry (CII), UNEP and WWF-India. The collective seeks to minimise externalities of plastics on the ecological and social health of our planet. The word 'un-plastic' specifically refers to moving all types of plastic in a circular economy, moving unnecessary plastic in the long run, while using sustainable alternative materials.

UPC members seek to:

- eliminate unnecessary use of plastic
- reuse plastics and reduce plastic leakage, circulate plastic within the economy
- reduce and replace plastic with sustainable alternative materials in the long term
- set time bound, public commitments to reduce plastic externalities

Sources:

[https://economictimes.indiatimes.com/news/company/corporate-trends/global-alliance-of-companies-to-eliminate-plastic-waste-launched/articleshow/67560496.](https://economictimes.indiatimes.com/news/company/corporate-trends/global-alliance-of-companies-to-eliminate-plastic-waste-launched/articleshow/67560496.cms?from=mdr)

<http://www.wrap.org.uk/content/what-uk-plastics-pact>

<https://www.wwfindia.org/?18581/UNEP-CII-and-WWF-India-launch-Un-plastic-Collective>

Approach and methodology for plastic lifecycle management



Hence, the conventional practice of linear consumption and traditional notion of circularity need to develop into one that is all encompassing of the respective stakeholders yet at the same time comprehensive to cover different social-economic and ecological conditions.

i. Phasing out single-use plastic

The most common single-use plastics found in the environment are, in order of magnitude, cigarette butts, plastic drinking bottles, plastic bottle caps, food wrappers, plastic grocery bags, plastic lids, straws and stirrers, other types of plastic bags, and take-away foam containers. These are the waste products of a throwaway culture that treats plastic as a disposable material rather than a valuable resource to be harnessed.

50% of the countries that have implemented bans or levies did not have sufficient data to assess the environmental impact of the policies; of the other 50%, 30% of the bans significantly reduced the use of plastic bags within a year, and 20% had little impact, either due to weak enforcement or lack of alternatives.

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Case study: Sikkim

As unenvironment.org approvingly notes, “Despite being small and isolated, and with its people leading their lives in extremely tough mountainous terrain, Sikkim has emerged as one of India’s environmental leaders.”

Sikkim, which in 1998 became the first Indian state to ban disposable plastic bags, is also among the first to target single-use plastic bottles. In 2016, Sikkim took two significant decisions. It prohibited the use of packaged drinking water in government offices and government events. Second, it banned the use of styrofoam and thermocol disposable plates and cutlery in the entire state in a move to cut down toxic plastic pollution and tackle its ever-increasing garbage problem.

What worked well

With massive awareness drives and penalties, this ban has been impactful. Sikkim’s residents now opt for plates made of paper, leaf, bagasse and even areca nut. Government offices have switched to alternatives like filtered water, large reusable dispensers and reusable water bottles for functions and meetings.

Impact

Hefty fines are imposed and shopkeepers’ licences are not renewed if they are found using plastic bags. Consumers have also been regularly made aware of the harmful effects of plastic. A research in 2018 by a Mumbai-based NGO eCoexist found that 66% of shops around Sikkim used paper bags or newspapers.

On top of this, tourists are being told not to bring in plastic bottles of water. To encourage them, clean water points have been set up where water, certified as safe by the government, is sold to fill reusable bottles.

Case study: Antigua and Barbuda

In January 2016, Antigua and Barbuda prohibited the importing, manufacturing and trading of plastic shopping bags. In July of the same year, the distribution of such bags at points of sale was banned, leaving enough time for retailers to finish their stocks since plastic bags sold in large retailers accounted for 90% of the plastic.

The ban was first implemented in major supermarkets, and later extended to smaller shops.

What worked well

Key elements of the policy’s success include four rounds of stakeholder consultations to ensure engagement and acceptance of the plan.

An awareness-raising campaign titled “I’m making a difference one bag at a time” included frequent television short clips by the Minister of Health and the Environment providing information on the progress of the ban and feedback from stakeholders. A jingle was produced to promote the use of durable bags for a cleaner and healthier environment. Moreover, shoppers were provided with reusable bags outside supermarkets, and dressmakers and tailors were taught how to manufacture such bags to meet increasing demand. Major supermarkets were also required to offer paper bags from recycled material, in addition to reusable ones. To encourage the manufacturing and use of alternatives to plastic bags, the legislation included a list of materials that remained tax-free, such as sugar cane, bamboo, paper, and potato starch.

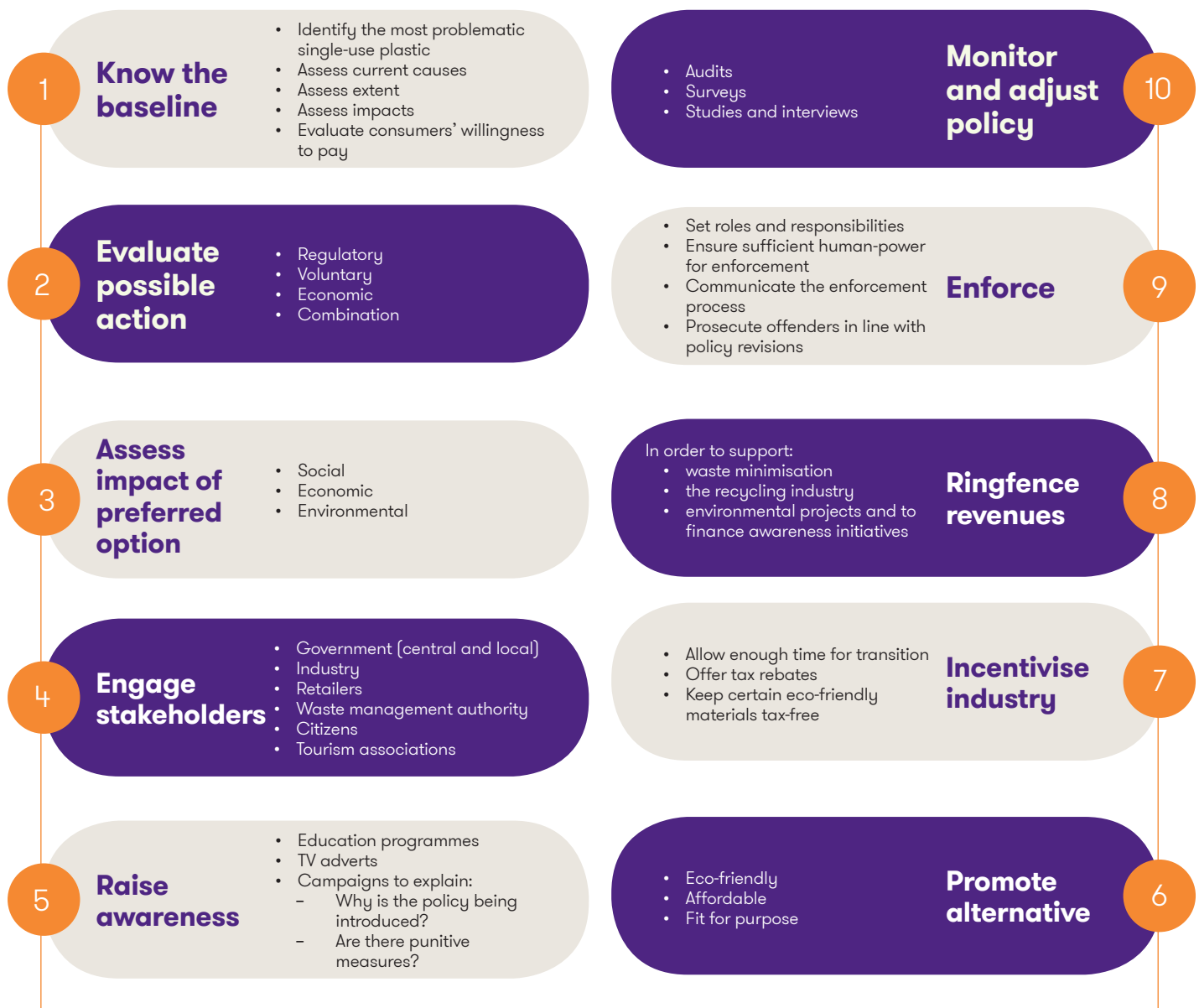
Impact

In the first year, the ban contributed to a 15.1% decrease in the amount of plastic discarded in landfills in Antigua and Barbuda and paved the way for additional policies targeting the reduction of plastics. For instance, the import of plastic food service containers and cups was prohibited in July 2017. As of January 2018, single-use plastic utensils were banned, as were food trays and egg cartons.

