

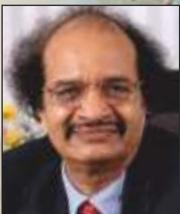
THE AWARE CONSUMER

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MITIGATING THE PLASTICS TIDE

INTERVIEW



Professor (Dr.)
GANAPATI D. YADAV
National Science Chair
(SERB/DST/GOI)

RESEARCH FEATURE

Plastic – Where is it
Coming From and
What is it Doing?

OUT OF THE BOX

Inventive Answers Driving
Towards a Sustainable Future



ROADS BUILT BY
REUSING PLASTIC WASTE

PLUS

ROUND UP • MY MARKET • THE PRESCRIPTION



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VIEWPOINT

MESSAGE FROM PUBLISHER & EDITOR

Stemming the Plastics Deluge – A Call for Action!



MUCH HAS BEEN said and written about the ubiquitous material called PLASTIC! This economical, strong and versatile polymer has invaded every part of our planet and made modern life virtually unimaginable sans the use of plastic in one form or another.

We are literally addicted to plastic and for good reason at that – plastics have revolutionised everything from healthcare to food safety. But, it is the increasingly throwaway culture coupled with the fact that plastic can persist in the environment for centuries that has made it a looming cause for concern. In fact, it is believed that a piece of plastic will never completely disappear from the face of the Earth; it will just break down into smaller and smaller particles that continue to linger around. Studies also prove that majority of the plastic that has been created is still present in our ecosystem!

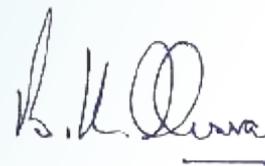
The impact on the environment and animal life was alarming enough. Now the presence of microparticles of plastic in the bloodstream has made it a human health issue as well.

Indeed, the ecosphere is heaving under a plastic pollution crisis that can change the world as we know it! In a recent study by the Stockholm Resilience Centre, scientists have concluded that man-made chemical and

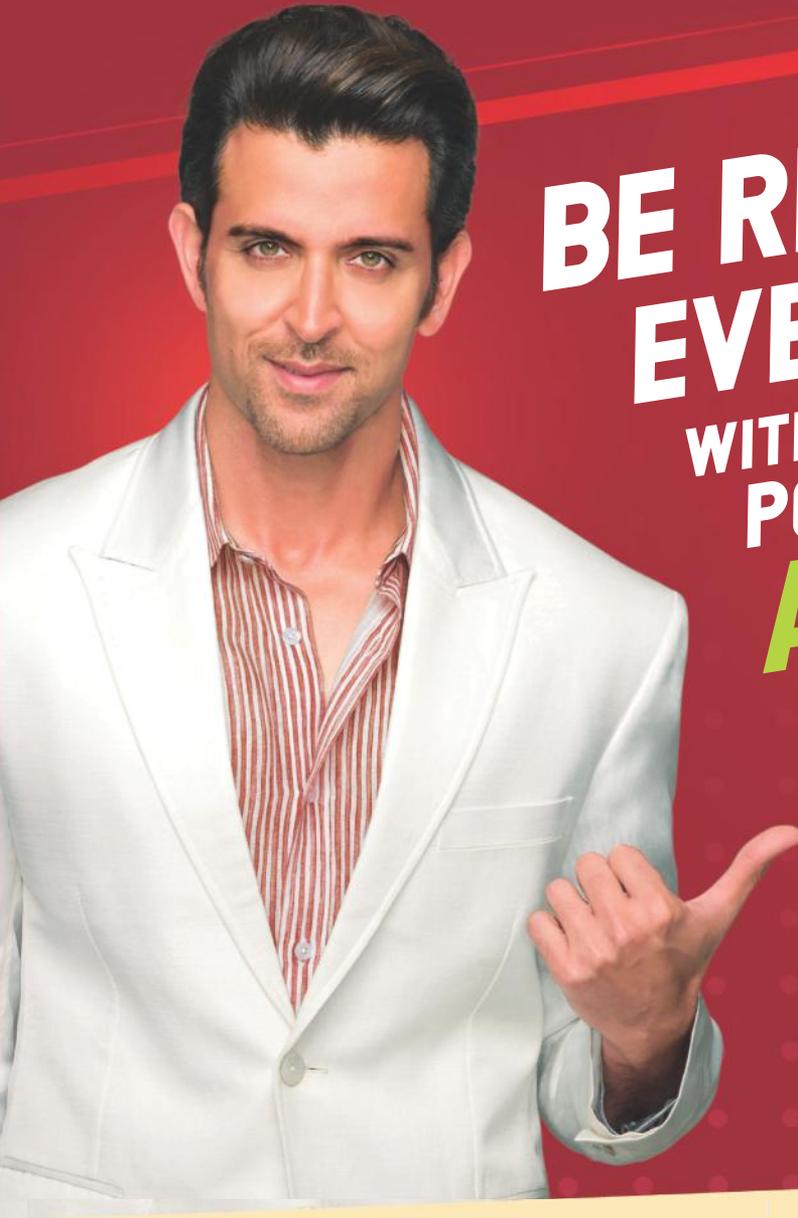
plastic waste worldwide has massively exceeded limits safe for humanity and the planet. Moreover, the day is not far when our oceans will have more plastic than marine life.

Still, when we blasély use a plastic bag, bottle or straw, how many of us ever consider where it will end up eventually?

This issue of The Aware Consumer is our attempt to push consumers to rethink how we produce, consume and dispose plastic. We are highlighting innovative attempts by the governments, industry and unsung heroes while pioneering to inspire significant changes in consumer behaviour, corporate practices and public policies.



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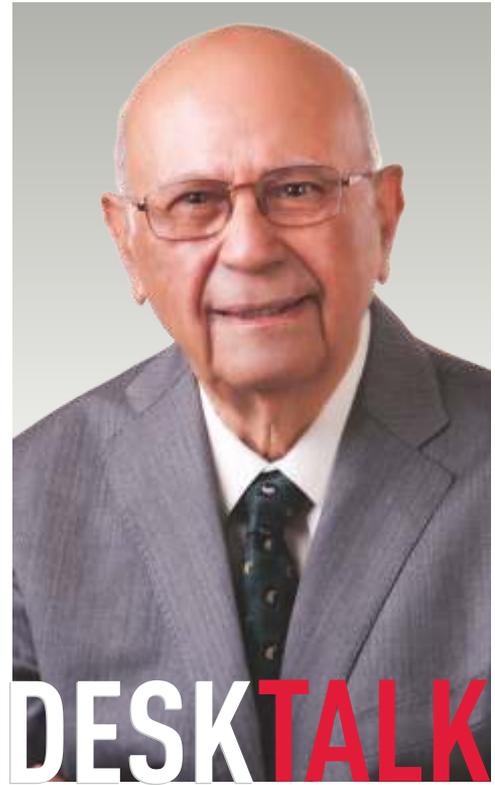
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PRAFULL D. SHETH

Editorial Board Member

LEADING THE WAY TO A SUSTAINABLE FUTURE



ALL OF US are well aware of the grave impact of plastic pollution! Most of us are persevering to reduce plastic consumption and wastage by making small changes in our lifestyle. We see more and more people heading out with their own cloth bags for groceries and other shopping.

Plastic warriors are quietly attempting to tackle the growing hazards in every nook and corner of the country. Everything from awareness campaigns and beach clean-ups to recycling and plastic waste management is underway. Innovators are coming up with ingenious solutions that either take the form of viable alternatives to plastic or putting the discarded plastics to productive use.

International agreements and treaties are being proposed and signed by the day. Countries are initiating actions within their boundaries to curtail both plastic consumption and wastage. There are discussions about

nipping the menace in the bud with production caps and the like. India has also taken on the ambitious undertaking of abolishing use of single-use plastics from last month.

That our endeavours are just not proving enough to tackle the impending doom is another story altogether. The scale of the problem is so massive that things are primed to get even worse. According to a report by the Organisation for Economic Co-operation and Development (OECD) released in June, both global plastic consumption and waste is set to nearly triple by 2060. About half of this is expected to end up in a landfill and less than a fifth is expected to be recycled.

While every small effort counts, it is obvious that we need more of everything now to pave the way for a more sustainable future!

OECD Secretary-General, Mathias Cormann sums it up best with, "If we want a world that is free of plastic pollution, in line with the ambitions of the United Nations Environment Assembly, we will need to take much more stringent and globally co-ordinated action!" ▶





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Plastic is a material of choice with innovative applications surfacing by the day.



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RETHINKING OUR RELATIONSHIP WITH PLASTICS



It is not plastic per se, but how we use it that is giving it a bad name!



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INTERVIEW



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MY MARKET

CAN WE RECYCLE OUR WAY OUT OF THE PLASTIC MESS OVERBURDENING THE EARTH?



It is much harder to get rid of plastic than to create it. While we have to be mindful about recycling plastic, simply giving the plastic we have used for recycling does not make us 'environment-friendly' consumers.



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OUT OF THE BOX

INVENTIVE ANSWERS DRIVING TOWARDS A SUSTAINABLE FUTURE



ROADS BUILT BY REUSING PLASTIC WASTE

We have been chasing the tail of plastic pollution since many years.



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LEADING THE CHARGE FOR HELPING THE FUTURE GENERATIONS

DR. VIJAY KUMAR SARASWAT
MEMBER, NATIONAL INSTITUTION FOR TRANSFORMING INDIA, GOVERNMENT OF INDIA

The expert committee, formed by NITI Aayog, noted that the informal sector and vulnerable groups significantly contribute to recycling waste. It's time that the sector is formalized and integrated under extended producer responsibility.



ROUNDUP



SAY 'NO' TO SINGLE-USE PLASTIC



Falling in Line with the Ban on **Single-Use** Plastics

DATA BRIEFING

Plastic carry bags with a thickness of less than

75 microns are currently illegal to manufacture, import, stock, distribute, sell, and use, according to the Plastic Waste Management Amendment Rules, 2021.

LAST YEAR, THE government announced that it will ban the manufacture, sale and use of identified single-use plastic items like plates, cups, straws, trays and polystyrene from 1st July, 2022.

Since then, various consumer-facing companies that are directly impacted by the proposal have been writing to the Centre expressing their concerns.

While the laments are centred on inconsistency in state-level regulations, loss of livelihood for workers and negative impact on the economy, most of them also urged the government to delay the planned ban. They cited reasons like

acceptable alternatives to the single-use plastics are either not available in sufficient quantities or are not economically viable.

Amul, India's leading dairy group valued at \$8 billion, wrote to the PM in the end of May asking for the ban to be postponed for a year on the grounds that it will affect milk consumption in the country. The company is worried about its small dairy and juice packs with plastic straws attached and contended that it may have to sell them without straws. It further upholds that they require 10 to 12 lakh straws per day.

However, the government's stance

did not waver even in the face of the intense lobbying by beverage companies and the ban kicked into force last month. Left with no choice, the manufacturers are falling in line. The Dabur group had commenced production of its Real brand juice packs with integrated paper straws well in advance while Parle Agro, maker of Frooti, is transitioning to biodegradable straws. Amul is working on manufacturing biodegradable straws that are cheaper than paper ones. Other companies are also looking to sustain their sales by importing paper straws from China, Indonesia and other nations. ▶

Coca-Cola Aims To Recycle 100% Of Its Bottles, Cans In 2-3 Years In India

AS PART OF its 'World Without Waste' initiative, the Coca-Cola Company announced that its India business is hopeful of achieving 100% recovery and recycling of post-consumer packaging, mainly bottles and cans, in the next two to three years.

'World Without Waste' is Coca Cola's global initiative under which it aims to collect and recycle every bottle or can that it sells globally by 2030. Recycling post-consumer packaging is also one of the three focus areas of the company's ESG (Environment, Sustainability and Governance) priorities.

The company is focused on three fundamental goals - Design, Collect and Partner. Accordingly, it is emphasising on the entire packaging lifecycle from how bottles and cans are designed and produced to how they are recycled and repurposed. It is working on making its packaging more sustainable by way of redesigning lightweight packaging, maximising use of recycled content and introducing innovative packaging. It is also partnering for developing sustainable, community-led programmes for integrated plastic waste management and promoting efficient recycling in India. In this context, it is fostering segregation of waste at source, streamlining collection mechanisms and helping build infrastructure to recycle post-consumer packaging into value-added products. ▶



"About 62,825 tonnes of post-consumer packaging was recovered in 2020. We refilled or helped recover 36 per cent of bottles and cans, equivalent to what we introduced into the marketplace in India"

- Rajesh Ayapilla, Coca-Cola India Director (CSR and Sustainability for India and South West Asia).

GOVT TO SET UP CONTROL ROOMS

- Dabur has started production of juice packs with integrated paper straws
- Amul is ready with alternatives despite a slight delay in shipments
- Ban will not impact its sales, says Parle Agro
- Government to set up national and state-level control rooms and form special enforcement teams to enforce ban from July 1

Microplastics Found In Fresh Antarctic Snow!

IN LATE 2019, Alex Aves, a Ph.D. student at the University of Canterbury in New Zealand collected snow samples from the Ross Ice Shelf in Antarctica. Researchers at the university were confident that there will not be any microplastics - plastic pieces much smaller than a grain of rice - in such a pristine and remote location.

However, when the freshly fallen snow from 19 sites across the Ross Island region of Antarctica (including 13 remote locations with minimal human disturbance) were analysed in the laboratory, the researchers were taken aback to find that each and every sample contained plastic particles!

A chemical analysis technique was used to identify the type of plastic particles present. The plastic particles were also examined under a microscope to identify their colour, size and shape.

The researchers found an average of 29 microplastic particles per litre of melted snow, which is higher than marine concentrations reported previously from the surrounding Ross Sea and in Antarctic sea ice. 13 different types of plastic were found, the most common being PET, commonly used to make soft drink bottles and clothing. In fact, PET was found in 79% of the samples.

Delving into the source, the researchers used atmospheric modelling, which suggests that the microplastics may have travelled as far as 6000

kilometres through the air propelled by their light weight and low density. To add to this, it is also likely that the humans in Antarctica are leaving behind a microplastic 'footprint'.

"It's incredibly sad! Finding microplastics in fresh Antarctic snow highlights the extent of plastic pollution into even the most remote regions of the world."

– Ms. Alex Aves, lead researcher and author of the study

The findings, published recently in The Cryosphere journal, bring to light a serious threat to the Antarctic region – from its distinctive ecosystem to the weather. Indeed, the microplastics have the potential to influence the climate by accelerating melting of snow and ice. In fact, darker-coloured ones (55% of the samples collected for the study) will further hasten the melting as they absorb more sunlight.

Such melting of glaciers on mountain ranges is what is leading to landslides and avalanches and causing glacial lakes to burst their banks in different parts of the world.

Another major study published in the 'Proceedings of the National Academy of Sciences' in 2021 states that microplastics are spiralling across the globe, often transported by dusts, wind and ocean currents. In the previous year, researchers had found microplastics near the summit of Mount Everest as well as in deep oceans. ▶

Bugs That Munch Plastic – A Revolution in Recycling!

IN A MAJOR breakthrough, a team of researchers at the University of Queensland's School of Chemistry and Molecular Biosciences, Australia found a species of worms that can break down plastic by eating it!

Indeed, the larvae of *Zophobas morio* darkling beetles - superworms - can eat through polystyrene thanks to a bacterial enzyme in their gut. These superworms grow up to two inches and are bred as a food source for reptiles and birds, or even for humans in Thailand and Mexico.

The study draws on previous reports that tiny waxworms and

mealworms have a good track record when it comes to eating plastic. Scientists at UQ hypothesised that as these are also beetle larvae, the much larger superworms can eat even more.

Led by Dr Chris Rinke, the research team fed superworms different diets over a three week period - some were given polystyrene foam (Styrofoam), some bran and others not fed at all. It was found that while the bran-fed superworms definitely gained more weight



Scientists Make Bioplastic 40%

BIODEGRADABLE PLASTIC OR 'bioplastic' is touted as the renewable and sustainable answer to taming the dinosauric beast of plastic waste. This technology is being introduced in everything from disposable bags, cups and teabags to 3D printing and packaging.

However, plastic that is labelled as biodegradable actually displays limited degradability in soil, seawater and other natural environments. Composting calls for industrial conditions of high temperatures and humidity which are missing in domestic compost heaps.

Now scientists at the Centre for Sustainable and Circular Technologies (CSCT) at the University of Bath have developed a way that could make these plastics more degradable in the natural environment.

Biodegradable plastic uses PLA (polylactic acid) that is created using lactic acid from the fermentation of sugars.

The research team found that incorporating just 3% sugar polymer units into PLA led to 40% degradation within six hours of exposure to ultraviolet light. And the best part is that this technology is compatible with existing plastic manufacturing processes. Therefore, it has the potential of being tested and adopted quickly by the plastic industry to make plastic more degradable at the end of the life of the product.

The research was led by Dr Antoine Buchard, Royal Society University Research Fellow and Reader in Polymer Chemistry from the CSCT. He elaborated that, "Most PLA plastics are made up of long polymer chains which can be difficult for water and enzymes to break down. Our research adds sugars into the polymer chains, linking everything together by bonds that can be broken using UV light. This weakens the plastic, breaking it



and were more active, polystyrene wasn't entirely unhealthy and the superworms didn't die like the starved ones. Dr. Rinke confirmed that, "the superworms can survive on a sole polystyrene diet, and even gain a small amount of weight - compared to a starvation control group - which suggests that the worms can gain energy from eating polystyrene. They are basically like eating machines!"