The UN report on single-use plastics highlights examples of effective instruments to minimise single-use plastic wastage based on the analysis of stakeholder-wise plastic waste management strategies adopted across the globe.

Types of instruments to reduce single-use plastic waste		Overview of method	Example of applications	Positive impacts
Voluntary reduction strategies		It builds on the understanding that for change to be long lasting, it needs to be voluntary and based on choice	Promotion of reusable alternatives to single- use plastic (eg, promotion of reusable bags, reusable bottles, etc.)	Allows time for the population to change consumption patterns, which can trigger changes among manufacturers; allows time for affordable and eco-friendly alternatives to enter the market
	Public-private partnership	The agreement sets the overarching goal but leaves the choice to the private sector on how to achieve the results	Voluntary agreements between government and retailers (eg, to encourage retails to voluntarily ban or phase out single-use plastic bags)	Valid alternatives to bans; achieves reductions in single-use plastic consumptions and stimulates businesses
			Agreement with producers (eg, to voluntarily establish extended producer responsibility, including deposit return scheme)	
Public education		It requires a gradual and transformational process - key to change consumers' behaviour	Introduction of environmental conservation principles in school curriculums	Common denominator for the success of any initiative
			Social campaigns	
Policy instruments	Regulatory	Bans the use, sale, etc., of certain single-use plastic items	Ban (total or partial)	Relatively simple to introduce; can reduce the amount of single-use plastic consumed; can be a step towards more comprehensive policies
		Laws and acts mandating that packaging manufacturers bear some responsibility in recovering packaging item	Extended producer responsibility	Reduces amount of packaging lingering in the environment; fosters business responsibility; stimulates recycling sector
	Economic	Levis or taxes on certain items	Levy on suppliers	Dissuasive effect, leading to behavioural change; generates (short term) income
			Levy on retailers	
			Levy on consumers	
	Combination of regulatory and economic		Ban and levy	A combination of the above
Extended producer responsibility				

The UN report also presents a 10-step roadmap to guide governments that decide to opt for a policy approach (the introduction of a ban or levy). The roadmap draws upon the experiences, both positive and negative, of over 60 countries that have already implemented bans and levies on single-use plastics (primarily plastic bags and Styrofoam)



Source:
https://wedocs.unep.org/bitstream/handle/20.500.11822/25496/singleUsePlastic_sustainability.pdf?isAllowed=y&sequence=1

ii. Implications and opportunities

The approximate size of the Indian plastic industry is more than 2,000 exporters, 150 plastic processing machinery manufacturers and more than 30,000 processing units. Around 85-90% of the sector remains small-scale. The domestic plastic consumption is expected to touch 20 million metric tonnes by 2020.

Plastic ban and levies are seen as a risk to the plastic manufacturing industries and the ones actively using the material in their supply chain. Thus, anti-plastic laws have been under scrutiny for fears of job losses and an increase in the economic burden for suppliers and consumers.

However, as the awareness about the harmful effects of plastic increases among the general public, there will be a domino effect on the economy as each of these sectors will begin to feel the pressure of consumer trends changing. This will, in turn, increase the demand for alternative products such as paper straws, paper bags, cotton/jute bags, glass bottles, aluminium cans, etc., thus bringing opportunities for manufacturers of more environmentally sustainable products and businesses involved with packaging and distribution of goods. Legislative changes also have been seen to act as a catalyst for forward-thinking companies to look for alternatives in their supply chain and accelerate research into product design and packaging.

With recycled products being the most feasible go-to alternatives, the recycling industry is the first to experience significant growth as can be seen in China, which is witnessing a plastic recycling revolution.

China and plastic recycling revolution

China, before the ban on plastic imports in 2017, accounted for 45% of the world's plastic waste despite having no infrastructure in place to effectively process it. Even since the ban, China's population is still responsible for 28% of the world's plastic pollution.

Thus the government ramped up efforts to deal with China's mountains of waste by working on a blueprint to establish 10 zero-waste cities by overhauling sale, creating a robust recycling infrastructure, catalysing scientific innovations and changing consumption habits of consumers through awareness.

According to China's People's Daily newspaper, the value of the recycling industry in China could be more than USD 1 trillion and account for 40 million new jobs by 2030.

Rwandan alternative packaging market

Rwanda passed a law banning the import and use of non-biodegradable packaging bags in 2008. After the plastics ban, investors tapped into the opportunity and established alternative packing industries as well as plastics recycling plants.

Bonus Industries, which was started after the plastics bags ban in Rwanda, produces paper bags for flour packaging, paper shopping bags, wax-coated paper for packaging bread, grocery paper bags, confectionery bags, seed bags and others, which are used by supermarkets in the country for packaging.

Bonus Industries produced 160 tonnes of grocery bags, and 60 tonnes of bread packaging material every month in 2017 and was able to export 78 tonnes of biodegradable bags for USD 250,000.

Sources:

Beat Plastic Pollution, Ministry of Environment, Forest and Climate Change
<https://www.ozy.com/acumen/a-plastic-recycling-revolution-is-brewing-in-china/93680>
<https://www.newtimes.co.rw/section/read/220257>

iii. Awareness, campaigns and incentives

Public awareness about plastics

Awareness among consumers is imperative to bring about a change in consuming habits and the throwaway culture embedded in the society. As plastic keeps getting more sophisticated, a lack of public awareness has led to single-use plastic's irrational use and people disposing of plastic improperly, thus resulting in the contamination of collections since not all the plastic can be recycled. This further raises the cost of recycling and the amount of plastic going to waste.

Hence, adequate know-how about the plastic lifecycle and its management is critical since it is ultimately the consumer that drives the market and all the stakeholders within it.

Campaigns and petitions

Public pressure can act as a trigger for policy decision-making at all levels of governance as well as the corporate sector.

In Bali, for instance, the 'Bye Bye Plastic Bags' initiative is a social campaign led by the youth to mobilise people in Bali to say no to plastic bags. Two teenagers campaigned for over four years to get plastic bags banned from the island, starting with a petition that collected over 100,000 signatures. Despite initial resistance from the local government, the governor eventually signed a memorandum of understanding to phase out plastic bags by 2018.

In Ireland, a nationwide 'shop and drop day' was organised, in which shoppers left plastic packaging behind in supermarkets to convince companies and consumers to cut down on unnecessary plastic.

Incentives

Incentivising results in better understanding of the impact generated and creates an environment of deliberations among the stakeholders.

CupClub is a London-based start-up which is attempting to overcome the coffee cup challenge. The business offers consumers a plastic coffee cup designed for reuse, which can be returned at collection points at collaborating retailers. A rewards-based system incentivises consumers and coffee retailers to engage in the scheme as well as covering the costs of reverse logistics

The Netherlands used an innovative approach to reduce and dispose of plastics. For waste pick-up, residents only pay for the disposal of trash, not recyclables. Thus, a simple solution: the more you throw away, the more you pay, which creates a significant incentive to reuse or recycle.

Sources:

<https://www.unenvironment.org/news-and-stories/story/eu-weighs-ban-single-use-plastics-these-european-countries-are-moving-ahead>

<https://www.oecd.org/environment/waste/background-paper-policy-approaches-to-incentivise-sustainable-plastic-design.pdf>

<https://www.unenvironment.org/news-and-stories/story/eu-weighs-ban-single-use-plastics-these-european-countries-are-moving-ahead>

Case study: Rwanda: Umuganda - Coming together for a common purpose

Umuganda is an organised community work in which about 80% of Rwandans take part in on the last Saturday of every month. It is compulsory for Rwandans aged 18 to 65 years to come together for just 3 hours and work on projects that usually involve infrastructure development or environmental protection. Expatriates and those over 65 who can take part are also encouraged to do so.

If citizens cannot participate for any reason, they can inform the committee; however, community members who can participate and do not could be fined up to USD 8 (RWF 5,000). Before fines are issued, the person will be warned and encouraged to attend. Furthermore, the revenue from collected fines supports community work.

Impact

Umuganda allowed the country to clear up plastic bag waste from drains, rivers, farms, cities and villages, by working together, Rwanda has become the cleanest country in East Africa. It became a simple, cost-effective way to address some of society's most pressing issues.

Other successful outcomes of this national volunteering day include the building of schools, medical centres and hydroelectric plants to rehabilitating wetlands and creating clean water supplies. Umuganda is estimated to have contributed more than USD 60 million to the country's development since 2007.

The Government of Rwanda introduced the National Umuganda Competition in 2009 to raise awareness of Umuganda and to increase participation. All levels of Rwandan society are involved - from the village up to the national level. The best activity in each district gets a certificate and funding for future projects. Additionally, the best three projects from across Rwanda are awarded a cash prize of between USD 1,500 and USD 2,300.

2. Reuse and replace

i. Reuse

Reuse models are sometimes considered burdensome or a thing of the past. However, innovative reuse models can unlock significant benefits, enabled by digital technologies and shifting user preferences. Such models can help deliver superior user experience, customise products to individual needs, gather user insights, build brand loyalty, optimise operations and save costs.

Reuse presents an innovation opportunity to change the way we think about packaging from something as inexpensive and light as possible to view it as a high-value asset that can deliver significant benefits to users and businesses.

Case study: Business-to-business

Swedish Return System for grocery distribution

Swedish Return System delivers reusable crates and pallets to the producer. The reusable units are filled and delivered to the wholesaler and then on to the retail outlet. The retailer empties the crates and pallets of goods and returns them to the wholesaler. Swedish Return System then takes back the reusable crates and pallets for quality control and washing, after which they are ready to be used again. Swedish Return System has been operating since 1997 and is currently enabling reuse crates to be used for half of all fresh food deliveries in Sweden.

Benefits

- Crates are vented which do not attract moisture and protect primary packaging to reduce product damage during transport.
- Return logistics are optimised and transportation costs are lowered due to lightweight pallets weighing 10 kg less than a Euro-pallet.
- Reusable crates reduce CO₂-equivalent emissions by 74% compared to similar disposable cardboard packaging.
- Crates have a lifetime of 15 years. When worn out, the crates are recycled and used in the production of new crates.

Case study: Business-to-customer

Confectionery closed-loop recycling programme and Loop packaging

Nestlé has formed a closed-loop recycling programme with waste management company TerraCycle in the UK and Ireland for its confectionery flexible plastic packaging. Pouches, bags and wrappers from single bars, blocks and multipacks of popular brands like KitKat, Milkybar and Aero will be accepted through the Confectionery Recycling Programme.

Consumers are encouraged to deposit used wrappers in their local TerraCycle bin. TerraCycle then accumulates the waste before sending it to a specialist recycler to be turned into plastic pellets. These pellets are sold to plastic manufacturers who can create new, solid plastic products like chairs and storage boxes.

The ultimate goal for the Nestlé confectionery portfolio is to find ways to remove non-recyclable materials and develop recyclable alternatives where possible. In addition to this Nestlé has also announced its partnership with TerraCycle in Loop, a subscription home delivery service for household foods and personal care products with reusable packaging.

Deliveries will be made to the consumer's front doorstep in customised, durable packaging, which is then collected, cleaned, refilled and reused. Thus, it provides a platform to integrate reusable product packaging as part of Nestlé's efforts to reduce waste.

Sources:

Reuse: Rethinking Packaging (Ellen MacArthur Foundation)

<https://www.nestle.com/media/news/nestle-haagen-dazs-loop-reusable-packaging-initiative>

<https://packaginginsights.com/news/nestle-teams-with-terracycle-for-confectionery-closed-loop-recycling-program.html>

ii. Replace: Alternatives to plastic

There is a requirement of environment-friendly alternatives that are at par in suitability and practicability to plastics. One such option that is gaining traction is biodegradable plastic and compostable plastic, but they have their limitations.

A crucial challenge of biodegradable plastics is that they tend to need particular waste management methods which are not always widely available. They usually need to be separated from the traditional recycling stream (which can be difficult and expensive) and have to go to specific compostable facilities. This does not mean such methods are unfeasible, but they could involve additional economic cost, especially if they are in the waste stream at low concentrations. They would require significant work in terms of infrastructure redesign.

Thus, countries tackling collection and segregation in plastic management need alternatives that are simpler and economical to adapt. A few such innovations are mentioned below:

Recycling vegetable waste

Ashwath Hegde, an NRI entrepreneur from Qatar, has devised a plastic bag made from natural products such as tapioca starch granules, vegetable oil and waste. The company has various products ranging from biodegradable trash bags and sachets to wrapping film and carry bags. The average cost of the plastic bag is INR 3.

Edible cutlery

Narayana Peesapati and his venture Bakey's manufacture edible cutlery from a mix of jowar, rice and wheat flour. Bakey's offers savoury, sweet and plain spoons that can be eaten, or left to decompose, post use.

Silicone-clad borosilicate glass lunch boxes and water bottles

Mumbai-based Tintbox provides silicone-clad borosilicate glass lunch boxes and water bottles that are eco-friendly, non-toxic, and chemically inactive. The outer protective silicone sleeve ensures they do not break even after falling.

Sachets made of regenerated cellulose

As a part of an innovation competition conducted by FMCG giant Hindustan Lever, students of IIT Madras developed a novel

packaging material from cellophane, which is regenerated cellulose and is entirely biodegradable. It is an eco-friendly alternative to package edible and non-edible products. The corporate giant has now shown an interest in incorporating this innovation into its product packaging.

Shower-friendly paper

Beauty behemoth L'Oréal has launched an eco-beauty range, Seed Phytonutrients. Made by Ecologic, the outer card is recyclable, compostable, glue-free and water-resistant. The inner liner is made with recyclable plastic and uses 60% less material than regular plastic bottles.

Colgate bamboo charcoal toothbrush

The Colgate bamboo charcoal toothbrush is made with 100% natural, biodegradable bamboo and is free from plastic packaging.

Water bubbles made from seaweed

The British start-up Ooho created an edible seaweed-based water bubble that could be a sustainable solution to the problem of the ecological footprint of plastic bottles. This small edible bubble contains 4 cl drinking water.

Papelyco

Plantable paper plates by Papelyco are an innovative alternative. Once used, the plates need to be placed in the ground and a plant will grow out of it. They even include essential minerals in the plate to provide the new sapling with the nutrients it needs to grow.

Jute bags

Jute bags are an excellent old alternative to plastic bags. Jute or hessian bags have high strength and long life as compared to other bags. Like cotton, jute is also a natural renewable source which is biodegradable and compostable. Jute plants also cleanse the air by consuming greenhouse CO₂.

Mushroom packaging

Developed in 2007 by Ecovative Design, mushroom packaging is made from mycelium and is a high performing packaging solution, cost competitive with conventional foams, and 100% home compostable.

Sources:

<https://ourworldindata.org/faq-on-plastics#are-plastic-alternatives-better-for-the-environment>
<https://www.youthkiawaaz.com/2017/03/environment-friendly-plastic/>
<https://yourstory.com/2018/07/startups-throw-plastic-kitchen-ecofriendly-alternatives>
<https://yourstory.com/2018/02/tintbox-offers-healthier-sustainable-alternative-plastic-lunch-boxes-bottles>
<https://www.innovationexcellence.com/blog/2018/07/02/13-plastic-packaging-alternatives/>
<https://www.colgate.com/en-gb/products/toothbrush/colgate-bamboo-charcoal-soft>
<https://medium.com/@shippr/top-5-alternatives-to-plastic-packaging-5f946c9bbe57d>
<https://www.goodnet.org/articles/5-biodegradable-plastic-companies-for-greener-future>
<https://medium.com/@greenhandle/beatplasticpollution-top-5-alternative-green-shopping-bags-3303118ce9a>
<https://mushroompackaging.com/>

3. Upcycling and downcycling

Upcycling and downcycling are part of the recycling process that make use of waste as a resource to produce product with a higher or lower value

i. Upcycling

Upcycling is the process of making use of byproducts or waste materials rather than using new raw materials, to generate a different product of greater value, while retaining the existing materials quality and features.