Superworms are like mini recycling plants, shredding the polystyrene with their mouths and then feeding it to the bacteria in their gut"

— Dr. Rinke

While the polystyrene-fed bugs did complete their life cycle and grow into pupae followed by fully developed adult beetles, further tests revealed a loss of microbial diversity in their guts



and potential pathogens. Therefore, while the superworms can and will survive on polystyrene, it is not the most nutritious of diets and does impact their health. It was concluded that the superworms can be provided with food waste or agricultural bioproducts along with the polystyrene. This can improve their health as well as become a solution to the problem of both plastic and food waste!

Following on this, the team moved to analysing the microbial gut community to pinpoint the gene-encoded enzymes that were involved in degrading the plastic. It was envisaged that science can create recycling plants to mimic what the larvae do - first shred the plastic in their mouths then digest it through bacterial enzymes. The breakdown products from the reaction can then be fed to other microbes to create high-value compounds (like bioplastics) that will become an 'upcycling' solution.

Indeed the appetite for polystyrene can prove to be the answer to plastic recycling on a mass scale! The researchers will continue growing the gut bacteria in the lab and further test its ability to degrade polystyrene. The focus will be on finding the most efficient enzymes and enhancing them further through enzyme engineering. Co-author of the

research, Jiarui Sun, remarked, "We can then look into how we can upscale this process to a level required for an entire recycling plant".

However, the commercial viability is still under question in the terms of scale-up and translation. And the low economics of new plastics bring a new dimension to the table. So, while this study offers new insights into plastic biodegradation and can help tackle plastic pollution, it still cannot be considered a cure-all. Research into other alternatives has to continue if we are to solve one of the most urgent environmental issues of our time!

Prior to this, in 2017, researchers had discovered that the wax worm can break down polyethylene (PE), albeit at extremely slow rates. They have been working on identifying the enzyme and producing it on industrial scales. Researchers in Japan even found a bacterium (*Ideonella sakaiensis* 201-F6) that can digest polyethylene terephthalate (PET) by secreting an enzyme called PETase, but again only at very small laboratory scales. More recently, UK scientists genetically engineered *E. coli* to transform plastic waste into vanillin - the molecule responsible for the characteristic smell and taste of vanilla. This opens prospects of turning plastic waste into a usable feedstock for modern industrial biotechnology! ▶

More Degradable Under UV Light



down into smaller polymer chains that are then more sensitive to hydrolysis. This could make the plastic much more biodegradable in the natural environment, for example in the ocean or in a garden compost heap." He added that, "Previously scientists have looked at enhancing the degradability of PLA to water - hydrolysis - but this is the first time anyone has looked at using light."

The strategy remains to be translated to real-life plastic objects and tested with sunlight!

It should be noted that production of biodegradable plastics is currently very low - around 4 million tonnes per year or just over 1% of the total global plastics production. ▶



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Consumers, Beware

Reduce your Plastic Footprint by Breaking the Plastic Habit

I AM NOT
PLASTIC

People are ready to rethink plastic! But there is lack of awareness on the one hand and dearth of sustainable options on the other. The question is what can we actually do to leave a liveable world for our future generations?

Each and every one of us has to take action if we want to save the planet from the overload of plastic waste!

consumers, beware

REDUCE YOUR PLASTIC FOOTPRINT BY BREAKING THE PLASTIC HABIT

PLASTIC HAS BECOME an integral part of our daily lives. This omnipresent material has transformed modern life to the extent that we just cannot imagine how the earlier generations ever managed to live without plastic!

However, the unduly excessive use has burdened our planet in every way from adding greenhouse gas emissions to destroying life under water. To get a finger on the sheer

magnitude of the problem - one million plastic bottles are purchased around the world every minute; up to five trillion plastic bags are used worldwide every year (Source: UN Environment Programme).

The good thing is that we have finally evolved into a plastic-conscious generation and consumers are actively interested in cutting down plastic pollution. But actually pursuing sustainability calls for a significant

shift in both our mindset and lifestyle. We have to consciously follow the four Rs of:

- **Refuse** – Half of all plastics ever manufactured have been made in the last 15 years. This has been fuelled by the extremely sharp hike in demand for plastic products. It follows that when consumers themselves decline to use problematic plastic items – straws and bags are a standing example -



Source: Life Out Of Plastic (LOOP)

it will automatically compel manufacturers to change the way they produce! Why not start demanding non-plastic options for say, packaging, from the stores and companies you buy from? You can even opt for cotton buds with paper sticks instead of plastic ones.

- **Reduce** – We need to go on a plastic diet by reducing the amount of plastic we use, especially single-use plastics. Something as simple as carrying reusable bottles instead of purchasing mineral water, cloth bags to avoid using plastic ones and reusable cutlery and cups to office can make a severe dent in the amount of plastic that enters the environment. Stop using cling wrap while at it.
- **Reuse** – When you cannot avoid using plastic completely, at least try to reuse the same as much as possible rather than discarding it immediately. What is keeping you from using the plastic bottles, disposable boxes and other products at home again and again? This will curtail plastic waste that ends up littering the roads, clogging the drains and polluting the oceans.
- **Recycle** – There will always be plastic that you cannot refuse, reduce or even reuse. In such cases, try to use plastic that is recyclable and ensure that it is recycled as required rather than being tossed into a trash can. This will work on two levels - keep plastics out of the ocean and reduce the amount of 'new' plastic. Alas, at present, just 9% of plastic is recycled worldwide.

Creating the Right Wave of Change

We are doggedly opting for alternative products that have a lower environmental impact. However, what if the substitute turns out to be a dead end in itself? The world at large is buying for using wooden

disposables, paper packaging, glass bottles and so on. But are these options sustainable in the long run? Some can prove to be damaging in their own way too – increased demand for wood will require cutting down of more trees and can lead to deforestation, paper production and quality is not sufficient for the new expectations and glass brings the problems of additional weight, space constraints, breakage, etc. Think of the carbon footprint and other costs of the supposed alternative.....

Moreover, many alternatives make inaccurate claims too. For instance,



Not all alternatives are created equally!

do not delude yourself that you are doing the right thing by opting for biodegradable plastics. In recent years, scientists have developed plastic from plants and other natural sources (like mushrooms, prawn shells, corn starch, sugar and agricultural by-products). This will not harm the environment and will also break down at a faster rate than regular plastics. However, it is subject to certain conditions that may not be palpable to the consumers.

Most bioplastics will only degrade in highly controlled environments and even composting calls for specially designed commercial facilities which are non-existent in India. Besides this, segregating the compostable

ones from regular plastic is quite impossible. And if the former end up in the regular recycling plants, they will contaminate the normal plastic. When stuffed in landfills, they will also release greenhouse gases. "Studies have basically found that the degradation of bioplastics in the guts of sea turtles is no different than plastic," expounds Richa Malik, founder of 'The Happy Turtle' start-up which sells and advocates for alternatives to plastic.

Moreover, biodegradable plastic is often considered a marketing 'greenwash' as there is no independently reviewed scientific evidence to support the claim. It follows that there is no silver bullet for curbing plastic pollution. Yet, we still have the power to drive change by changing the way we consume. Re-evaluate your daily habits and focus on the kind of companies you are buying from. Abstaining from harmful plastics and looking for environment-friendly choices will push businesses to invest in developing sustainable alternatives. Indeed, they have to be driven to build new technologies that can lead to a course correction, so to speak.

As you cut down your contribution to the plastic waste and inculcate a zero-waste lifestyle, try to spread the word to the people around you. Advocate the impact of your actions and become a role model for family, friends and colleagues. Make them a part of the solution. Above all, teach others also to vote with their wallet and watch the difference!

Conclusion

Shifting from a disposable lifestyle to a sustainable one is a tall order and can seem impossible at first. The challenge is intensified by the lack of feasible options for going plastic-free. Yet, keep in mind that every small step counts – it won't turn the tide for sure, but we can at least attempt to scratch the surface of the problem! ▶

PLASTIC

– Where is it Coming From
and What is it Doing?



The world is teeming with plastic!
We cannot even fathom the scale of
the problem of plastic waste

Plastic is a material of choice with innovative applications surfacing by the day. While this new material initially emerged as an answer to protecting the natural world, the exponential growth in usage has made it a gargantuan threat in itself. We attempt to trace the evolution of plastic, its usage and the accompanying problems apart from how the international community is attempting to curb the menace.

PLASTIC IS EVERYWHERE today – in things that we see around us and where we can't see it too. Given the ubiquitous use of plastic, it is difficult to comprehend that plastic as we know it is just over a century old!

The first man-made plastic was introduced to the world way back in 1862 by Alexander Parkes. He showcased 'Parkesine' at the London International Exhibition as an alternative to ivory and horn. This was an organic material derived from cellulose which he discovered while trying to develop a synthetic substitute for shellac for waterproofing.

Plastic continued to be a work in progress over the next couple of decades with scientists trying to improve on the initial processes and products. Finally, the first fully synthetic plastic – Bakelite or phenol formaldehyde – was invented in 1907 by Leo Baekeland. He is also credited with coining the term 'plastics'!

As this revolutionary product did not contain any molecules found in nature, the world rejoiced in the fact that mankind had finally succeeded in creating new materials and does not have to be limited by natural resources. Endless possibilities were looming on the horizon as the new material could be shaped or moulded into almost anything.

This marked the beginning of the plastic revolution and a staggering number of plastic innovations emerged during the period of the Second World War.

However, rapid growth in global plastic production set in only in the 1950s with manufacturers starting to use plastic for making consumer products. Bottles, milk jugs, pipes and thousands of other products made of plastic started entering the consumer world. Yet, till the 1970s, plastic production was limited and the associated waste was mostly manageable. After this, global production zoomed exponentially and it is estimated that annual production of plastics increased nearly 200 times to 381 million tonnes by 2015 (see Figure 1).

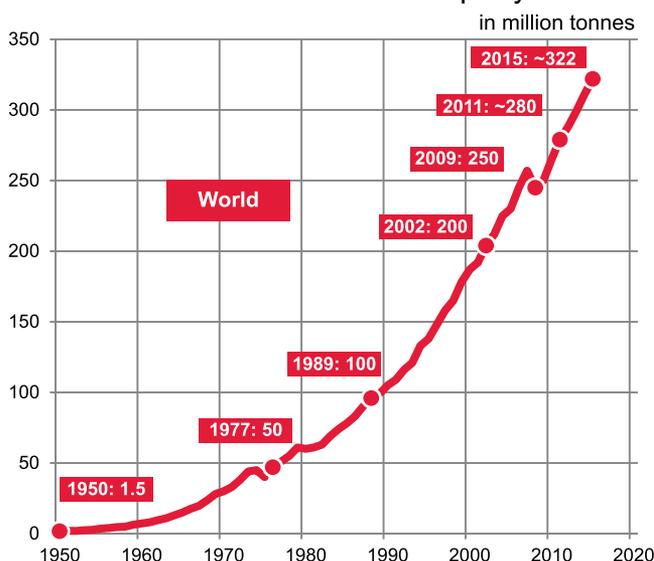
The boom in the plastic industry has been so rapid that it is estimated that half the plastic on Earth has been made since 2005! We are producing around 400 million tonnes of plastic every year – with Asia accounting for 51% of the production and China being the world's largest producer (see Figure 2).

As of 2020, the global mass of produced plastic exceeds the biomass of all land and marine animals combined. There literally seems to be no looking back as plastic production is expected to double by 2040! (Source: United Nations Environment Programme)

FIGURE 1:

Global Plastics Production 1950 to 2015

Annual global polymer resin and fiber production (plastic production), measured in metric tonnes per year



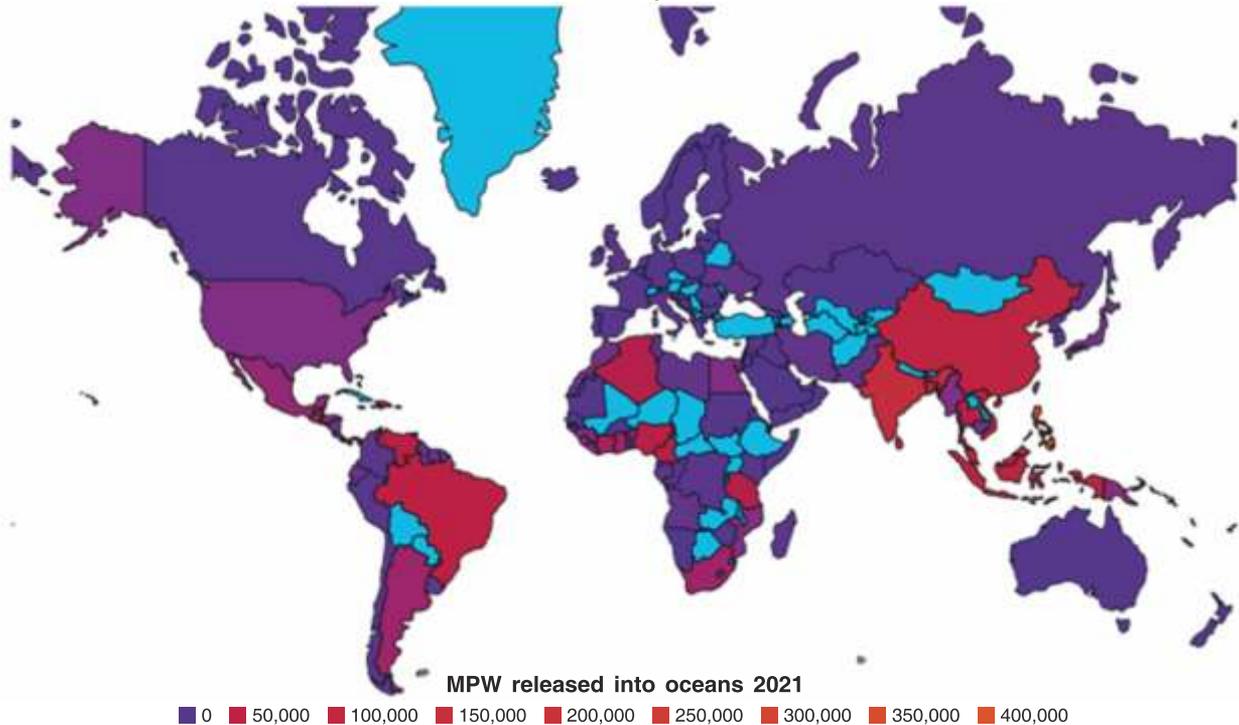
Plastic usage has blown out of proportion to the extent that it is becoming a part of the Earth's fossil record and a marker of our current geological era - Anthropocene. A new marine microbial habitat has even been christened 'plastisphere'!

Pandora's Box of Troubles

The problem with plastic is that it takes centuries to degrade. In fact, it never completely disappears; it simply continues to linger in the environment in some form or the other (see Figure 3). And given the scale of our plastic consumption, it follows that a colossal amount of plastic waste is entering the environment every day.

Plastic waste is leaving its mark throughout the ecosystem in countless ways. It is polluting our land and water on the one hand and being consumed by stray animals, birds and fish on the other. Nearly 700 species, including endangered ones, are known to have been affected by plastics. 90% of seabirds contain plastic debris. Millions of animals get entangled in plastic and end up dead. The stomachs of many others are so

FIGURE 2:
Plastic Pollution by Countries
(Note: MPW = Mismanaged Plastic Waste)



India	MPW released into oceans 2021: 126,513	Total MPW created 2021: 12,994,100	Plastic waste created 2016: 26,327,933	Plastic waste per capita (kg) 2016: 19.88	Plastic waste created 2010: 4,493,080
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packed with plastic that it reduces their urge to eat and they die due to starvation.

We are bombarded with heart-breaking images of animals tangled in plastic. News keeps surfacing of whales and other marine animals washed ashore with their stomachs clogged with plastic trash. Can we forget the young Cuvier's beaked whale that died after being washed ashore in the Philippines with 40 kgs of plastic in its tummy?

Experts say that by 2050 there will be more plastic than fish in the oceans by weight. This will leave our water bodies overheated, acidified and lacking oxygen while unleashing mass marine extinction.

To put a number on it, about 8 million tons of plastic waste is entering the oceans every year (see Figure 4). That's the equivalent of setting five garbage bags full of trash on every foot of coastline around the world!

That's not all – plastic contains more than 10,000 additives, processing aids and monomers that make it stronger, more flexible and durable. Not only do these extend the life of the products and make them difficult

to break down, but around 2,400 of them have been identified as potentially hazardous.

According to the 2021 UN report, *From Pollution to Solution: A Global Assessment of Marine Litter and Plastic Pollution*, plastics contributed to about 4% of global warming in 2015 with greenhouse gas emissions at 1.7 gigatonnes of CO2 equivalent. This is projected to increase to approximately 6.5 gigatonnes or 15% by 2050 (UNEP estimates).

Yet, it cannot be denied that plastic turned out to be a literal life saver during the COVID-19 pandemic in the form of disposable masks, shields, gloves and PPE kits. Plastic packaging of food multiplied to protect it from the virus. However, on the uglier side, the protective equipment and packaging materials did add immensely to the plastic waste in the ocean.