Upcycling results in giving extended life to an existing product and thus results in reduction of energy usage, water use, pollution and carbon footprint.

As consumers are getting more aware, upcycling is offering companies around the world a compelling marketing narrative and a path to innovate their product line to have multiple use cycles.

Some of the companies using Upcycling are as follows:

Adidas

Adidas partnered with the environmental organisation Parley for the Oceans in 2015 to turn marine pollution into sportswear. They used waste recycled plastic bottles as a replacement for virgin polyester and expect to make 11 million pairs of shoes with ocean plastic. Adidas says the partnership has prevented 2,810 tons of plastic from reaching the oceans.

Reliance Industries

The company, which has its roots in the polyester business, has started converting used plastic bottles into clothes to make sustainable clothing affordable and accessible. It has partnered with brands like Arrow, Wrangler, Raymond and Lee among other international brands.

Furthermore, it is also working on ways to further recycle these products once they have been used by consumers, by having a system in place where customers can return used products at the store and get a discount.

The RED Group

The Group-led REDcycle Program in Australia, partnering with brands like Coles and Woolworths, collects soft plastic packaging like bread bags, frozen vegetable bags, pasta

bags, biscuit packets and sachets that consumers bring from home to the supermarket every time they shop. The material is collected and processed by RED Group and then shipped to Australian-based manufacturer Replas, where it is reprocessed into new products. More than 100 million pieces of plastic have been saved from the landfill by this programme in the past three years and turned into outdoor plastic products such as bollards, fencing, decking and furniture.

Delta Airlines

Delta Airlines announced a project to upcycle 350,000 pounds of retired uniforms into bags and passport covers with the help of Portland-based manufacturer Looptworks.

Loop Industries

Loop Industries, in partnership with cosmetics company L'Oréal Group, converts waste PET plastic and polyester fibre into Loop PET which can be endlessly upcycled. Furthermore, they have also turned shredded plastic and clothing into new bottles for Pepsi, Evian and Coca-Cola.

Phinix

Phinix is a textile upcycling start-up that collects textile wastes and transforms them into high-value products such as footwear, fashion accessories and lifestyle pieces instead of leaving them to be discarded in landfills.

Playback Clothing

Playback Clothing creates tees, hoodies, and sweatshirts by transforming trash - plastic bottles and clothing scraps - into environment-friendly clothing. The company also retains the original colour of the recycled material (so no chemical dyes).

Hipcycle

Hipcycle, an online retailer, upcycles goods to create home decor, jewellery and fashion accessories that are durable, affordable and fashionable.

Preserve

Preserve is a company that collects recycled goods and makes toothbrushes and kitchenware. Most of these recycled goods include recycled plastic yogurt containers, lip balm tubes and water-filtering systems.

Sources:

<https://www.businessinsider.in/Adidas-is-turning-plastic-ocean-waste-into-sneakers-and-sportswear/articleshow/70948890.cms>
<https://economictimes.indiatimes.com/industry/cons-products/garments/-textiles/from-plastic-to-fashion-ril-finds-business-in-sustainability/articleshow/70868575.cms>
<https://www.plastixnz.com.au/page.asp?PageID=%7BFF2A81AB-4A1F-46E8-81E4-1B888F4153E9%7D&Library=What+impact+will+a+plastic+bag+ban+have+on+the+local+industry>
<https://www.greenbiz.com/article/down-upcycling>
https://www.businessinsider.in/This-company-turns-shredded-plastic-and-clothing-into-new-bottles-for-Pepsi-Evian-and-Coca-Cola/articleshow/70572877.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst
<https://www.unenvironment.org/news-and-stories/story/how-4-asia-pacific-entrepreneurs-are-cashing-going-plastic-free>
<https://www.organicauthority.com/live-grow/5-companies-with-upcycling-ideas-that-work>

ii. Downcycling

Downcycling is the process of making use of by-products or waste materials rather than using new raw materials, to generate the same or different product of a lesser value, with quality of existing material downgraded.

Upcycling of a product can only be done a limited number of times, and thus downcycling plays a critical role in keeping the material in the closed-loop cycle.

There are primarily two types of downcycling:

Mechanical recycling

This refers to the processing of plastics waste into secondary raw material or products without significantly changing the chemical structure of the material.

Feedstock recycling (or chemical recycling)

It is the process of changing the chemical structure of plastic waste, converting it into shorter molecules, ready to be used for new chemical reactions.

Furthermore, Reliance Industries is also working on ways to further recycle these products once they have been used by consumers, by having a system in place where customers can return used products at the store and get a discount.

Case study: Construction of roads

A government order in November 2015 has made it mandatory for all road developers in the country to use waste plastic, along with bituminous mixes, for road construction. It was mandated to help overcome the growing problem of plastic waste disposal in India.

What worked well

The process is easy and does not require new machinery. For every kilo of stone, 50 grams of bitumen is used, and 1/10th of this is plastic waste; this reduces the amount of bitumen being used. Plastic increases the aggregate impact value and improves the quality of flexible pavements. Wear and tear of the roads have been decreased to a large extent.

Impact

The process of aggregating plastic on road constructions has led to a generation of additional jobs for ragpickers. Plastic waste helps increase the strength of the road, reducing road fatigue. Roads have better resistance to rainwater and cold weather. Since a large amount of plastic waste is required for a small stretch of road, the amount of plastic waste consumed for the construction of roads helps in the managing of plastic.

India has built one lakh kilometres of roads in at least 11 states using discarded plastic. The revolution of plastic waste roads started brewing in 2015 when the Centre made it mandatory for all road developers in the country to use plastic waste for road construction. This initiative falls in line with the government's Swachh Bharat Abhiyan that aims to address India's garbage crisis.

Sources:

<https://www.plasticseurope.org/en/focus-areas/circular-economy/zero-plastics-landfill/recycling-and-energy-recovery>

<https://www.thebetterindia.com/43685/plastic-waste-in-road-construction-plastic-man-india-prof-vasudevan/>

<https://swachhindia.ndtv.com/plastic-waste-roads-one-lakh-kilometre-india-20274>

<https://www.mohua.gov.in>

Case study: Unique stone block made with plastic coating

Plastone blocks use granite and ceramic waste, along with the plastic waste and have been found to withstand more pressure and resist water percolation. It can be used for flooring, especially outdoors, and is a cheap and strong substitute for cement block. Additionally, it can be an effective liner for water bodies, especially canals, preventing water seepage. Each plastone block consumes about 300 plastic bags and 6 PET bottles. It can be an effective liner for water bodies, especially canals, preventing water seepage. It can also be used to raise compound walls. A coat of emulsion can be provided to make it colourful and attractive.

The Maharashtra government has decided to procure the technology for making plastone, a unique stone block made with a plastic coating, from Rajagopalan Vasudevan, known as the plastic man of India.

Case study: Waste to tiles

Bengaluru-based non-profit Swachha developed a solution that can convert discarded plastic waste into tiles and irrigation pipes. In association with the Bruhat Bengaluru Mahanagara Palike (BBMP), Swachha has developed what they are calling 'Re-Tile' - tiles which customers can use on pavements. This is a project by the Eco Solutions arm of the non-profit.

What worked well

The state government issued a blanket ban on the manufacturing, storing and distribution of single-use plastics such as carry bags, flex banners, plates, etc. Re-Tile can be used on pavements, as wall cladding tiles, apartment walkways and swimming pools because of their lightweight. Swachha Re-Tile recycled floor tiles are made of recycled polypropylene materials and utilise a unique interlocking edge design to eliminate the need for adhesives, making installation quick and inexpensive.

Impact

These tiles are non-porous, flexible and durable. The tiles remain steady despite heavy traffic and footfall. They can be installed directly over damaged or problem floors with minimal sub-floor preparations. Moreover, they are resistant to most solvents, chemicals and abrasions, and simple to maintain, reconfigure or remove.

Another innovative model has been developed in Hyderabad to beat plastic pollution and prevent the plastic from reaching its landfill. Bamboo House India, a social enterprise, in collaboration with the Greater Hyderabad Municipal Corporation (GHMC) is using paver tiles on roads made from thousands of used polybags and other plastic items.