The India Story

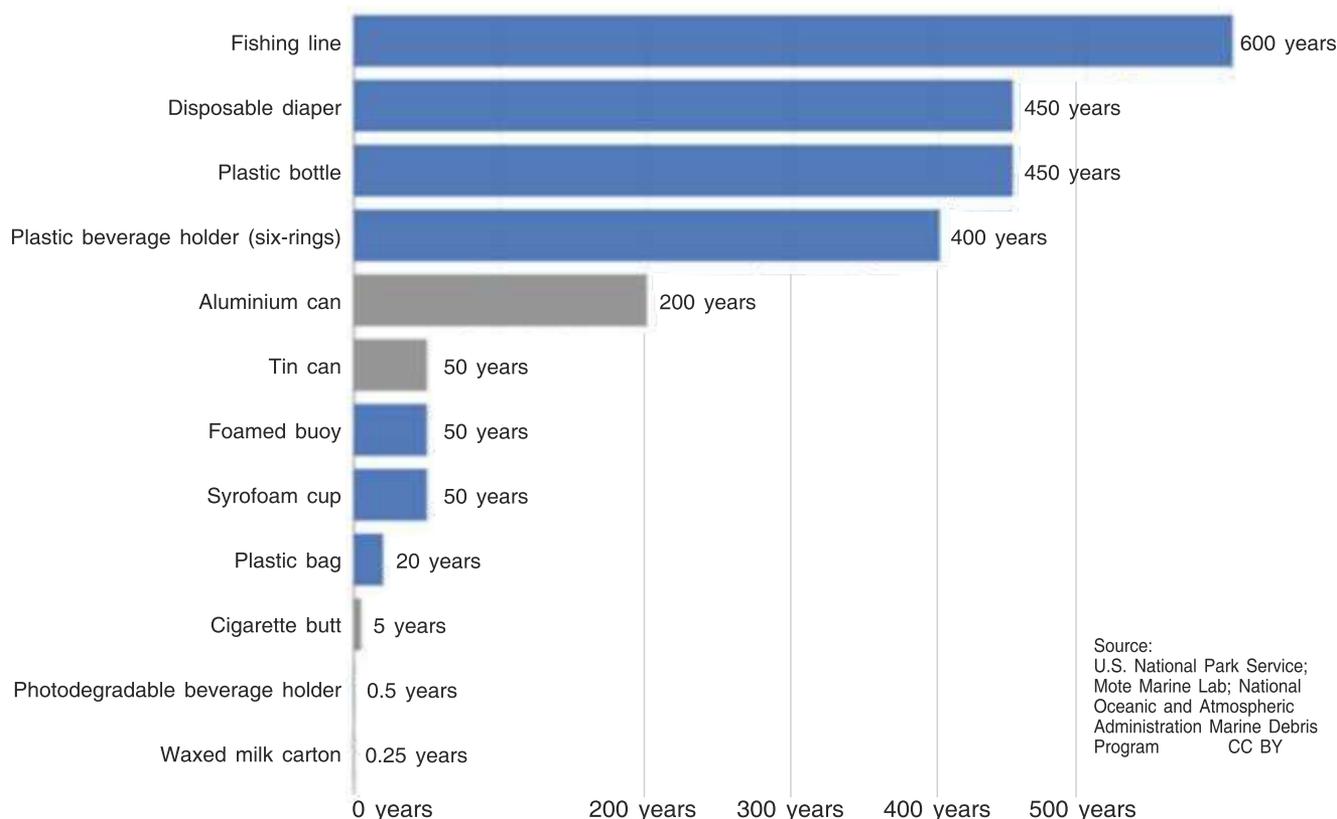
"India is generating 3.5 million tonnes of plastic waste annually" - Union Environment Minister Bhupender Yadav. What's more, our per-capita generation of plastic waste has almost doubled in the past five years!

Global Plastic Watch (GPW) is a digital platform that maps the world's plastic pollution in near real-time using a unique combination of satellite imagery and artificial intelligence. Using freely available data from the European Space Agency, GPW detects plastic waste sites on land and monitors them over time. It has detected and confirmed 2,802 sites in 25 countries using the Global Plastic Watch tool.

FIGURE 3:

Decomposition rates of marine debris items

Average estimated decomposition times of typical marine debris items. Plastic items are shown in blue.



Source: U.S. National Park Service; Mote Marine Lab; National Oceanic and Atmospheric Administration Marine Debris Program CC BY

“Orders through food delivery aggregators add up to 22,000 tonnes of plastic waste created every month in India” – estimate by Zomato CEO, Deepinder Goyal in his blog in September 2018

And most of this accumulates in piles on the roadsides or empty lots, not to mention choking water bodies. Our sacred river Ganga alone transports 0.1 million tons of plastic every year to its mouth - ranking second in the Top 20 list of rivers that move the most plastic waste to the seas (as of 2017).

Not only are our plastic bans proving to be ineffective, but they also come with pointless riders that thumb the issue. For instance, the restriction on microplastics in leave-on cosmetics will come into force only from 2028, even though alternatives already exist. Even the ban on single-use plastics that was implemented from last month provides an incomprehensible assurance that more plastic products will be added to the phase-out list only after a decade. This translates into a moratorium of 10 years to companies to keep polluting the environment!

Irrational Dumping of Plastic Waste Across Borders

It is a fact that the high income countries of the world generate much more plastic waste per person than their middle and low income counterparts. However, they also

have advanced waste management infrastructure that can process them safely.

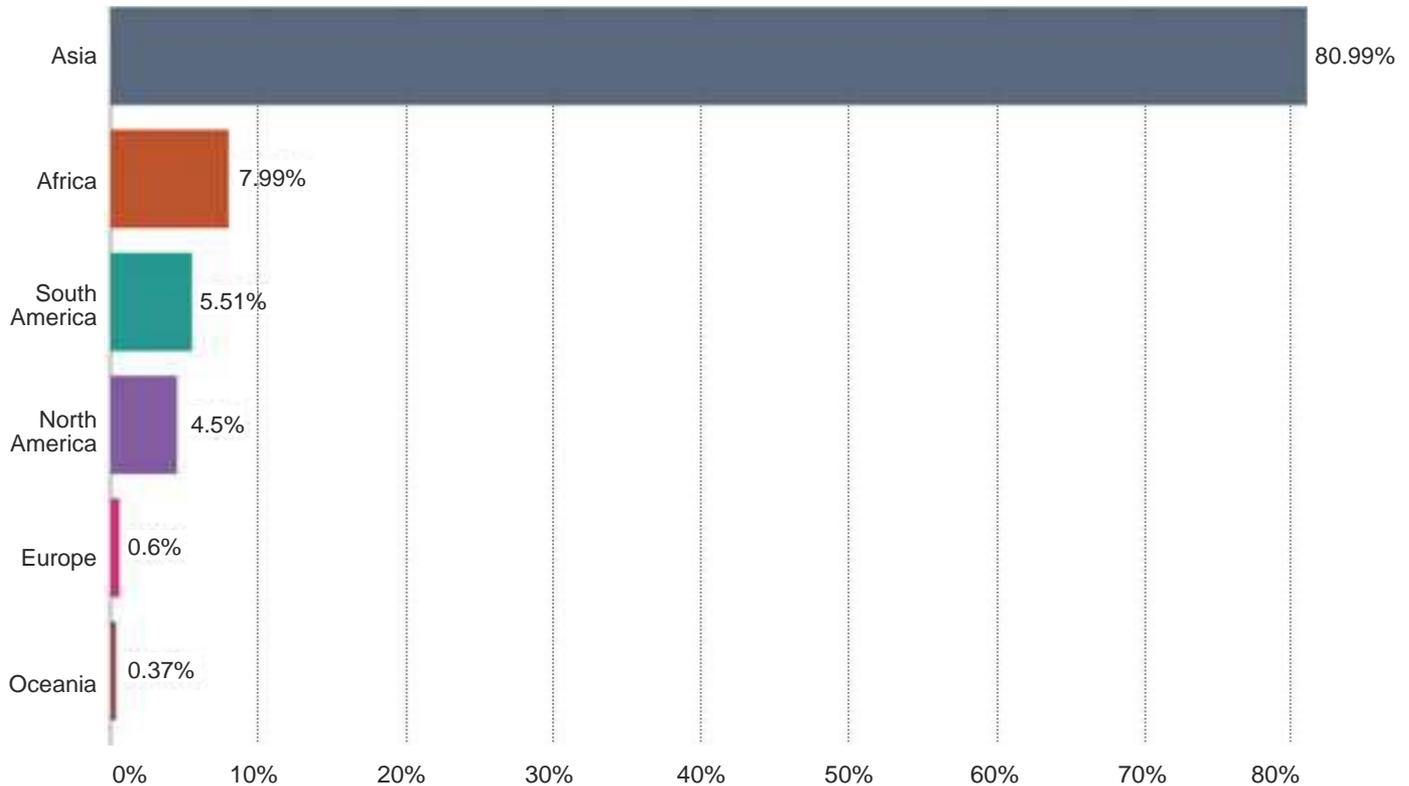
Yet, what do these developed nations do with their recyclable plastics? They actually export them to the developing and underdeveloped nations, thus unceremoniously discarding their waste outside their borders! Indeed, millions of tonnes of plastic waste is shipped thousands of kilometres every year. According to estimates, 68,000 shipping containers of plastic were exported from the US in 2018. (see Figure 5)

This overwhelms the already poor waste management facilities in the importing countries; they have no choice but to resort to burning or dumping rather than recycling. Alas, most of this mismanaged plastic waste finds its way into the ocean! So much so that, trade of plastic waste is considered the prime culprit of marine litter.

In a surprising move, China - the world's largest plastic importer – put its foot down and announced a ban on imported plastic waste in 2017. The United Nations also imposed a ban on waste plastic trade unless it meets certain criteria. A May 2019 amendment to the Basel Convention regulates the export/import of plastic waste. By

FIGURE 4:

Share of global plastic waste emitted to the ocean, 2019



Source: Meijer et al (2021). More than 1000 rivers account for 80% of global riverine plastic emissions into the oceans. Science Advances. CC BY

2020, 180 nations had adopted new international rules that limited the trade of plastic waste. (see Figure 6)

But the practice of richer countries offloading their problems on developing countries continues. Why don't these well-equipped nations manage their waste appropriately within their own borders?

The Global Stage

The world commemorates Earth Day, World Environment Day, World Oceans Day, Global Recycling Day and many more in a bid to move towards a more sustainable future. And the conversation around saving the environment seems to rest more and more on curbing plastic pollution.

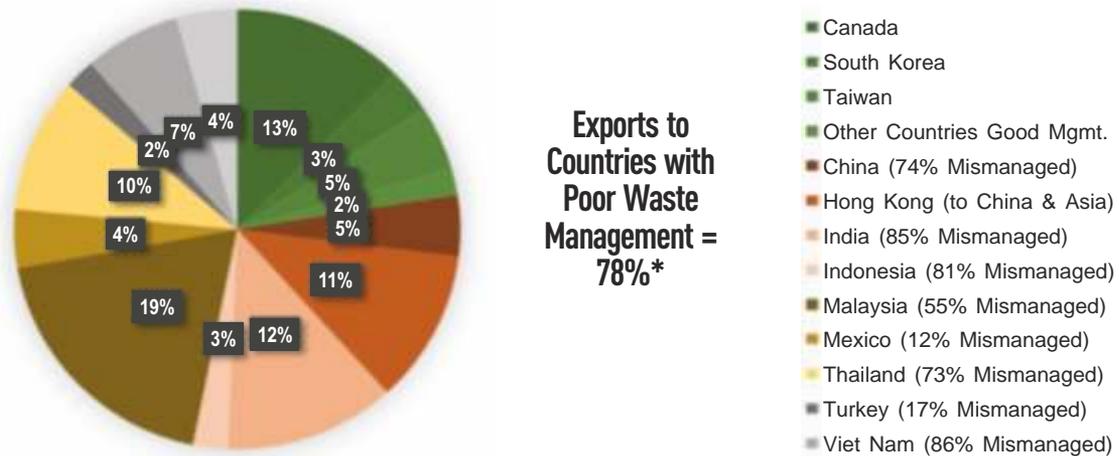
Countries are working on dealing with the growing plastic nuisance within their borders. Global entities are also brainstorming on ways to manage the plastic waste on a worldwide level. The USA is focused on waste management while many other countries are looking at production and the use of single-use plastic. The 2015 international 'Paris Agreement' was centred on net zero in which several nations agreed to revamp their energy policies to suit this purpose.

The United Nations Organisation has been prompting efforts to write a global treaty on the issues of dealing with plastic waste. In March 2022, at the fifth



Plastic pollution is a global problem. Approximately 7 billion of the 9.2 billion tonnes of plastic produced from 1950-2017 became plastic waste, ending up in landfills or dumped.

FIGURE 5:
Destinations of 2018 U.S. Plastic Waste Exports



2018 Total U.S. Plastic Waste Exports = 1.07 million metric tonnes

*Countries with Waste Mismanagement Rate >5% (Jambeck (2015), World Bank data)

U.S. Census Bureau Data

Data Analysis by The Last Beach Cleanup

The World's Oceans Are Infested With Plastic

Number and weight of plastic pieces afloat at sea



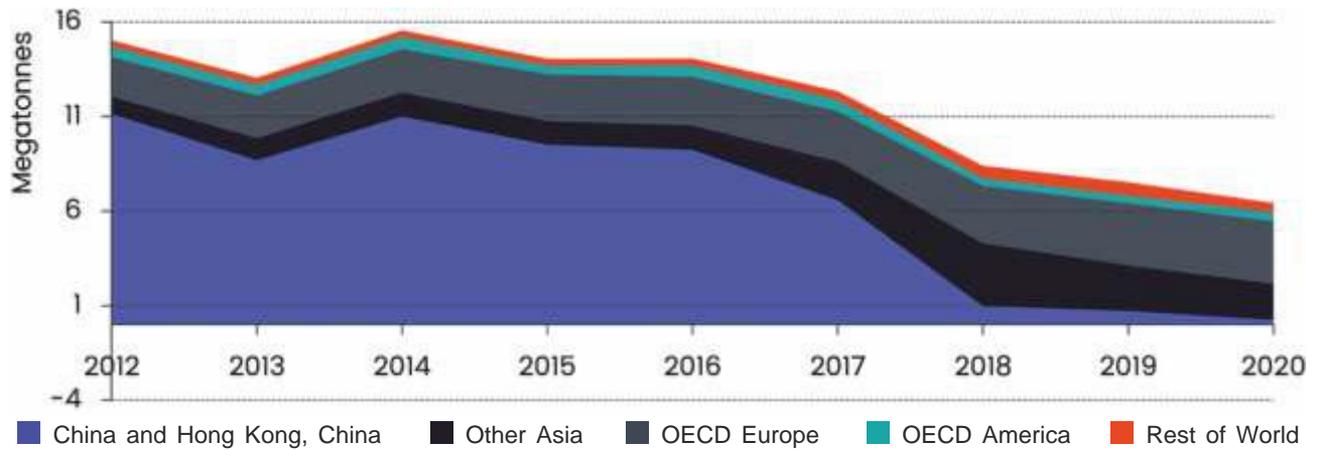
Plastics make up at least 85% of marine litter — the largest and most harmful component (Organisation for Economic Co-operation and Development)



A standing ovation at #UNEA5 that spelled the most important environmental deal since the Paris accord

FIGURE 6:

Global reported exports of plastic waste and scrap by weight and destination



United Nations Environment Assembly (UNEA) in Nairobi, Kenya, senior representatives from 175 countries backed a ground-breaking resolution that called for immediate collective action to rein in the soaring plastic pollution. This will culminate in a legally binding, international agreement aiming to make all plastics sustainable with an overarching goal to end plastic pollution.

Estimated to be in place by 2024, the treaty will lead to international scientific and technical cooperation to address the whole life cycle of plastics – from production and design to disposal – even while focusing on designing reusable and recyclable products. Therefore, this will not only signal an end to single-use plastics but also transform the plastic life cycle from a linear model to a circular one.

It was contended that a shift to a circular economy can:

- Reduce the volume of plastics entering oceans by over 80% by 2040

- Reduce virgin plastic production by 55%
- Reduce greenhouse gas emissions by 25%
- Save governments \$70 billion by 2040
- Create 700,000 additional jobs

While preparations for this landmark global resolution are ongoing, the plastic waste and chemicals in plastics are being discussed at various international meetings and conferences being organised around the world.

Conclusion

The industry, the governments and the international associations need to instigate more and more changes to curb the plastic crisis. Action is urgently needed to understand and control each and every aspect of the plastic life cycle! ▶

Assessing the Plastic Future that Lies in Store



Working with over 100 countries, the OECD is a global policy forum that promotes policies to preserve individual liberty and improve the economic and social well-being of people around the world

Plastic pollution is one of the great environmental challenges of the 21st century, causing wide-ranging damage to ecosystems and human health. Two reports released by OECD this year attempt to assess the global trends in plastic use, waste and leakage even while providing a roadmap for global action. It is also estimated that without policy intervention, plastic pollution will grow relentlessly while waste management and recycling will continue to fall short.

GLOBAL PLASTICS PRODUCTION has grown relentlessly in recent decades. The world is reeling under the varied fallouts like - carbon footprint, high volumes of waste, persistent pollution, harm to wildlife and ecosystems and considerable socio-economic costs due to the negative impacts of plastic litter on tourism and fisheries.

However, it cannot be denied that growing awareness of plastic pollution has alerted public opinion and paved the way for stronger policy interventions on this front. Many OECD countries and emerging economies have been implementing policies that specifically aim to reduce the negative environmental impacts associated with different stages of the plastic lifecycle.