Sources:

Beat Plastic Pollution - Ministry of Environment, Forest and Climate Change
<https://www.thebetterindia.com/43685/plastic-waste-in-road-construction-plastic-man-india-prof-vasudevan/>
<https://www.thehindu.com/news/cities/mumbai/waste-to-wealth-state-to-build-toilets-using-plastic-mans-technology/article25062741.ece>
<https://www.thebetterindia.com/166565/bengaluru-innovation-plastic-recyclable-tiles-news/>
<https://swachhindia.ndtv.com/plastic-waste-management-hyderabad-to-roads-to-get-paver-tiles-from-waste-plastic-24689/>

4. Recovery

If energy is recovered from waste, it is categorised as recovery. To recover, a new technology prepares and treats waste materials in order to generate energy and the energy produced by this method is used for various purposes.

i. Waste to energy

Processing various plastic waste in cement kilns could go a long way in solving the problem.

In March 2008, a trial run was conducted with 1.5% plastic waste as supplementary fuel to coal. During the use of plastic waste as an alternative fuel and raw material (AFR), the material and energy value present in the waste was fully utilised in the cement kiln. This established plastic waste as a perfect replacement to the fossil raw materials and fossil fuels conventionally utilised in the kiln. There were no abnormal emissions of dioxins or furans. There was no impact on the quality of cement. The successful trial run at ACC Kymore revealed that the problem of plastics waste disposal now had a potential solution.

In November 2012, RK Srivastava of MPPCB (Madhya Pradesh Pollution Control Board) highlighted in his report to the Central Pollution Control Board (CPCB) the several environmental benefits of co-processing of plastic and polythene waste.

CPCB approved the results of the trial and declared co-processing of plastics waste in cement kilns as a successful method for environmentally sound plastics waste management.

ii. Plastic to fuel

In 2014, Dehradun-based Indian Institute of Petroleum (IIP), a constituent laboratory of the Council of Scientific and Industrial Research (CSIR), developed a unique process of converting plastic waste like polyethene and polypropylene, both together accounting for 60% of plastic waste, to either gasoline or diesel. The technology is capable of converting 1 kg of plastic to 750 ml of automotive-grade gasoline. Due to nearly no presence of sulphur in the produced fuel, IIP's plastic converted to fuel is pure and meets the Euro III standards. IIP also stated that a vehicle using this fuel would be able to run for at least two kilometres more per litre.

GAIL, a central public sector undertaking, will help the government's premier R&D body CSIR in scaling up the new technology to convert plastic waste to automotive-grade diesel and roll it out after six months of regular operation of a small plant in Dehradun. The move may help India deal with the menace of plastic waste to an extent.



Sources:

<http://www.indiaenvironmentportal.org.in/files/file/Beat%20Plastic%20Pollution.pdf>

<https://swachhindia.ndtv.com/recycling-plastic-in-india-converting-plastic-waste-to-fuel-the-unrealised-potential-9436/>

<https://timesofindia.indiatimes.com/india/csir-and-gail-join-hands-to-scale-up-production-of-diesel-from-plastic-waste-delhi-may-get-such-plant/articleshow/70880430.cms>

5. Landfill

i. Tackling existing waste and pollution

Indians throw out 15,342 tonnes of plastic waste every day, out of which only 60% gets recycled, mostly by the informal sector. There is over 6,100 tonnes of plastic waste being dumped in landfills and ending up in streams and polluting groundwater resources every year. There is plastic which does not decompose at all, and some can take up to 450 years to completely break down. CPCB surveyed 60 Indian cities and found that plastic accounts for 8% of all solid waste. Delhi produces the maximum plastic waste in the country, followed by Kolkata and Ahmedabad. The biggest hurdle to plastic recycling and waste management is segregation of waste at source.

The Union Minister of Environment and Forest undertook an initiative making source segregation of waste mandatory. The initiative was to move from waste to wealth. Dumping of waste in landfill leads to contamination of groundwater. Segregation at the household level will begin with division of waste into biodegradable, non-biodegradable and domestic hazardous waste.

Landfills are large holes carved into the ground lined with clay and plastic to hold waste. It is one of the most common forms of waste management but poses several problems. Methane and carbon dioxide are often released from landfills into the air. Landfills do not just release gases but also liquids like leachate, which can contaminate underground water sources.

Case study: Kabadiwalla Connect

Kabadiwalla Connect, a technology-based social enterprise based in Chennai, aims to leverage the informal ecosystem of urban waste recyclers to decrease the amount of waste sent to landfills in Indian cities by 70%.

At present, municipalities, multinational brands and waste management companies find it a challenge to effectively engage with informal stakeholders despite growing evidence of the numerous benefits of forming mutually beneficial partnerships.

What worked well

Kabadiwalla Connect brings together the informal sector formally to reduce the amount of waste present in the landfill through segregation at the source. The informal ecosystem drives the recovery of post-consumer waste in developing world cities. Kabadiwalla Connect uses its technology platform to leverage the already existing informal infrastructure towards a more efficient waste management system. The Kabadiwalla Connect platform makes the informal ecosystem more accessible to other players.

Impact

Kabadiwalla Connect integrates the informal ecosystem into the reverse-logistics supply chain. This helps municipalities, brands, and waste management companies recover waste efficiently and more inclusively.

Instead of developing a new system for waste management, municipalities can use the informal infrastructure to reduce operational costs, corporations can carry out their extended producer responsibility through it, and apartments and small businesses can send their recyclable waste directly to informal stakeholders that are a part of the informal ecosystem.

Source:

Beat Plastic Pollution, Ministry of environment, forest and climate change

ii. Collection and segregation

Collection and segregation is the initial step towards an effective waste management system. One of the major problems related to segregation is that not all plastic can be recycled. Lack of public awareness is also a challenge which often leads to contamination of the plastic collected and eventually leads to increase in expenditure in recycling.

In the United States, for example, the introduction of single-stream recycling where recyclables are not separated in household collections led to a surge in recycling rates. Also, as plastic became more complex, people started placing wrong

things in their bins. According to the UN Environment's report *The State of Plastics*, "Chemicals added to plastic polymers, products made of mixed materials and food packaging contaminated with food waste make recycling difficult and costly."

Without segregation, it is difficult to manage plastic. For some major cities the segregation rates are really low, so the contaminated dry waste is discarded by all recyclers and ultimately ends up in landfills. Recycling of plastic is a long process in which the collection, segregation and transportation are very tedious. However, there are some success stories in this sector too that may pave the way for others to follow.

Case study: Solid Waste Collection and Handling (SWaCH)

SWaCH is an innovative partnership with informal workers to recover plastic waste in an inclusive circular economy approach. The 3,000 SWaCH waste pickers engage in door-to-door waste collection, and the collected recyclable items, including plastic waste, are segregated manually by on the premises of a waste generator, in sorting sheds, in the open. The waste pickers have a crucial role in plastic recycling because the collection and segregation of plastic waste are mainly carried out by them.

What worked well

The waste pickers can collect and segregate various plastic types from different sources, such as households, slums, the commercial sector, streets and landfills, which conventional waste collection systems find it difficult to cater to. For example, the SWaCH waste pickers collect 30,000 tonnes of plastic waste per year, of which 15,000 tonnes is segregated and sent to recycling. The SWaCH waste pickers receive income from the payment of the user fee from households and from the recyclable materials they sell to itinerant buyers and scrap shops.

Impact

An estimated 30,000 tonnes of plastic material is annually collected and sent for recycling with the help of the informal waste economy, diverting 52% of the plastic waste in Pune from landfills. The SWaCH waste pickers save up to INR 160 million (US\$2 million) yearly due to their collection and diversion of recyclable plastic waste. The informal economy-based municipal solid waste management model protects the environment and contributes to a circular economy by promoting the recycling of plastic waste and returning valuable materials to local and global recycling industries and producers.

Sources:

<http://web.unep.org/environmentassembly/plastic-recycling-underperforming-sector-ripe-remake>

https://www.unescap.org/sites/default/files/Closing%20The%20Loop_Pune%2C%20India%20Case%20Study.pdf

Artificial intelligence (AI)

The current waste management systems are unable to efficiently deal with the tonnes of garbage generated every day. Automating the processes of garbage sorting and disposal, by switching to AI for smart recycling and waste management, is expected to bring in better disposal methods to recycle sustainably. There are opportunities for AI and robotics to improve processes through various stages, from garbage collection to transportation, to sorting and recycling.