The Organization for Economic Co-operation and Development's (OECD) *Global Plastics Outlook: Economic Drivers, Environmental Impacts and Policy Options* report released in February this year is the first to comprehensively take stock of current plastic production, use and waste generation; uncover the underlying economic drivers; and map the related environmental impacts on a global level.

The key findings include:

- Plastic consumption has quadrupled over the past 30 years while production doubled from 2000 to 2019 to reach 460 million tonnes (Mt) (see Figure 1).
- Plastic waste generation more than doubled from 2000 to 2019 to 353 million tonnes. Nearly two-thirds of plastic waste comes from plastics with lifetimes of under five years, with 40% coming from packaging, 12% from consumer goods and 11% from clothing and textiles.
- Only 33 Mt, or 9% of the 353 Mt of plastic waste is recycled (15% is collected for recycling but 40% of that is disposed of as residues). 19% is incinerated and 50% ends up in landfills. The remaining 22% evades waste management systems and goes into uncontrolled dumpsites, is burned in open pits or ends up in

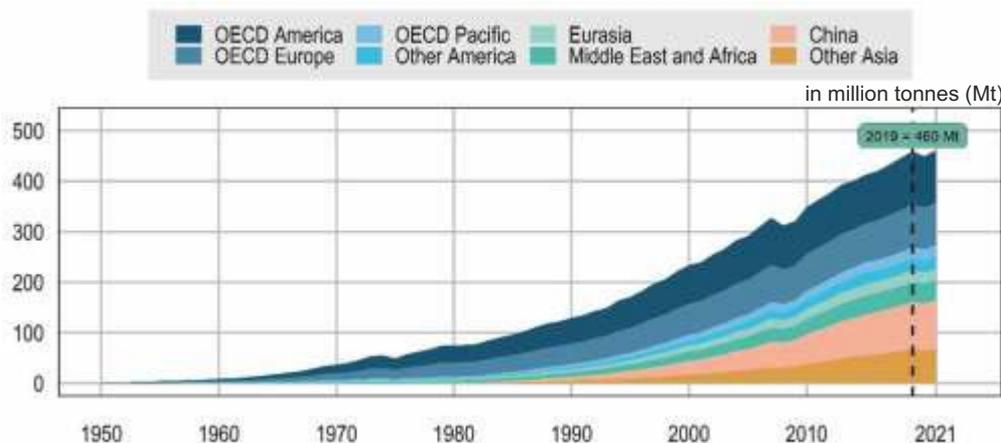
terrestrial or aquatic environments, especially in poorer countries. (see Figure 2 & 3)

- In 2019, 6.1 Mt of plastic waste leaked into aquatic environments and 1.7 Mt flowed into oceans. There is now an estimated 30 Mt of plastic waste in seas and oceans, and a further 109 Mt has accumulated in rivers.
- Most plastics in use today are virgin (primary) plastics made from crude oil or gas. Production of plastics from recycled (secondary) plastics has more than quadrupled from 6.8 Mt in 2000 to 29.1 Mt in 2019. But this is still only 6% of the size of total plastics production. (see Figure 4)

The report also identifies four key levers that are essential to bend the plastic curve:

- **Markets For Recycled Plastics** – Create a separate and well-functioning market for recycled plastics, which are still viewed as substitutes for virgin plastic. Setting recycled content targets and investing in improved recycling technologies could help to make secondary markets more competitive and profitable.
- **Technological Innovation** – Like better product design and developing environmentally friendly alternatives. (see Figure 5)
- **Domestic Policy Measures** – Bans and taxes on single-use plastics exist in more than 120 countries but are not doing enough to reduce overall pollution. Landfill and incineration taxes that incentivise recycling exist in very few countries. There should be greater use of instruments such as Extended Producer Responsibility schemes for packaging and durables, landfill taxes, deposit-refund and Pay-as-You-Throw systems. (see Figure 6&7)
- **International Co-Operation, Including International Financing** – This should include supporting lower-income countries in developing better waste management infrastructure to reduce their plastic leakage.

FIGURE 1:
Global Plastics Use – 1950-2021



Therefore, the findings point that an effective policy mix necessitates a whole of life-cycle approach requiring policy interventions both:

- downstream of the value chain (such as end-of-life management)
- upstream of the value chain (such as product design)

Shortly after the release of this report, the United Nations Environmental Assembly (UNEA) adopted the landmark resolution to convene an inter-

TREATMENT SHARES BEFORE TAKING INTO ACCOUNT RECYCLING RESIDUES AND LITTER CLEAN-UP

FIGURE 2:
Share of plastics treated by waste management category, before recycling losses, 2019

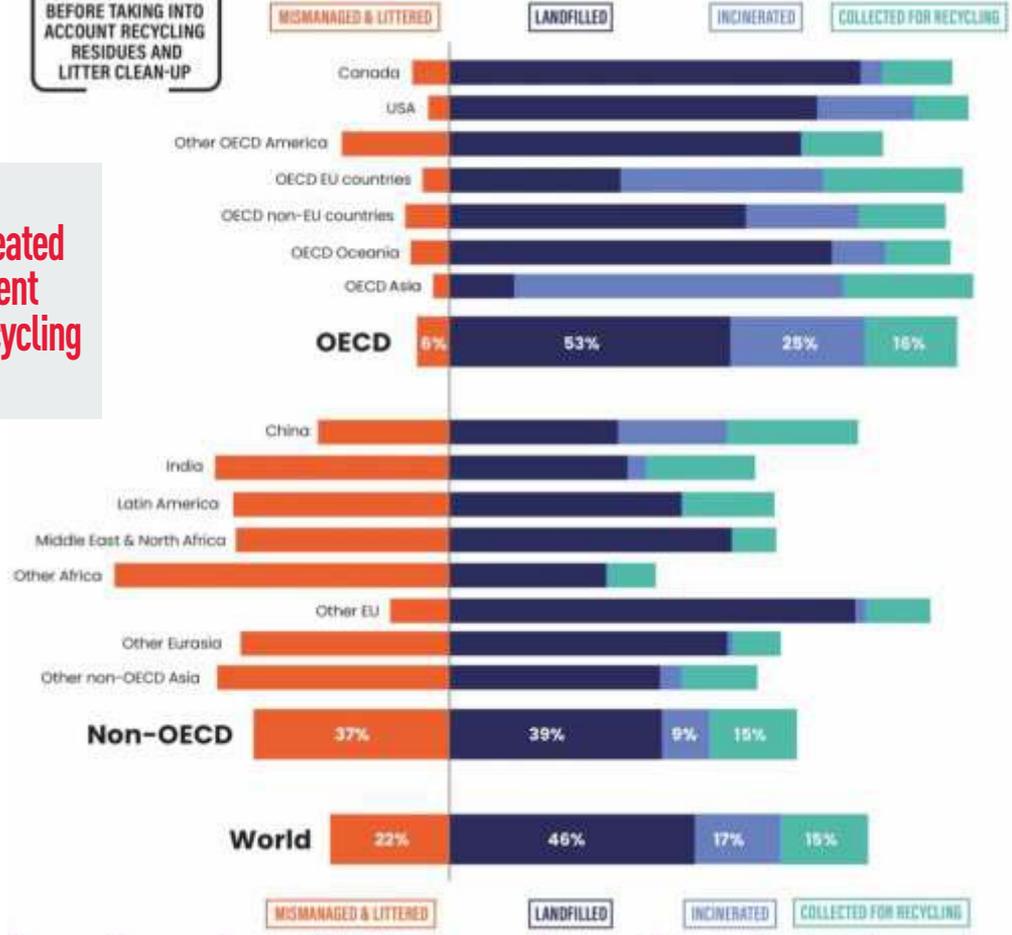


FIGURE 3:
Share of total plastic leakage into the environment, 2019

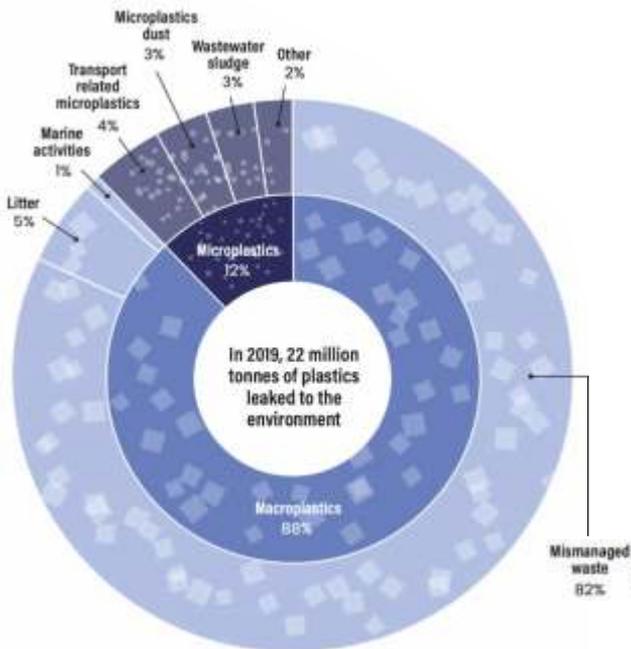


FIGURE 4:
Primary and Secondary production of Plastic

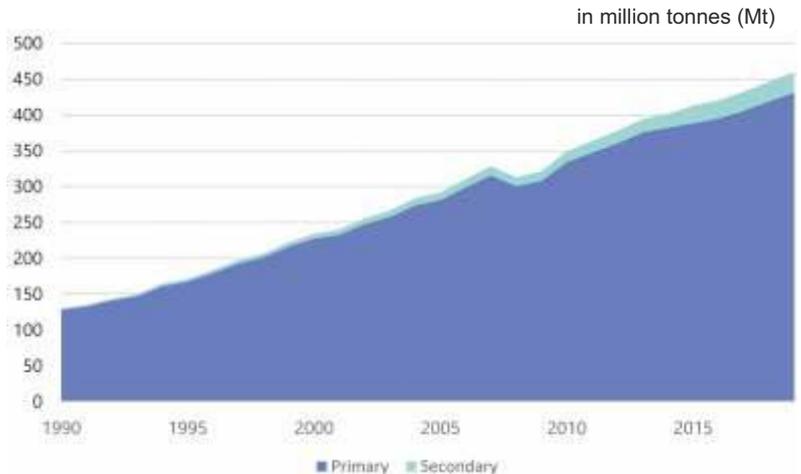


FIGURE 5:
Classification of innovation in environmentally relevant plastic technologies



FIGURE 6:
Policy approaches to reduce plastic leakage

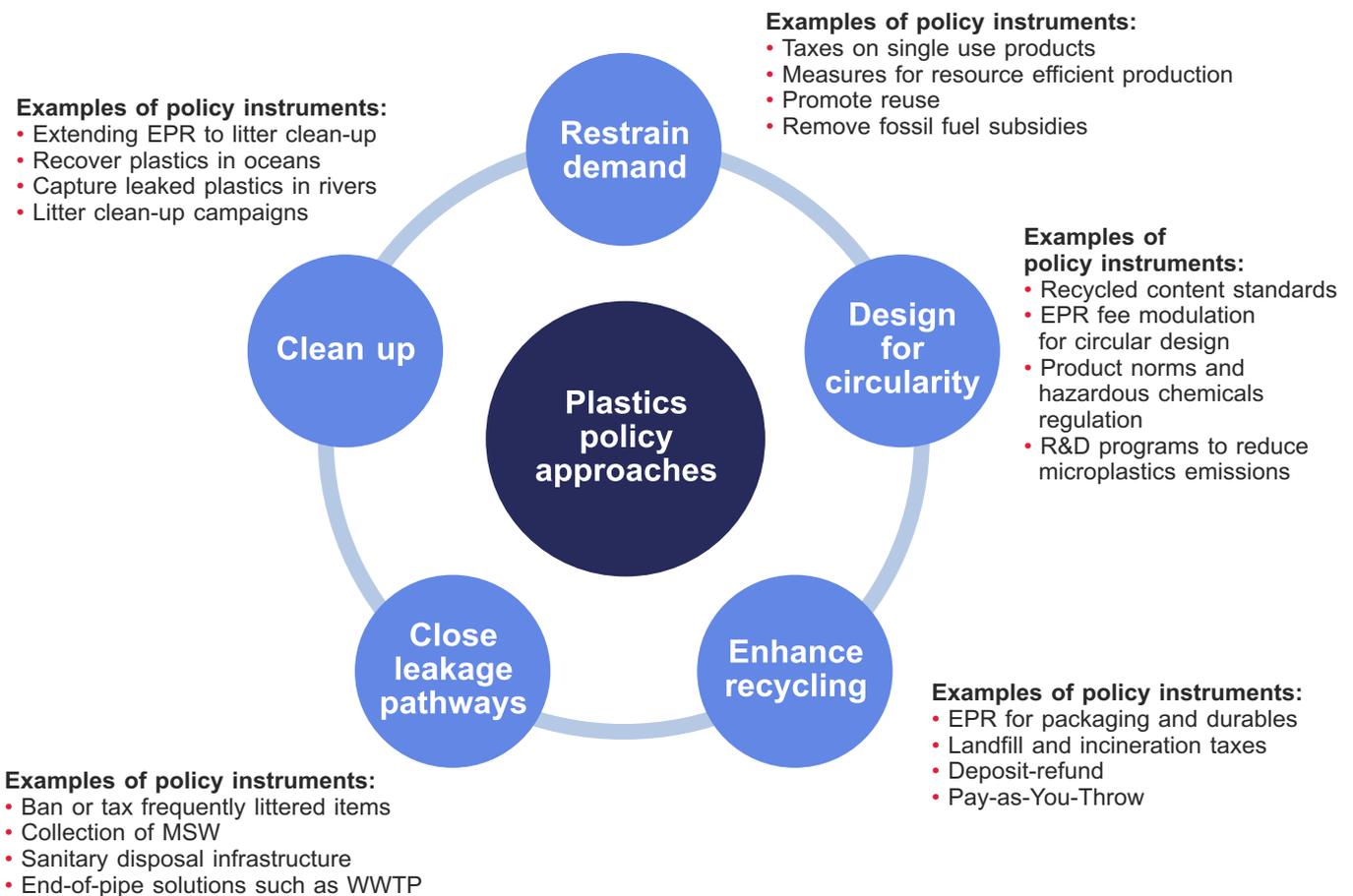
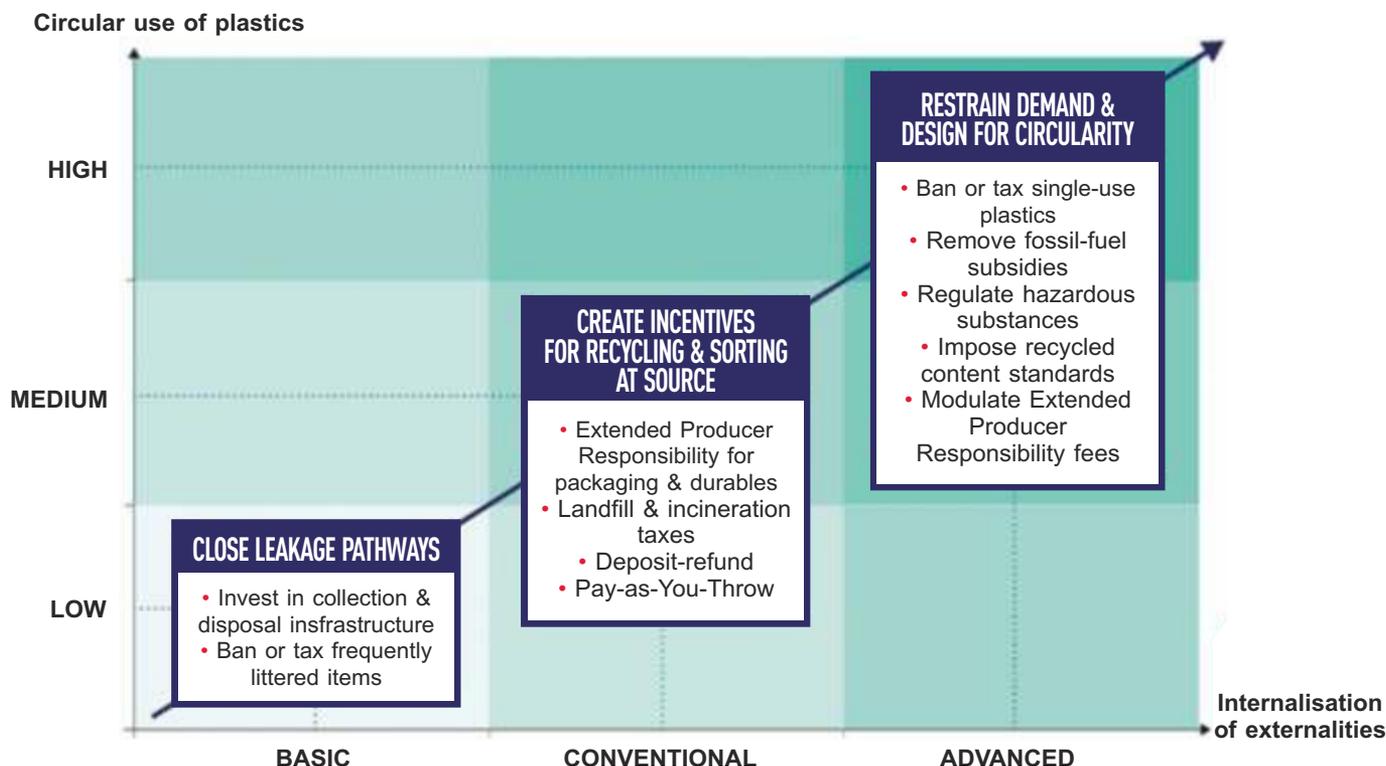


FIGURE 7:

Policy roadmap for more circular plastics use can involve a stepped approach



governmental negotiation committee to develop an internationally binding instrument on plastic pollution by 2024. Within a month, (on 31st March 2022), the Declaration of the OECD Environment Ministerial Meeting committed to develop comprehensive and coherent life-cycle approaches to tackle plastic pollution and promote co-operation internationally.

The OECD builds on its first report with the *Global Plastics Outlook: Policy Scenarios to 2060* which provides a set of coherent projections of the sectoral and regional drivers and consequences of plastics use in the coming decades till 2060 (including plastics use and waste as well as the environmental impacts).

Leveraging the OECD's unique expertise in global environment-economy modelling, the report quantifies the

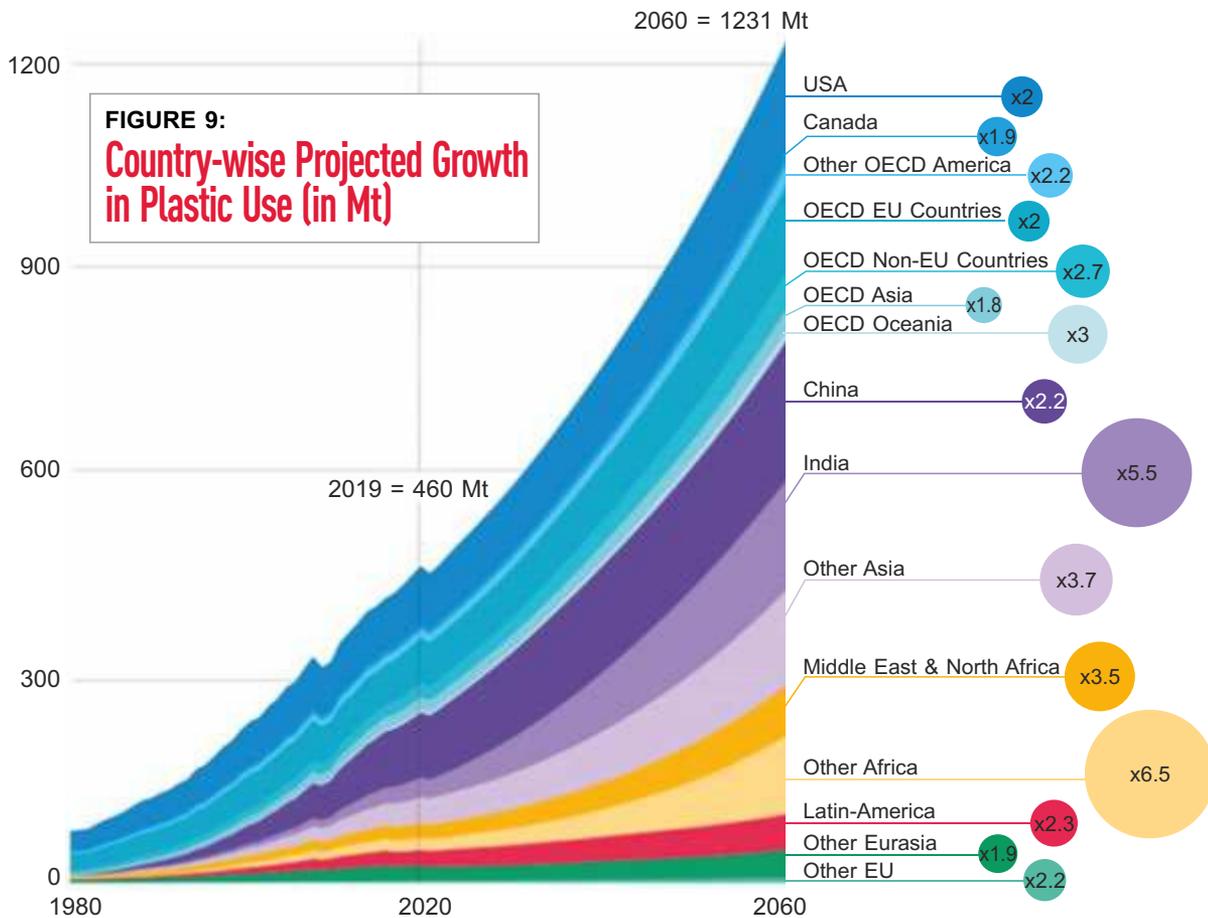
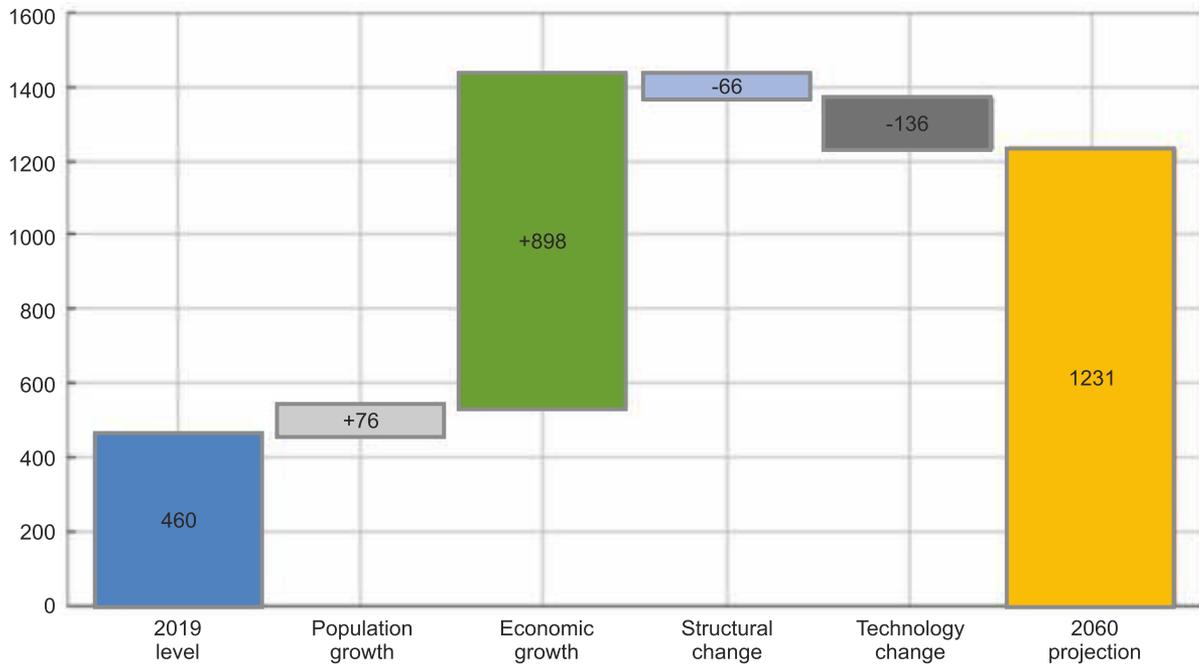
“This report can help decision-makers understand the direction in which we are heading and help to assess which policies can support a more sustainable and circular management of plastic materials. As the challenges associated with plastics production, namely growing leakage and greenhouse gas emissions, are transboundary in nature, it will also be crucial that countries respond to the challenge with coordinated and global solutions.” - *Mathias Cormann, Secretary-General, OECD*

consequences of both 'business-as-usual' on the leakage of plastics to the environment, and the benefits of more ambitious global policy action. While with 'business-as-usual', global plastics use, waste and related environmental damages are projected to increase by 2060, timely and ambitious policies can drastically reduce future environmental damages and in particular plastic leakage to the environment. The level of ambition of the policies and of international engagement will determine the extent to which plastic pollution is reduced.

The findings suggest that in the absence of additional policies by 2060:

- Plastic consumption will nearly triple from 460 Mt in 2019 to 1,231 Mt in 2060. (see Figure 8 & 9)
- Plastic waste is on track to almost triple by 2060, with around half ending up in landfills and less than a fifth recycled. (see Figure 10) Almost two-thirds of this will be from short-lived items, including packaging and low-cost products.
- Plastic leakage to the environment will double to 44 Mt a year, while the build-up of plastics in lakes, rivers and oceans will more than triple, as plastic waste balloons from 353 Mt in 2019 to 1,014 Mt in 2060. (see Figure 11)

FIGURE 8:
Decomposition of the increase of plastics use between 2019 and 2060 (in Mt)



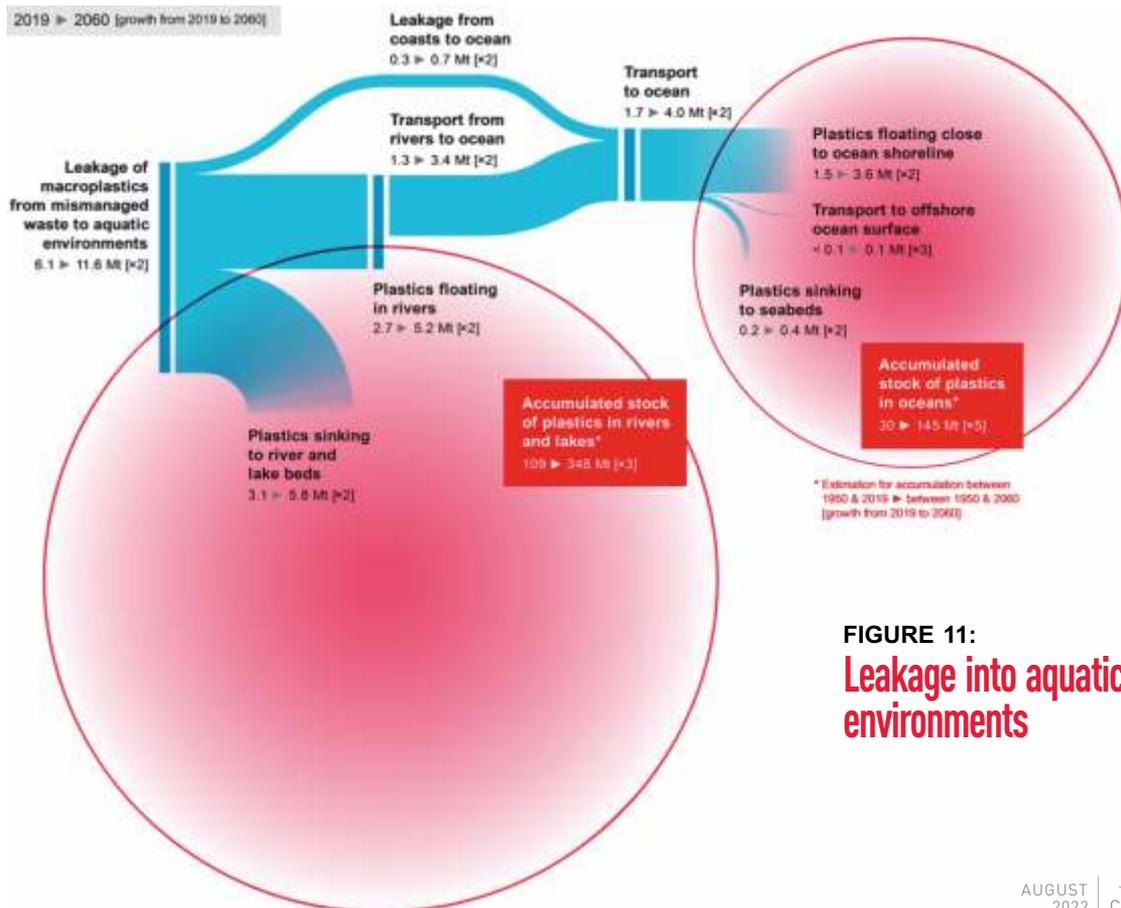
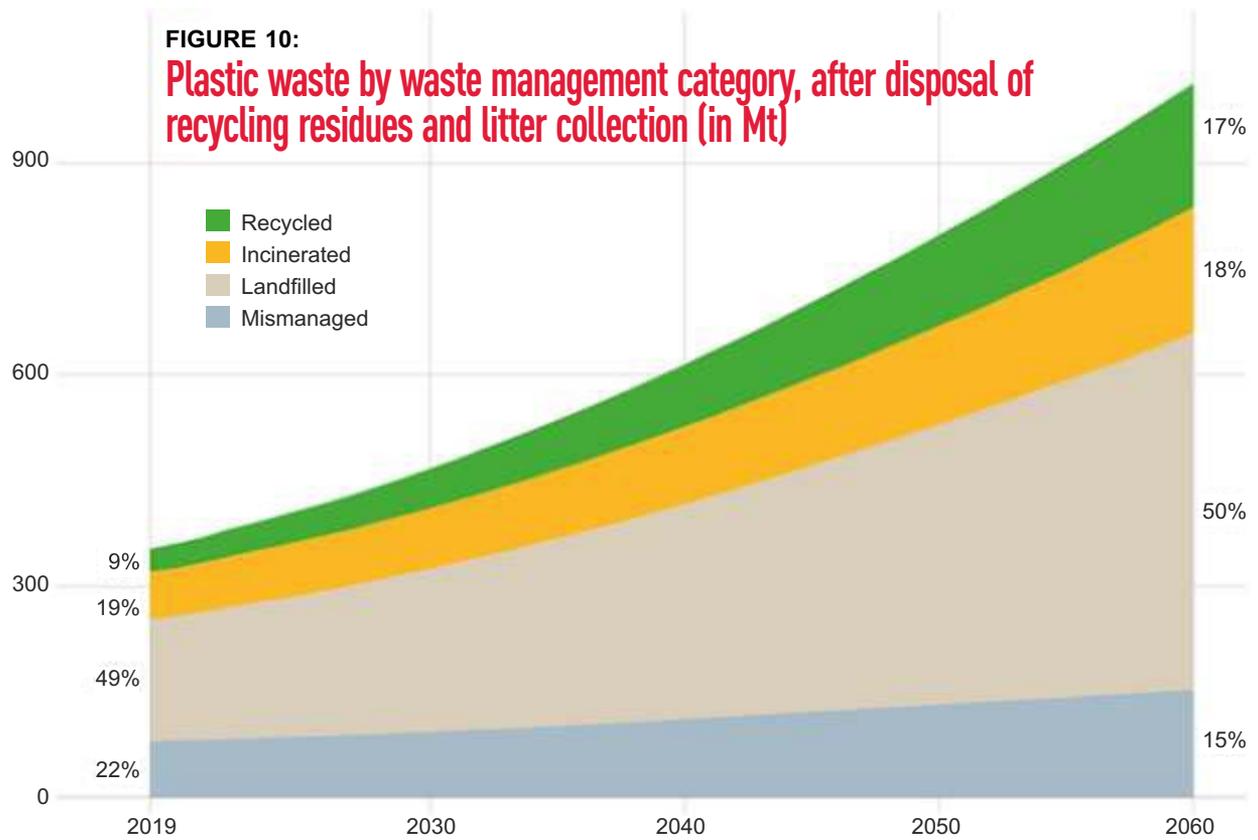


FIGURE 11:
Leakage into aquatic environments

FIGURE 12:
 Share of plastic waste by waste management category (in Mt)

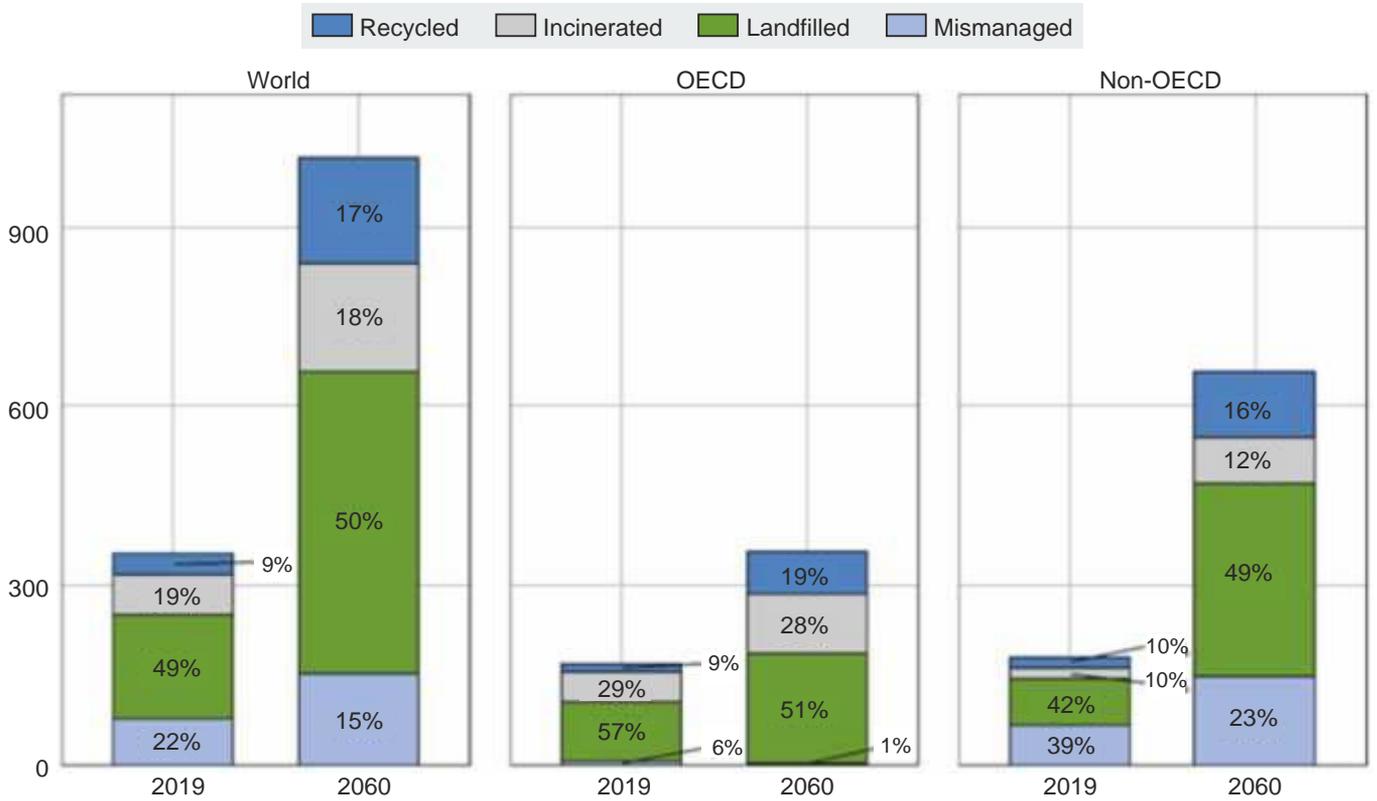


FIGURE 13:
 Primary and secondary plastics production (in Mt)