Intelligent bins

Another solution is a smart bin with IoT sensors which can measure the waste levels of the bin. The data is then sent to the central waste disposal system, which can categorise the kind of garbage and appropriate disposal methods. The AI programme provides analytics and insights into the type of waste to be collected which can be integrated with fleet management solutions. AI helps municipalities make data-driven decisions to optimise waste collection times, frequencies and routes.

Deep learning-driven sorting

Another solution utilises robotics and deep learning to sort out the trash. The garbage on the conveyor belt at the plant is scanned with cameras and analysed by deep-learning algorithms to identify trash based on its type. A robotic arm then pulls items off the belt as required for sorting. The model is continually self-improving. These robots are already in use at garbage dumps and plants in Europe and the United States.

Reverse vending and deposit and return scheme

A reverse vending machine is one where people can return empty beverage containers like bottles and cans for recycling. What makes it a 'reverse' vending machine is that instead of the user putting in money and getting out a product, the user puts in a product in and receives money or coupons with monetary value.

Reverse vending systems automate the process of collecting, sorting and handling the return of used drink containers. Refillable containers are returned to the bottle or beverage producer for cleaning and refilling. Non-refillable containers are taken to a processing facility where they are washed, shredded and used for the production of new containers.

In India, many cities like Delhi and Bhopal have installed these machines in public places.

iii. Dealing with multi-layered plastics waste

Multi-layered plastic packaging is packaging with at least one layer of plastic as the main ingredient in combination with one or more layers of materials such as paper, paper board, polymeric materials, metalised layers or aluminium foil, either in the form of a laminate or co-extruded structure.

a) Styrofoam

Foamed plastics are common but often erroneously referred to by the brand name 'Styrofoam'. This material is widely used to make food containers as it is rigid, lightweight, and has good insulation properties. Plastic with recycling symbol of #6, Styrofoam is the trademarked name of Expanded Polystyrene (EPS). This material is impossible to degrade with time and further causes trouble for landfills.

Solution: A recycling solution for Styrofoam is to take foam packaging and compress it, reducing the bulk somewhat. Another method is to use limonene. Limonene dissolves and concentrates EPS and can itself be reused. The chemical causes the EPS foam to melt without heat, reducing it to 5% of its original size. Thermal compaction uses heat to reduce chopped EPS to a concentrated brick that is easier to ship. When burnt in municipal incinerators, polystyrene yields nothing but carbon dioxide and water vapour. It is a good fuel for waste-to-energy plants that capture the heat and transform it for useful purposes.

b) Tetra Pak

Tetra Paks are cartons used for packaging milk, juice and various other liquids. These containers protect the contents from getting contaminated with bacteria and other microbes, giving the product a shelf life of months. These cartons have six layers of packaging, including different layers of plastic and aluminium in addition to raw paper. Therefore, they cannot be recycled as 'normal' paper waste but need to go to special recycling units for separation of the different materials or, if not recycled, can end up in landfills.

Solution: Tertiary recycling is the most preferred option for multi-layered packaging since separating the individual layers is difficult and costly. Pyrolysis and gasification are two key technologies currently used for tertiary recycling of multi-layered packaging waste. If tertiary recycling is not possible, quaternary recycling may be considered; it is the process of recovering energy from waste plastics by incineration.

Sources:

<https://www.allerlin.com/blog/4-ways-ai-can-revolutionize-waste-management> ;
<https://www.triconinfotech.com/blog/2019/06/13/ai-in-waste-management-recycling-industries/>
<http://businessfortnight.com/chief-minister-of-madhy-pradesh-inaugurates-plastic-waste-recycling-project-in-bhopal/>
<https://swachhindia.ndtv.com/delhi-plastic-bottle-recycling-reverse-vending-machine-22324/>
Swachh Bharat Mission, Ministry of housing and urban affairsSource

Streamlining plastic lifecycle management

While talking about plastic and its management, it is crucial to understand that all the five stages discussed have been partially part of the existing system in some form or the other. The main deterrent to the effective management of plastic has been the lack of using these stages systematically and holistically, which can be achieved only through greater inclusiveness and better collaborations.

The plastic industry has grown exponentially in the last 15 years and is estimated to follow a similar trajectory in the coming few years. With rising concerns about the impact of plastic, enterprises using plastics have realised the need for adding recycling as part of their value chain. This approach is vital for these enterprises to become environment-friendly and at the same time give the plastic recycling sector a platform to develop into a balanced and robust industry in itself, just like the paper-recycling industry. Furthermore, plastic recycling has to become more consumer-friendly too so that, rather than consumer sorting their trash, the process is taken care of for them.

Another critical aspect of effective plastic management is having an all-inclusive approach to decision-making and moving towards multi-stakeholder partnerships. Indore is an excellent example in this regard; it included the circularity approach in dealing with government policies, multi-stakeholder initiatives and tackling plastic beyond end-of-life through plastic to fuel. Furthermore, it is crucial to note that plastic circularity includes not just the waste to wealth initiatives for plastic but also the reform of the informal sector of plastic waste management wherein ‘waste pickers’ are adequately supported and mentored to become ‘waste managers’, thereby generating employment, improving local industrial competitiveness, reducing poverty and decreasing municipal spending.



6. Plastic lifecycle management and the UN Sustainable Development Goals (SDGs)

SDG	Challenges	Solutions
2 ZERO HUNGER 	Plasticulture is linked to risking soil fertility and being an entry point for potential carcinogens to enter the food chain through crops.	Using organic mulch, biodegradable material or natural materials like biopolymer instead of plastic.
3 GOOD HEALTH AND WELL-BEING 	Incineration and open burning of plastic releases a large number of toxins, causing air pollution.	Awareness about better ways to dispose of plastic and harmful effects of burning it.
6 CLEAN WATER AND SANITATION 	There has been a sharp increase in the concentration of microplastics found in the water supply. 83% of tap water and 93% of bottled water brands have microplastic present.	Taking actions to avoid plastic entering water bodies. Using non-synthetic clothes to prevent the release of microplastic into wastewater upon washing. Treatment of wastewater for microplastics.
7 AFFORDABLE AND CLEAN ENERGY 	99% of plastic is manufactured from petroleum and natural gas which leads to emission of greenhouse gases.	Using alternatives to reduce reliance on plastics. Converting plastics into sustainable fuels through 'waste to energy' or 'plastic to fuel'.
8 DECENT WORK AND ECONOMIC GROWTH 	Bans on plastic have severe ramifications on the global plastic industry, job losses being the most significant one.	Use of feasible alternatives opens space for new employment opportunities and economic growth of the respective sector.
10 REDUCED INEQUALITIES 	Plastic waste from around the world is mostly catered by low-income countries through the informal sector.	Finding waste management ways within the country for employment opportunities.
11 SUSTAINABLE CITIES AND COMMUNITIES 	The non-decomposing nature of plastic results in blocking waterways and exacerbating natural disasters. Also, it clogs sewers leading to a breeding ground for mosquitos and pests.	Converting waste plastic to eco-bricks for construction and mixing it with bitumen in building roads.

Sources:

Transforming our world: The 2030 agenda for sustainable development, <https://wasteaid.org/waste-sustainable-development-goals/>, <https://www.downtoearth.org.in/blog/environment/plastics-in-agriculture-entry-point-for-carcinogens-to-food-chain-60778>, <https://www.no-burn.org/burning-plastic-incineration-causes-air-pollution-dioxin-emissions-cost-overruns/>, <https://www.earthday.org/2018/03/23/the-invisible-plastic-particles-in-our-drinking-water/>, <https://www.unenvironment.org/interactive/beat-plastic-pollution/>

SDG

Challenges

Solutions

12 RESPONSIBLE CONSUMPTION AND PRODUCTION



Rapid urbanisation has led to a tremendous increase in consumption and production and thus, the solid waste generation.

Plastic accounts for 5.8% of the total solid waste, positioning itself third after food (38.3%) and paper/cardboard (20.60%).