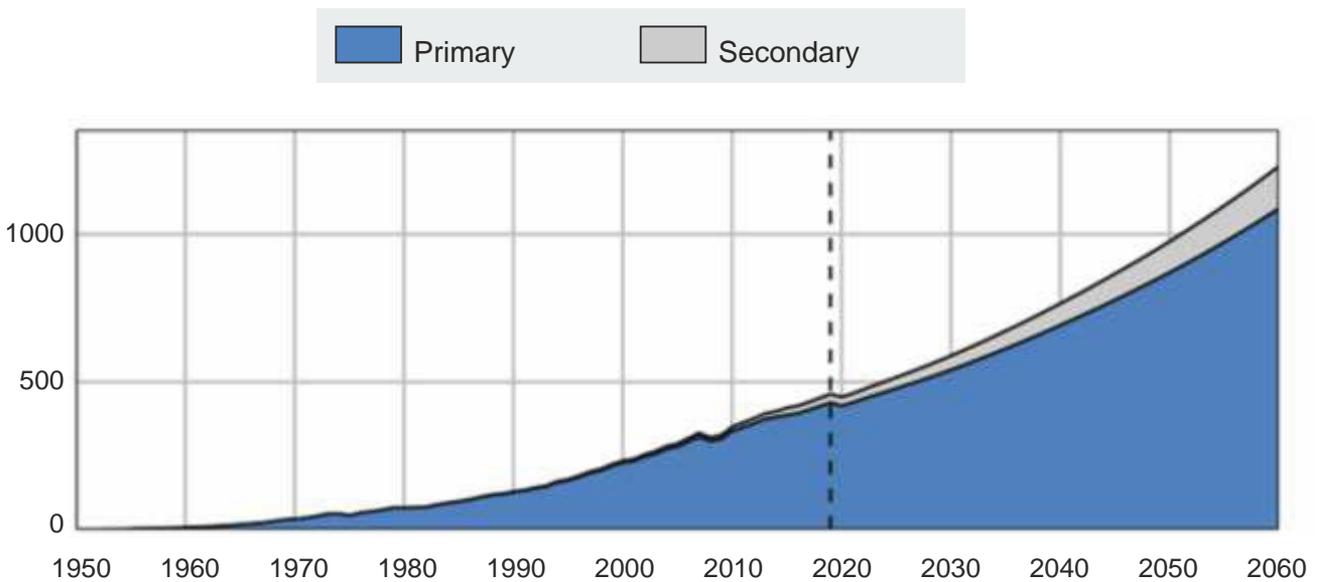
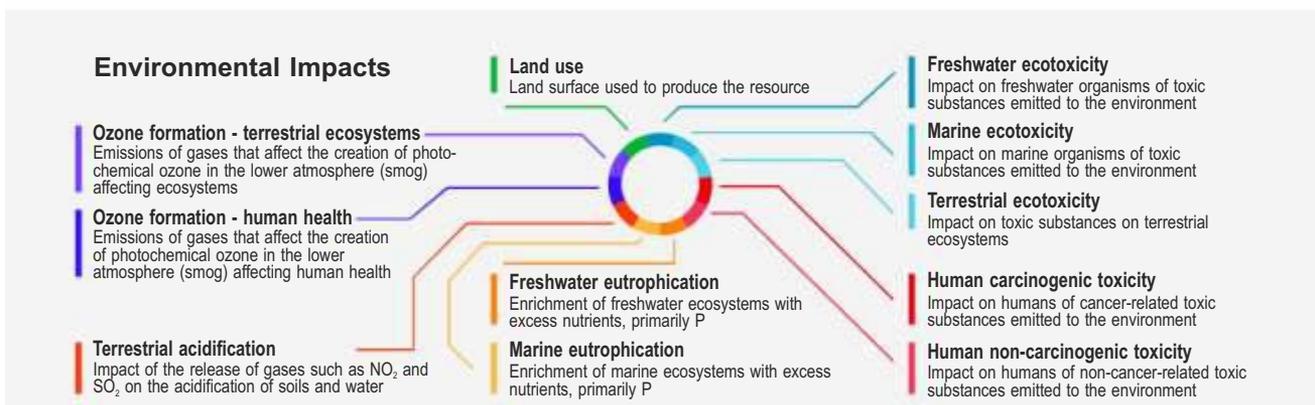
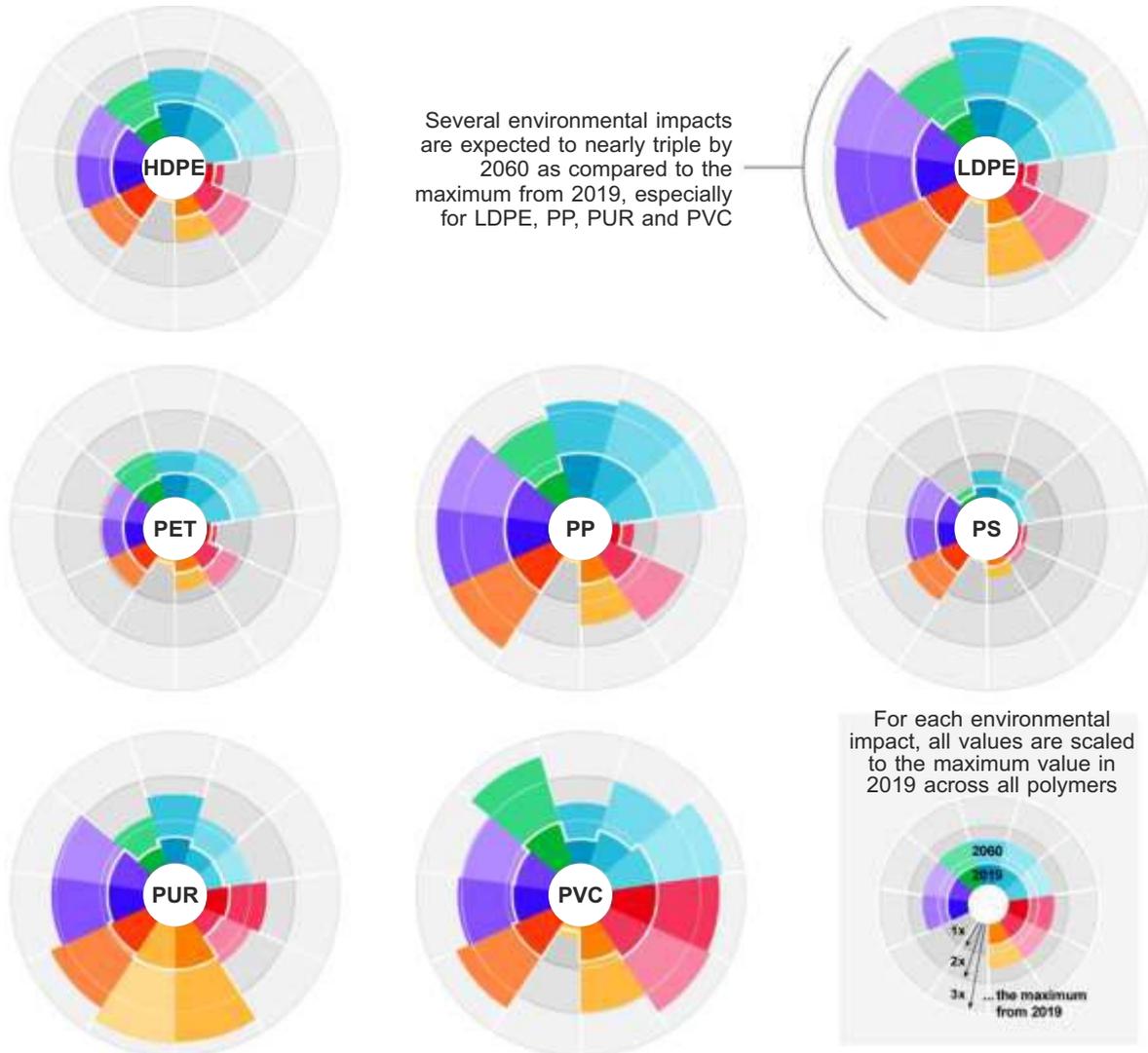
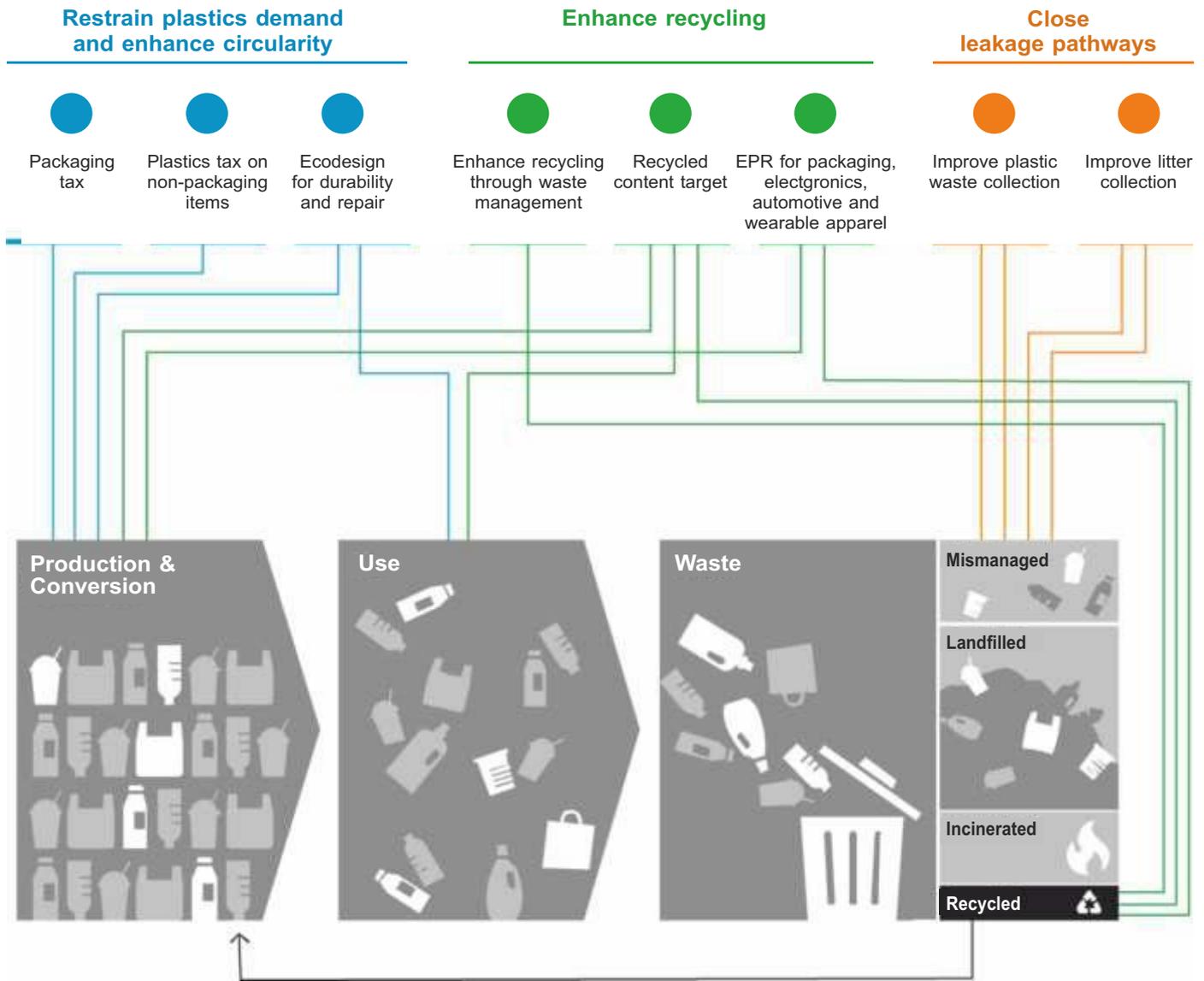


FIGURE 14:
The environmental and health impacts of polymers will double by 2060



(Note: PP=polypropylene; HDPE=high-density polyethylene; LDPE=low-density polyethylene; PVC=polyvinyl chloride; PS=polystyrene; PET=polyethylene terephthalate; PUR: polyurethane)

FIGURE 15:
Policy package of the Regional Action scenario



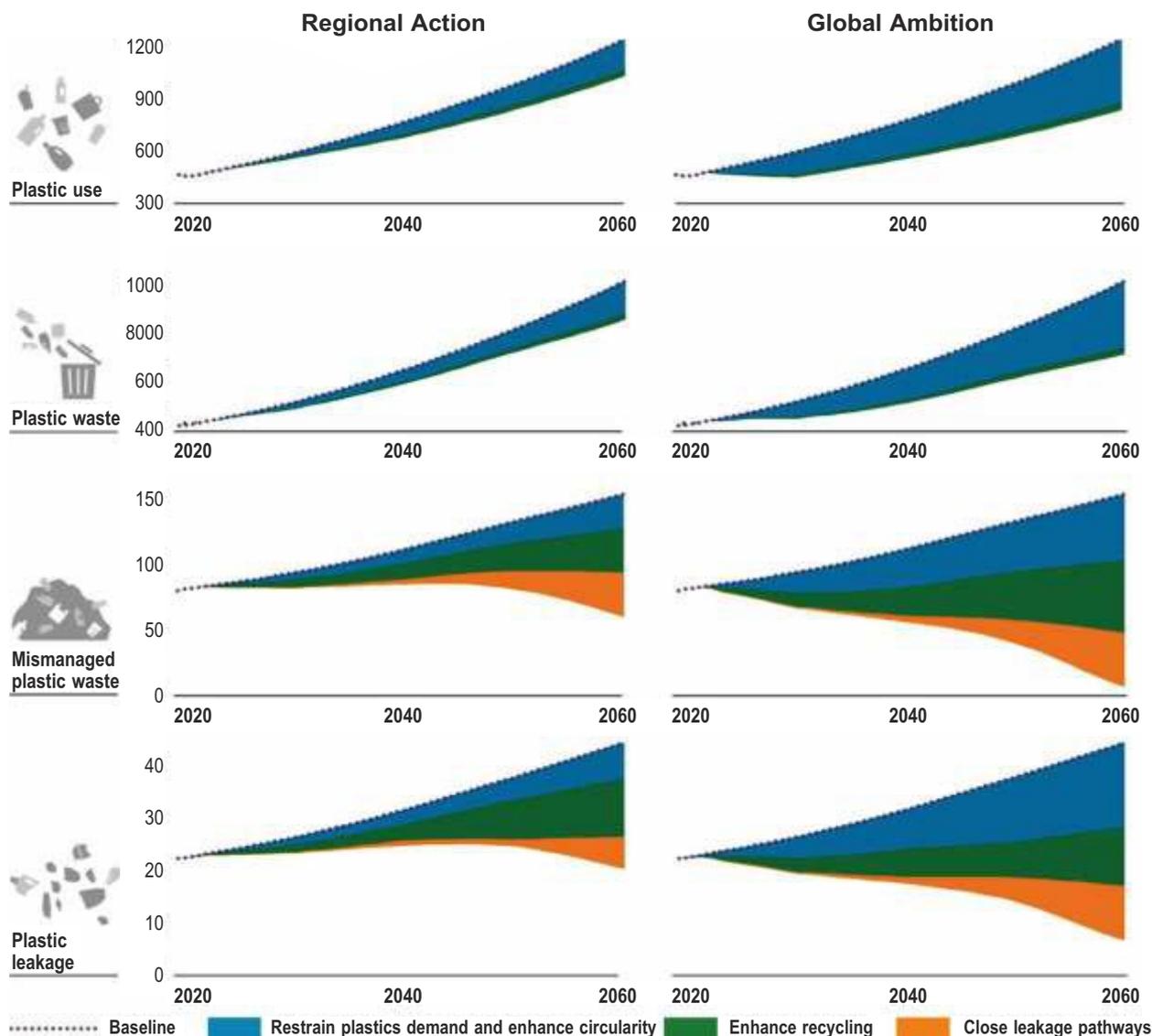
- The share of plastic waste that is successfully recycled is projected to rise from 9% in 2019 to 17% in 2060, while incineration and landfilling will continue to account for around 20% and 50% of plastic waste respectively. The share of plastic that evades waste management systems – ending up instead in uncontrolled dumpsites, burned in open pits or leaking into the soil or aquatic environments – is projected to fall from 22% to 15%. (see Figure 12)
- Recycled plastics are projected to grow quicker than virgin plastics and double their market share. Yet, they will still make up only 12% of total plastics use in 2060. (see Figure 13) The projected rise in plastics consumption and waste will come despite the increase in the use of recycled plastic in manufacturing new goods as well as technological advances and sectoral economic shifts.

The report goes on to present a set of policy instruments at two levels of international action with different levels of stringency. It also compares the impact of these two potential scenarios which can both help flatten the plastics curve while substantially curbing plastic leakage.

- **Regional Action** – This comprises of a mix of fiscal and regulatory policies primarily in OECD countries. (see Figure 15) It has the potential to decrease plastic waste by almost a fifth and more than halve plastic leakage into the environment without a substantial impact on global GDP, which would be lower by 0.3% by 2060. (see Figure 16)
- **Global Ambition** – This comprises of more stringent policies implemented worldwide. It could decrease

FIGURE 16:

A comparison of the impact of both policies at different steps of the plastics lifecycle



plastic waste by a third and almost completely eliminate plastic leakage to the environment while lowering global GDP by an estimated 0.8%. (see Figure 16)

The report highlights that globally coordinated policies can give a big boost to the share of future plastic waste that is recycled - from 12% to 40%!

The report proposes concrete policies that can be implemented along the lifecycle of plastics that could reduce the environmental impacts of plastics and encourage a more circular use of them on the one hand and significantly curb/eliminate plastic leakage into the environment on the other. Such as:

- Taxes on plastics, including on plastic packaging

- Incentives to reuse and repair plastic items
- Targets for recycled content in new plastic products
- Extended Producer Responsibility (EPR) schemes
- Improved waste management infrastructure
- Increased litter collection rates

Conclusion

It is clear that the current plastic lifecycle is far from circular right now. In fact, plastic leakage and greenhouse gas emissions are increasing. Eliminating plastic pollution is possible but requires strong global action. In fact, combining policy action to mitigate both climate change and plastic challenges can enable countries to achieve their climate objectives while making the plastics lifecycle more circular. ▶

Rethinking Our Relationship with **Plastics**

It is not plastic per se, but how we use it that is giving it a bad name! So, instead of tarring all plastics with the same brush, we have to de-link our lifestyle from the troublesome over-dependence on the wrong ones. The world should move towards a circular economy that is restorative and regenerative.



We cannot blindly label plastic as wasteful and pointless!

GOING BY ALL the grave predictions of plastic pollution and how the 'world's most wasteful material' will threaten the very survival of the planet in a few decades, plastic is being viewed as 'pure evil!' And solving the plastic problem is deemed as one of the greatest challenges we face today. Alas, this is shrouding the myriad benefits of plastic that made it so popular in the first place.....

Indeed, plastic can be considered one of the most versatile innovations of our time - it has weaved its way into a horde of essential items that we use day in and day out. What stands in its favour is that it is lightweight, strong, durable and very economical. The material has also proved to be resistant to water, corrosion and chemicals. It

serves many valuable functions, from maintaining food quality, safety and reducing food waste to playing a crucial role in healthcare by way of life-saving devices and more.

Moreover, it is virtually impossible to entirely cut out plastic from our lives as we come in contact with it in various forms in our clothes, vehicles, furniture, televisions, refrigerators and even mobile phones. It figures everywhere from agriculture to construction to electric equipment to pharmaceuticals.

Delving deeper into the issue, there is actually no need to renounce plastic completely as not all plastics are bad. Plastics are of different types and options like PETE or PET (polyethylene terephthalate), HDPE (high-density polyethylene), PVC

(polyvinyl chloride) and PP (polypropylene) are recyclable. Therefore, they do not impinge on the environment like say PS (polystyrene better known as Styrofoam).

The worst culprit hands down is single-use plastics (SUPs) that cannot be recycled at all. These are the disposable plates, spoons, straws, boxes, bags, bubble wraps, cling wraps and other packaging items along with earbuds and medical gloves that are mostly made of polystyrene.

While these items are usually disposed of after just using once, the fact is that many of the bottles, cups and plates can actually be reused. In fact, PET bottles are not only 100% recyclable but infinitely reusable as well, making them a much more



Polyethylene terephthalate (PET)
Water bottles, dispensing containers, biscuit trays



High-density polyethylene (HDPE)
Shampoo bottles, milk bottles, freezer bags, ice cream containers



Low-density polyethylene (LDPE)
Bags, trays, containers, food packaging film



Polypropylene (PP)
Potato chip bags, microwave dishes, ice cream tubs, bottle caps, single-use face masks

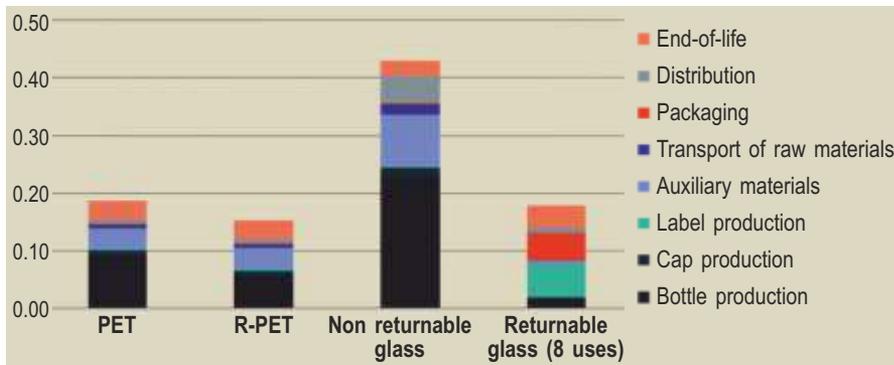


Polystyrene (PS)
Cutlery, plates, cups



Expanded Polystyrene (EPS)
Protective packaging, hot drink cups

The carbon footprint of a non-returnable glass bottle is higher than a plastic equivalent



Comparison of 1 litre milk bottle, in kg CO2 eq. -
Source: OECD Report (Note: R-PET= 100% recycled PET)

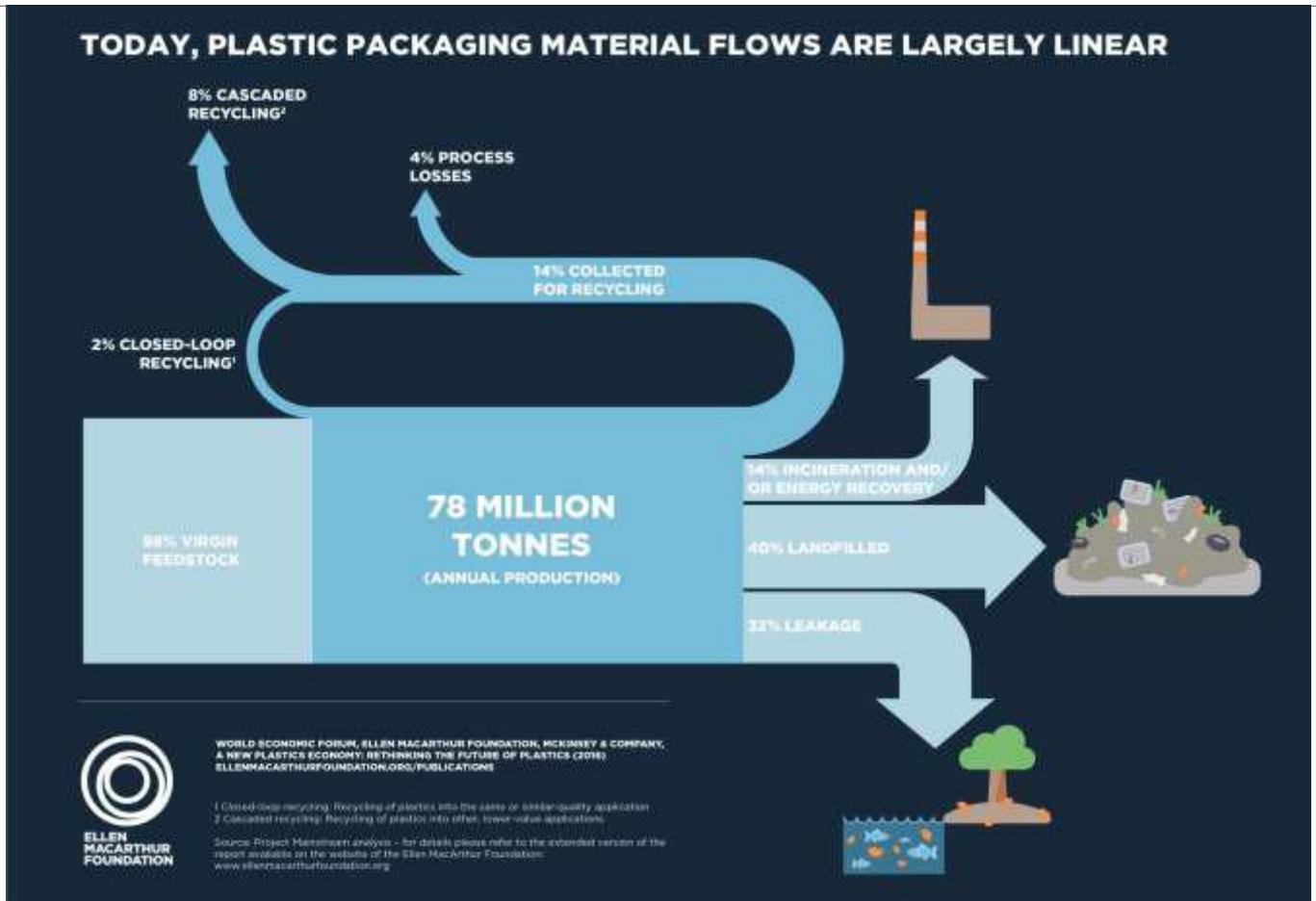
sustainable and eco-friendly option than glass, steel or aluminium.

This PET plastic is ease to use and affordable. To top it, it also creates a lower carbon footprint during manufacturing than the other alternatives. And, with liquid medicines being packed in PET, it follows that this material will be safe for our food, water and juices and will maintain their quality as well.

The Much-Needed Transition

Indeed, the blame rests with our lifestyle of convenience that is translating into a harrowingly wasteful and throw-away culture. This linear model of take-make-waste is unsustainable and with the government banning SUPs, we have no choice but to move towards a regenerative circular economy.

Plastic itself isn't the problem, it's what we do with it!
Plastic itself isn't the problem, it's our attitude!
Plastic itself isn't the problem, it's the use of SUPs!



The circular economy is defined by a holistic approach that looks at the entire ecosystem – from sourcing and production to use and after use. Therefore, the 'new normal' will be defined by:

- Eliminating all problematic and unnecessary plastic items and switching to sustainable alternatives as available.
- Innovation at every level - from materials, packaging and reprocessing technologies to even the business models - to ensure that the plastics we need are reusable, recyclable or compostable. Right from the beginning, products have to be designed so that they use less material and their packaging is recyclable. They should also promote use and reuse to the maximum without any losses.
- Circulating all the plastic items we use in the economy so that they don't end up in the environment and cause pollution. Landfills and incineration do not support a circular economy. Circulation involves



We have no choice but to embrace a circular economy!

remaking, say, packaging into new forms of packaging. Then the materials will constantly flow around a 'closed loop' system without waste of any kind.

- Increasing efforts to recycle plastic which involves effective infrastructure for collection, sorting, breakdown and rebuilding supported by enabling policies and regulations. Therefore, used materials are recovered and remade into new items again and again.

A circular economy is the only solution that can match the scale of the problem of plastic pollution!

It follows that plastic can also have a sustainable impact when it is properly managed. This requires us to change both our attitude and lifestyle – for instance, try to reuse PET and other safe forms of plastic as much as possible rather than mindlessly discarding them immediately after use. Opt for items made of safe, recycled plastic wherever possible. When it comes to disposal, look for recycling options instead of simply throwing them in the dustbin.

This kind of a circular economy is the only answer if we are to continue to reap the unique benefits of plastics without harming mankind, wildlife or the planet in general.

Conclusion

The future has to be defined by using plastic efficiently, maximising value and eliminating waste. When done properly, this will benefit the society, the environment and the economy! ▶

A Plastic Waste-Free Future for India?

Faced with a plastic waste crisis, India has formulated varied policies and iterations in earnest to reduce its plastic footprint. The government has finally initiated a huge step as a push back, in line with its broader environmental agenda! It's wait and watch now.....



*Plastic bag is the poster child of the government -
Bans on thin plastic bags are the most common regulations!*

INDIA HAS AN extremely low per capita use of plastics – 11kgs per year as compared to 109 kgs in the USA. However, the total consumption level ranks much higher given the heavy population burden of 1.3 billion! To top this, nearly 40% of the country's plastic waste is neither collected nor recycled. In fact, according to 2021 estimates, India stands second on the leader board in the list of countries that release the most plastic into the ocean (126,513 tons – Source: <https://worldpopulationreview.com/>).

Fortunately, the government is keenly cognizant of the problem and being key actors in the plastics value chain, is showing ambition for reducing the use of plastic, especially single-use plastic, by way of various policies (read bans).

Sikkim was the first state to pass a ban on plastic bags way back in 1998. But the country got its first plastic waste management law in 1999 that imposed restrictions on the use of plastic carry bags (thickness of 20 microns and less) and packing of food in recycled plastic. Later, a 2003 amendment diluted the restriction on carry bags. In 2009, Himachal Pradesh became the first state in the country to actually implement a ban on plastic shopping bags.

The Plastic Waste (Management and Handling Rules) 2011 even introduced a ban on use of plastic materials in sachets for storing, packing or selling gutkha, tobacco and pan masala. This was superseded by the much more progressive Plastic Waste Management Rules 2016 that laid down a comprehensive framework on Extended Producer Responsibility (EPR) focusing on the manufacturers and brand owners. It even boldly proposed a phase out of all multi-layered plastics used in packaging within two years. But the clause was diluted through an amendment come 2018.

In 2017, New Delhi banned plastic bags, cutlery, cups and plates and by 2019 more than half of the states and union territories had announced bans on single-use plastics in some form or the other. However, going by the real scenario on the roads, nobody will believe that carry bags made of virgin or recycled plastic less than 50 microns in thickness are prohibited across the country since years.

Alas, most of the rules proved ineffective in tackling the burgeoning plastic crisis in the country and remained paper tigers. While the intent is there, unjustified delays and lax enforcement coupled with exemptions and insufficient requirements jeopardise their effectiveness. Maharashtra's ban on single use disposable plastic was touted as the most effective with strict enforcements and hefty fines. SUPs did disappear for some time, but now things are back to square one!

Furthermore, the constantly shifting goal posts - revisions in targets without taking stock of old ones – seemed as if we were merely paying lip service to the cause.

India even banned import of solid plastic waste from 2019. BIS established an Indian Standard to regulate plastics like microbeads and other small particles (that are not biodegradable/water-soluble) in cosmetics and toiletries. But, political will and regulatory seriousness has always been lacking.....

Coming of Age

In the 4th United Nations Environment Assembly (UNEA), 2019, India piloted a resolution on a global phase-out of single-use plastic (SUP) products by 2025, bringing worldwide focus on this burning issue.

Since then, the government has been taking several measures to recycle and reuse plastic. The Union Ministry of Drinking Water and Sanitation requested various governmental departments to avoid the use of plastic water bottles during meetings, etc. Instead, they should make arrangements to provide drinking water that does not generate plastic waste. Sikkim restricted plastic water bottles and styrofoam products in government functions and meetings. Even Bihar banned plastic water bottles in government meetings. Many food vendors, restaurant chains and local businesses have started adopting biodegradable cutlery and cloth/paper bags.

In August 2021, Prime Minister Narendra Modi announced the world's most ambitious undertaking – a blanket ban on most single-use plastics that will take effect from 1st July, 2022. Following this, the Ministry of Environment, Forest and Climate Change notified the Plastic Waste Management Amendment Rules 2021 to prohibit identified single-use plastic items which have low utility and high littering potential.

Under the Extended Producer Responsibility, the plastic packaging waste that is not covered by the ban has to be collected and managed by the producer, importer and brand owner (PIBO) in an environmentally sustainable way until the end of their life cycle (as per Plastic Waste Management Rules, 2016). The new amendment has given a legal force to the guidelines for EPR paving the way for effective implementation. This will streamline the process as manufacturers and brand owners are now accountable for the collection, recovery and recycling/reuse of their products. It has also set up a 'market mechanism' for plastic waste management wherein an efficient approach lets waste generators earn credits that can be sold and purchased.

The ministry constituted a National Level Taskforce for taking coordinated efforts to eliminate identified single-use

"Previous attempts to ban or phase out multi-layered plastic were scuppered by the 'politics of recycling'. High plastic industry representation in committees drives policies in their favour, leaving municipalities to deal with plastic pollution using taxpayers' money" - Siddharth G Singh, Deputy Programme Manager, Centre for Science and Environment (CSE)

plastic items and effective implementation of Plastic Waste Management Rules, 2016. The states/UTs were also requested to constitute a Special Task Force and develop a comprehensive action plan for implementing both the ban and the rules in a time bound manner.