Embedding sustainability of resources throughout the supply chain, involving all stakeholders - from the source of the raw material to the final consumer.

Educating consumers on sustainable consumption lifestyle, providing them with adequate information through standards and labels and engaging in sustainable public procurement, among others.

13 CLIMATE ACTION



Plastic contributes to greenhouse gas emission at every stage of its lifecycle.

By 2050, plastic will be responsible for up to 13% of the total carbon budget equivalent to 615 coal-fired power plant.

Transitioning to a zero-carbon energy system has the potential to reduce emissions from plastic to 51%.

14 LIFE BELOW WATER



12.7 million tonnes of plastic waste is washed into the sea every year, and 51 trillion microplastics are already in the sea.

Consumption of plastic by marine creatures harms their health.

Cleaning oceans to get rid of the plastic waste and ensuring, through mass awareness, that plastic does not end up in water bodies.

15 LIFE ON LAND



Plastic toxins in dumps seep into the groundwater and contaminate it.

The wind carries littered plastic waste with it, leading to pollution even at places devoid of human settlements like forests. Furthermore, animals are at risk of coming into contact with this waste and getting intoxicated.

Adoption of plastic lifecycle management practices that cater to producers, as well as consumers.

Conducting regular awareness drives as well as cleanliness drives by involving all stakeholders.

16 PEACE, JUSTICE AND STRONG INSTITUTIONS



Waste management sector continues to be majorly informal in highest plastic waste producing countries due to lack of regulations or weak enforcement.

Industries consuming plastic do not account for its end-of-life use and its impact on the surrounding society and ecology.

For enterprises using/producing plastic materials, seeking licence-to-operate from the surrounding communities will build inclusiveness.

Formalising the informal waste management sector through better infrastructure and all-inclusive partnerships.

17 PARTNERSHIPS FOR THE GOALS



Oceans have become a common ground for countries to dump plastic waste.

Mismanagement by major plastic waste generating nations and industries has put the global ecology at risk.

Countries and companies cutting across sectors should build partnerships that support plastic-free initiatives and work on innovations for effective plastic lifecycle management.

Sources:

<https://www.theguardian.com/environment/2019/may/15/single-use-plastics-a-serious-climate-change-hazard-study-warns>, <https://news.un.org/en/story/2017/02/552052-turn-tide-plastic-urges-un-microplastics-seas-now-outnumber-stars-our-galaxy>, <https://www.indiatimes.com/news/india/how-a-kerala-fisherfolk-removed-25-tonnes-of-plastic-waste-from-the-sea-in-just-ten-months-347364.html>, https://www.huffpost.com/entry/in-the-developing-world-waste-can-be-a-vital-resource_b_8147028, <https://www.azocleantech.com/article.aspx?ArticleID=790>, <https://www.plasticstoday.com/content/economic-effect-plastic-bag-bans/35843076718443>, <https://theconversation.com/plastic-warms-the-planet-twice-as-much-as-aviation-heres-how-to-make-it-climate-friendly-116376>, <https://www.downtoearth.org.in/news/pollution/plastic-warms-the-planet-twice-as-much-as-aviation-heres-how-to-make-it-climate-friendly-64674>

Way forward



1. Plastic accounting

The unceasing rise in plastic waste globally has brought attention to the alarming rate at which the production and use of plastic are increasing. Managing this proportion of plastic using the above lifecycle approach requires thorough accounting of the plastic used, its environmental effects and the stakeholders associated in its lifecycle. These aspects can be assessed using comprehensive methodologies, which can be applied to individuals, companies, countries or regions.

Plastic footprinting

To provide a clear picture of the impact of and opportunities related to plastic usage, and to make informed decisions, reliable metrics are necessary. A plastic footprint is one such metric that mainly includes three dimensions:

1. The quantity of plastic used in a system
2. The quantity of plastic emitted into the environment during production, transport, use or end-of-life of a plastic product
3. The impact, directly or indirectly generated by the pollutants emitted (or the leaked plastic) on human health or the environment.

Plastic footprinting can be classified into three main categories:

1. Business, or product-level footprint, intended to be used by the private sector
2. National, or regional-level footprint, intended to be used by the public sector
3. Individual-level footprint, intended to be used by citizens and consumers

For example, at an individual level, every time someone chooses a single-use plastic such as a plastic straw instead of a reusable item such as a stainless steel straw, that person adds to his or her plastic footprint. The more plastics used, the bigger the plastic footprint. Furthermore, plastic footprint acts as a precursor to plastic neutrality.

Being plastic neutral means having a net-zero plastic footprint by balancing a measured amount of plastic produced with an equivalent amount that it is offset either by recycling or through buying of plastic credits to make up the difference.

There are grocery stores in Goa, Chennai and Bengaluru which function with zero-plastic. Recently, Hyderabad got its first zero-waste grocery store which encourages its customers to bring their non-plastic packaging. If a customer is not carrying a bag, the store packs all the essentials in paper covers, cloth bags and containers.

Lifecycle assessment (LCA)

LCA is a methodology of compilation and evaluation of the inputs, outputs and potential environmental impact of a product system throughout its lifecycle, that is, from the extraction of natural resources to the final disposal. It is typically applied to a specific product or company and contains two components:

- i. The direct component accounts for material consumption, pollutant emissions and impacts created by the company or product itself, eg, when packaging is dropped as litter.
- ii. The indirect component accounts for additional activities related to the company or product at other stages of its lifecycle controlled by third parties, eg, when plastic pellets used for one component of a given plastic product are lost by a sub-contractor.

Sources:

International Union For Conservation of Nature (IUCN)
<http://www.taza.co/plastic-footprint-and-carbon-footprint/>
The Plastics Division of the American Chemistry Council (ACC)

2. Plastic responsibility

Extended producer responsibility (EPR)

EPR is a strategy in which the manufacturer is responsible for the proper disposal of the products they sell. Intended to reduce waste and encourage environmental procedures, this strategy shifts the responsibility of disposal back to the manufacturer. EPR is further divided into three types:

- a. **Buyback depository Mechanism (deposit-refund scheme):** It is a system mandated by the manufacturers to buy back the PET bottles to ensure recycling. Under this scheme, customers will get back a deposit paid to a retailer on handing PET bottles or milk pouches back to the store. There are more than 40 countries all over the world who have adopted this mechanism. Mumbai is also one of the cities to have adopted this system. Consumers and manufacturers are both equally responsible for this mechanism to attain success.
- b. **Corpus fund:** It is a fund initiated by industries to pool in a corpus for creating infrastructure and programmes relating to socio-economic and ecological development. For example, the plastic manufacturing industry has initiated a fund with an initial corpus of 1 million which focuses on the low-value waste being cleared from the streets through recycling.
- c. **Plastic credit:** It is a credit system where producers are not required to manage their plastic waste but in place take an equivalent amount of plastic to be recovered and recycled to meet the given responsibility.

Extended producer responsibility was implemented in India, but the awareness level at both the consumer and manufacturer end has not been prevalent.

63 countries have extended producer responsibility (EPR) mandates for single-use plastic. These countries with EPR represent about 33 % of the 192 countries. Europe has the most active uptake of EPR as a regulatory measure with 38 countries, followed by nine countries in the Asia Pacific region, nine countries in Latin America and the Caribbean, and seven countries in Africa.

EPR as a policy approach consists of several elements which were found by researchers in the countries assessed. Some examples include:

- Responsibility for addressing environmental impact: In Australia, EPR is part of lifecycle management for a range of products and can consist of the potential ecological effects of a product in all stages of production, distribution, use, collection, re-use, recycling, reprocessing and disposal of that product.
- Recovery and recycling of bags: In Mali, the producer and distributor who markets or uses in its activity's plastic or other non-biodegradable packaging are obliged to proceed to recovery of its plastic and packaging used for recycling.
- Responsibility for return and trade control: Gambia requires importers to return plastic or recycle it at own costs, and manufacturers to be responsible for recycling.

Producer responsibility organisation (PRO)

A PRO is a professional organisation that helps producers/ brand owners meet their EPR targets through various processing technologies for plastic waste including end of life applications like waste to energy, waste to fuel, waste to road and waste to cement kiln.

In India, the concept of PRO is recognised in two sectors, namely, plastic waste management and e-waste management. PRO-based EPR schemes for packaging typically apply variable costs based on the type of packaging material placed on the market like glass, paper/card, metals, plastic.

Costs for plastic and composite packaging materials tend to be significantly higher than costs for other packaging materials. For reference, in Italy, plastic is charged at EUR 188 per tonne, compared with EUR 45 for aluminium, EUR 16 for glass, EUR 13 for steel and EUR 4 for paper/card.

Sources:

<http://www.businessdictionary.com/definition/extended-producer-responsibility.html>

<https://timesofindia.indiatimes.com/city/mumbai/indias-first-plastic-buyback-scheme-to-come-into-force-on-wednesday/articleshow/64911045.cms>











Legal Limits On Single Use Plastics And Microplasts: A Global Review of National Laws and Regulations (UN Environment)

OECD: Policy Approaches to Incentivise Sustainable Plastic Design

3. Plastic circularity

Circularity is a system aimed at eliminating the production of waste and the continual use of resources with minimal loss of value.

While looking into the lifecycle of plastic, the approach of attaining circularity revolves around the cradle-to-cradle (C2C) principle. It is the process of reforming the value chain of products and services to transform the linear cradle-to-grave (C2G) lifecycle into a closed-loop ecosystem. A brief account of the difference with respect to plastic is given below:

Cradle-to-grave	Cradle-to-cradle
 It is the traditional model of using plastic as a make-use-dispose product.	It is a model that mimics natural systems wherein end-of-life plastic is broken down and is re-entered into the value chain as raw material.
 The product is made from a mixture of materials that are not usually eco-friendly when disposed of.	The material used can be recycled as many times and remain in the closed-loop system.
 Linear process	Cyclical process
 It results in significant waste generation.	No amount of waste is generated.
 Recyclability starts after the product's end-of-use.	Recyclability starts during the design phase of the product itself.
 Production uses conventional sources of energy.	Production uses renewable energy.
 The quality of product significantly decreases and so does its value.	The quality of the plastic used does not degrade; hence, there is no loss in value.
 The carbon footprint is high.	There is low to no carbon footprint.
 Designing requires relatively low investment and R&D.	Designing requires high initial investment and R&D.
 Cost efficiency is initially higher than in the C2C process.	The process is cost-efficient once scaled.

Sources:

<https://wasteaid.org/waste-sustainable-development-goals/>, <https://www.downtoearth.org.in/blog/environment/plastics-in-agriculture-entry-point-for-carcinogens-to-food-chain-60778>, <https://www.no-burn.org/burning-plastic-incineration-causes-air-pollution-dioxin-emissions-cost-overruns/>, <https://www.earthday.org/2018/03/23/the-invisible-plastic-particles-in-our-drinking-water/>, <https://www.unenvironment.org/interactive/beat-plastic-pollution/>, <https://www.downtoearth.org.in/news/pollution/plastic-warms-the-planet-twice-as-much-as-aviation-here-s-how-to-make-it-climate-friendly-64674>, <https://www.plasticstoday.com/content/economic-effect-plastic-bag-bans/35843076718443>, <https://theconversation.com/plastic-warms-the-planet-twice-as-much-as-aviation-here-s-how-to-make-it-climate-friendly-116376>, <https://www.theguardian.com/environment/2019/may/15/single-use-plastics-a-serious-climate-change-hazard-study-warns>, <https://news.un.org/en/story/2017/02/552052-turn-tide-plastic-urges-un-microplastics-seas-now-outnumber-stars-our-galaxy>, <https://www.indiatimes.com/news/india/how-a-kerala-fisherfolk-removed-25-tonnes-of-plastic-waste-from-the-sea-in-just-ten-months-347364.html>, https://www.huffpost.com/entry/in-the-developing-world-waste-can-be-a-vital-resource_b_8147028, <https://www.azocleantech.com/article.aspx?ArticleID=790>

IMPACT2030

With plastic's impact covering 13 of the 17 United Nations Sustainable Development Goals, it becomes crucial to inculcate its lifecycle management practices into the targets set for achieving these goals. Additionally, governments, companies and organisations should work together to create a holistic result, which is the case with IMPACT2030.

IMPACT2030 is a philanthropic collaboration between companies, employees and NPOs around the world all aligned towards the SDGs and advancing them through human capital investments. It is a community of 75 partner companies whose purpose is to align companies and their employee volunteer efforts with the Global Goals, advance the practice of employee volunteering, and create real and sustainable change.

CSR corpus for plastic lifecycle management

Plastic at present is omnipresent in its function and calls upon the need for a multi-pronged approach in managing it. The lifecycle management of plastic requires not only a systemic execution but also cross-sector and multi-stakeholder partnerships. The CSR law in India has been a catalyst for socio-economic and ecological development of the nation and thus can be instrumental in developing these collaborations through inclusiveness.

The CSR law mandates companies in the CSR bracket to spend 2% of their average net profits in the social and environmental sector, thus helping in nation-building by being responsible businesses. CSR gives opportunities for companies working in different industries but sharing a common cause to pool in-part or whole of their CSR fund.

Combining funds can be a game-changer for the plastic industry in addressing the plastic risk and creating infrastructure for research and development in various stages of plastic's lifecycle.

Global treaty on plastic

The Montreal Protocol to save the ozone layer depletion turned 30 in 2019 and has been termed as a landmark environmental success. Today, it serves as a model for addressing other international problems facing the earth and the life on it, one of which is plastic mismanagement.

The UN Environment Assembly has recognised plastic pollution as a “rapidly increasing serious issue of global concern that needs an urgent global response.” Plastic pollution is a matter of international concern and cannot be solved solely within national borders or regions. Thus, a global, legally binding treaty with clear targets and standards is required for plastic lifecycle management at the international stage, and governments and businesses should make a push for it at all available platforms.

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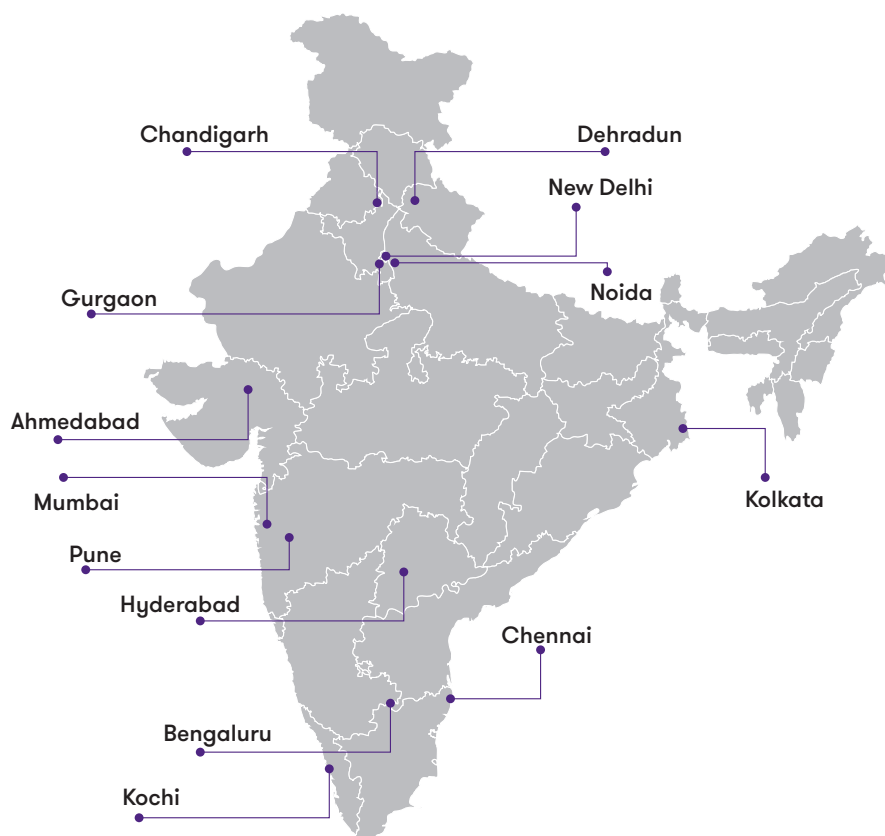
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