Additionally, the government is working on generating awareness – it organised a two month long 'Awareness Campaign of Single Use Plastic 2021'. The 'India Plastic Challenge – Hackathon 2021' was organised for students of higher educational institutions to encourage innovation in development of alternatives to identified single-use plastic items and digital solutions to plastic waste management. Some of the innovative solutions were recognised under Startup India Initiative.

Green Measures to Implement the Ban

In April this year, Union Environment Minister Bhupender Yadav launched the mascot 'Prakriti' to spread awareness among the masses about small changes that can be sustainably adopted in their lifestyle for a better environment. He launched various other initiatives like:

- National Dashboard on Elimination of Single-Use Plastic and Plastic Waste Management
- Extended Producer Responsibility Portal for Plastic Packaging
- Mobile App for Single-Use Plastics Grievance Redressal
- Monitoring Module for Single-Use Plastics
- Industrial Production of Graphene from Waste Plastic

“The exemption given to compostable plastics will undo all the progressive measures in the proposed ban because producers may just stamp thin carry bags as compostable and there won't be any way to verify these claims.” - *Dr. Vijay G. Habbu, senior polymer scientist and adjunct professor at the Institute of Chemical Technology, Mumbai*

International Initiatives

At the fifth session of the UNEA held in March 2022, India proposed a draft resolution on plastic pollution based on the principle of immediate collective voluntary action by countries. It encourages member states to improve resource efficiency, implement EPR, develop sustainable packaging products and craft policies for promoting recycling. To facilitate global action, India agreed to setting up of an inter-governmental negotiating committee for a new international legally binding treaty and was constructively engaged in the negotiations.

“India is committed to address plastic pollution including marine plastic pollution to reduce the adverse impacts on terrestrial and aquatic ecosystems and human well-being” – *Environment Secretary Leena Nandan at UNEA*



The manufacture, import, stocking, distribution, sale and use of following single-use plastic, including polystyrene and expanded polystyrene, commodities shall be prohibited with effect from 1st July, 2022:

- ear buds with plastic sticks, plastic sticks for balloons, plastic flags, candy sticks, icecream sticks, polystyrene (thermocool) for decoration
- plates, cups, glasses, cutlery such as forks, spoons, knives, straw, trays, stirrers, wrapping or packing films around sweet boxes, invitation cards, and cigarette packets, plastic or PVC banners less than 100 microns

To stop littering due to light weight plastic carry bags, the thickness of plastic carry bags has been increased from 50 microns to 75 microns with effect from 30th September, 2021 and further to 120 microns with effect from 31st December, 2022.

PM Modi launched the global Lifestyle for the Environment (LiFE) Movement, on World Environment Day – 6th June, 2022. It advocates living a lifestyle that is in tune with our planet and does not harm it. This concept was first introduced by our Prime Minister during the 26th United Nations Climate Change Conference of the Parties (COP-26) in Glasgow in 2021. It was here that he also pledged to cut India's carbon emissions to net zero by 2070 apart from reducing the total estimated carbon emissions by 1 billion tons from 2021 to 2030 and get 50% of its energy from renewable resources by 2030.

Conclusion

Just a month into the ban, it is to be seen how effectively the government manages to implement this bold initiative! The problem here is the glaring lack of feasible alternatives to plastics. Why don't we consider imposing taxes that will deter the production or use of single-use plastics? Why aren't there any tax breaks, subsidies and other fiscal incentives to encourage sustainable and reusable alternatives to single-use plastic products? Why don't we push for circulating the same plastic in the economy as long as possible? ▶



Professor **DR. GANAPATI D. YADAV**

National Science Chair (SERB/DST/GOI)

is a chemical engineer, inventor and academic, known for his research on nanomaterials. He is currently the Emeritus Professor of Eminence at Institute of Chemical Technology, Mumbai. He has served as the Former Vice Chancellor & R.T. Moody Distinguished Professor, and Tata Chemicals Darbari Seth Distinguished Professor of Leadership and Innovation at the same institute. The Government of India awarded him the fourth highest civilian honour of the Padma Shri (2016) for his contributions to science and engineering. In 2022, he was elected member of the United States National Academy of Engineering.

Q In your point of view, what environmental issue will require the most attention in ten years?

If there is no technological interference, then the people are facing issues brought on by technological advancement. Another technology must address any issues that one technology causes. It needs to be kept in mind that by 2025, there will be around 8 billion people on the planet, and the amount of waste these individuals will produce is guesstimated to be around 1.4 to 6 kilogram per standard. In waste management, seminars and webinars, the concept of Green Design is consistently being discussed.

The European Union has incorporated the really broad terminology of Green Design, which includes discussions around the recovery and recycling of plastics. Also discussed regularly are technologies that help make treatment of plastics extremely efficient. However, the topic of conversation that is most commonly discussed is the utopic idea of a 'zero waste' society. To build a 'zero waste' society, technology has to become the backbone which will go a long way to drive and make the concepts of Zero Waste and a Circular Economy a reality.

When this plastic was first developed in the 1950s and 1960s, Billy May saw plastics as the perfect replacement for paper that originated from the bark of trees. Given that the creation of plastics did not involve the cutting down or destruction of trees, it was thought to be the most ideal substitute. As the years passed, the thickness of these plastic bags, wrapping, and other items decreased to miniscule levels giving birth to the concept of 'Microplastics'.

In the initial years, products made from Single-use plastics or SUPs were given away for free. In the later years, this became a fast-growing problem as people would use and throw these products. The thought of reusing or recycling these products never even entered the minds of the people leading to high levels of waste and pollution.

People began to sit up and take cognizance of the seriousness of this issue only when this high level of built-up waste spilled over from the land into the waters of the sea and the ocean. There is no denying that people should be encouraged to continue using plastics, but instead of SUPs, use multiple-use plastics that can be easily and completely recycled and reused. For this, the multi-use plastics need to be built of a specific thickness for people to be able to use it and re-use it many times over.

To deal with the rapidly increasing problem of plastic pollution and climate change in our country, the Central Pollution Control Board has banned the use of SUPs starting July 1, 2022. However, this in my opinion is nothing more than a knee-jerk reaction and a short-term solution.

It's a common misconception that all biodegradable plastics contain oxygen. Actually, there is no oxygen in the plastic bag. As a result, it doesn't decompose, but what happens is that the microorganisms also add oxygen to the plastic's bio. And that is how the degradation starts.

Q Are certain plastics worse than others?

Most people are not aware that firstly there are multiple grades of plastics, nor do they know the

difference between the different types of plastics. Different plastics have unique physical/chemical properties and are assigned different codes for identification & recycling. There are seven different kinds of plastics each having their own resin code. Of these, PET bottles, punnets, etc. are easy to collect and segregate.

Symbol	Resin Type	Common Products
	PET Polyethylene Terephthalate	Water bottles, Soda bottles, Peanut butter jars
	HDPE High-Density Polyethylene	Milk jugs, 5 gallon buckets, Shampoo bottles, Laundry detergent containers
	PVC Polyvinyl Chloride	Vinyl, Tubing/pipe, Siding, Auto product bottles
	LDPE Low-Density Polyethylene	Laundry baskets, Bread bags, Squeeze bottles, Plastic film
	PP Polypropylene	Yogurt containers, Amber-colored pill bottles, Coffee cup lids, Straws, Kitty litter buckets
	PS Polystyrene	Styrofoam cups, solo cups, Egg cartons, To-go containers
	Other	Toys, Sippy cups, CD/DVDs, Lenses

Technology is the only solution to fight pollution. For instance, rubber pollution, like plastics pollution, occurs in various environments and originates from a variety of sources, ranging from the food industry processing chain to tire wear. Synthetic and natural rubber dust and fragments now occur in food, airborne as particulates in air pollution, hidden in the earth as soil pollution, and in waterways, lakes, and the sea. Activated carbon filters are installed in the rubber plants for the treatment of solvents or Volatile Organic Compounds (VOC). Such technological advancements are needed to combat plastic pollution too.

Q The packaging industry generates a significant amount of hazardous waste. What measures do you think the sector should take up to control plastic pollution?

The earth's ecosystems, on which we depend, are impacted by plastic packaging, which is extremely inefficient. About 32% of 78 million tons of annual plastic packaging production is dumped in our oceans, according to a World Economic Forum (WEF) report. And around 43% of plastics manufactured is used for packaging and most of it is single use, as estimated by The Energy and Resources Institute (TERI).

The worst material for recycling is tetrapak since it contains three different types of materials: paper, metal and plastics. Paper that has been recycled eventually ends up in the trash, but PET can be reused. Further, he mentioned that the technology that is required to recycle metal, paper and plastics all at once is cumbersome. Paper is more harmful to the environment because it is made from the trees that have been cut down. Paper is therefore not environmentally beneficial. Therefore, any manufactured product should only contain one material because that improves its recycling potential. Moreover, dumping materials into the open environment makes them harmful.



INTERNATIONAL HONOUR – Professor G. D. Yadav Elected as Fellow of the National Academy of Engineering, USA

Q Which in your opinion is a better alternative to single use plastics - glass, aluminium or PET?

Testing a substance's durability can reveal the ideal substitute for single-use plastic. Since people do not believe in reusing carry bags, the idea of single-use plastic is problematic. Glass is not environmentally friendly. Glass requires a temperature of well over 1600°C. These extreme temperatures leave large amounts of carbon footprint. The production of glass requires huge amounts of sand and water which dangerously affects the balance of the natural ecosystem. Water required approximately per annum for washing glass (20-liter bottles) x 50 lakh x 12 months = 120 crore litres. On the other hand, metal is heavy, contaminates the environment, and pollutes the economy. Metals like tin also consist of a thin polymer coating for preventing them from rusting. These coatings are made from polymers that contain BPA. The only logical action is to recycle plastics. PET plastic can be recycled entirely and therefore, it can be the most suitable option to replace single-use plastics.

Q What contribution do you think citizens can give to rescue the globe from the debt of the climate crisis?

Even though the climate problem can seem overwhelming, we urgently need all hands on it right now. People can lower emissions significantly and increase their resilience to climate change through collective action. Kids in schools need to be taught recycling from the start. Every time we recycle, we save our

environment a little more. In India, there is no penalty for littering items. Stricter norms are the only solution to save Mother Earth. Citizens don't hold themselves responsible for their actions. Every citizen is going to be under the trap of an upcoming environmental crisis; therefore, everyone needs to address the issue on their end first. There is a need to advocate for behaviour change among the masses.

Q What do you think is the biggest challenge in plastic waste management?

Plasticslinger in the ecosystem for such a long time. It is durable and can withstand the elements for hundreds or perhaps thousands of years. Additionally, they have been poorly maintained for years, which has led to the intrusion of used plastics into every ecosystem on the planet. The idea that "Plastic needs to be thrown out" needs to be disproved. The knee jerk reaction by the government in increasing the taxes for the import of the raw materials for plastics is not a wise course of action.

Q How do you think the concept of circular economy can be applied to curb plastic pollution?

By design, a circular economy is reparative and regenerative. In a "closed-loop" system, materials flow continuously as opposed to being utilized only once before being discarded. In the case of plastics, this entails maintaining the economic worth of polymers while preventing their escape into the environment. A Circular Economy is an optimal solution. Solar Energy, Wind Energy, and Hydrogen Energy are like the trinity of the environment. Energy should essentially be recycled. Those in the general economy must use it once more. The circular economy is predicated on reuse and recycling. There might be limitations on the product's lifespan to encourage recycling. The best thing is chemical recycling. Achieving the target of Net Zero by 2025 is possible with the use of the concept of circular economy.

Q What are your future plans and goals for your commitment to sustainability?

I am working on a green hydrogen project. In 2022, carbon dioxide will be taken into consideration, up from 412 PPM in 2020. The end of the planet will occur in 2050 when carbon dioxide levels reach 2000 PPM. We will have coal-based carbon plants till 2050. In the circular economy, solar, hydrogen, and wind energy are crucial. Therefore, there is a need for incentivization of the technology, as no one technology can assist in combating climate change alone.

Q How can we convince people to adopt environment-friendly solutions and how can we make them aware of the climate crisis?

Our planet is our home and the source of our sustenance, but we are interacting harmoniously with the environment. It appears that people have chosen a road of self-destruction, killing the very place that provides us a sanctuary. Whether we are in the manufacturing or service sectors, we should use the media to convey our knowledge. It should be done as a social service. It is necessary to increase awareness among children. The universe should profit from the acts of policymakers. ▶

AFTERWORD



Pyush Misra
Trustee,
Consumer Online Foundation

We are Eating, Drinking and Breathing **MICROPLASTICS!**

“Plastic pollution is a very visible issue. But it is what we cannot see that is ringing alarm bells of impending doom! Yes, I am talking about the bane of microplastics that make up most of the plastic waste that is infesting our oceans, our environment and even our bodies!”

— says *Pyush Misra*



Microplastics have been termed as a 'plastic time bomb'!

MODERN LIFE IS saturated with plastics. This omnipresent material marks everything from our appliances and electronics to furniture and clothing to tyres and paints to food packaging and pharmaceuticals. It is used everywhere from kitchens and bedrooms to offices and hospitals.

The world is fixated on curbing the use of plastic items like bags, straws, wrappers and more. Clean-ups focus on clearing plastic garbage from our roads and beaches. We are gripped by the menace of plastic items polluting our oceans that either strangle the marine population or accumulate in their stomachs.

This encompasses all the plastic that we can see. But what about that which we cannot see or even perceive?

Indeed, plastic is generally split into two categories: macro and micro plastics. Macro plastics are the visible pieces larger than 5 mm, the debris of which is usually found in garbage dumps, gutters, beaches and on surface water. On the other hand, microplastics comprise of pellets and granules smaller than 5 mm that are not readily seen and thus, do not receive as much attention either!

Microplastics can be made intentionally – like microbeads that are added to cosmetic and body care products for exfoliation in facial scrubs or glitter in makeup. Miniscule bits of plastic are also present in detergents, paints, cleaning products, pesticides, fertilisers, nappies, menstrual pads and even medicines

and toothpastes. They are also used as infill material on artificial sports pitches.

Apart from this, microscopic fragments slowly erode from plastic items like car tyres while synthetic microfibrils shed from clothing. Invisible specks of plastic shear off every time we microwave food in plastic containers. Studies show that babies swallow millions of microplastic particles every day along with the milk from plastic bottles!

A 2016 study cited by Water World states that more than 700,000 microscopic plastic fibres could be released into the environment during each cycle of a washing machine!

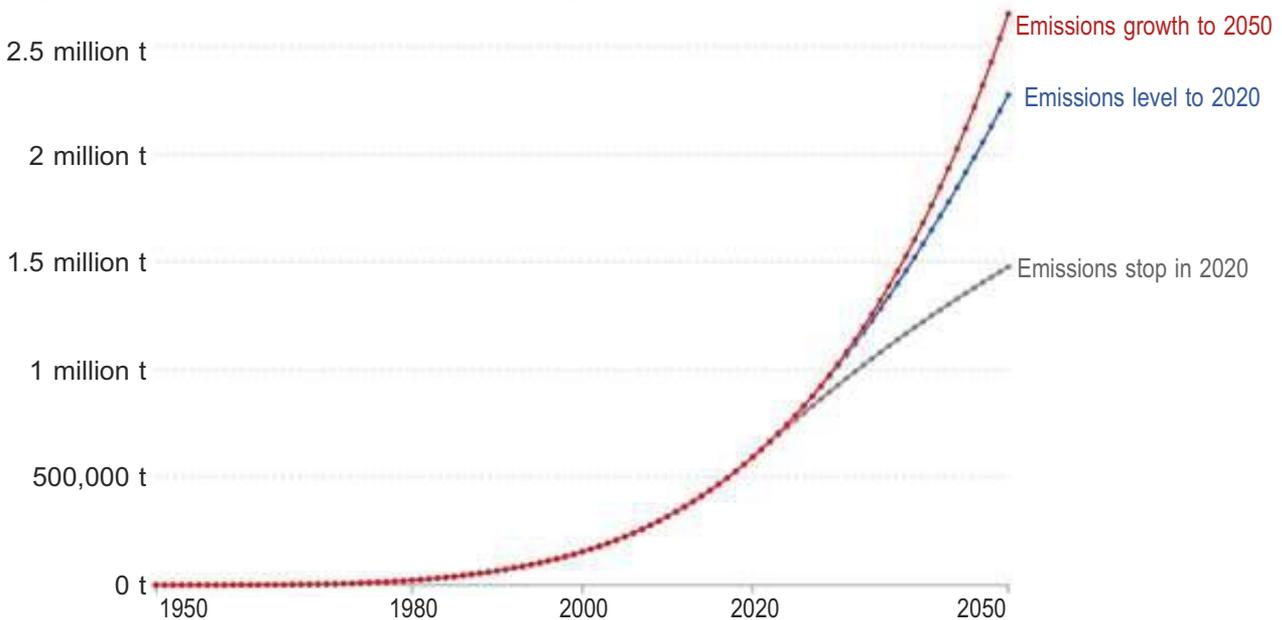
Another 2019 study on Marine Microfiber Pollution estimated that 1.5 million trillion microfibrils were present in the oceans around the world.

A study of particular exfoliant products found that between 4,500 and 94,500 microbeads are released per use.

To add to this, everything from discarded bags, bottles and fishing nets to food packaging and other debris break down into smaller and smaller particles due to the constant action of sunlight, wind and waves. Even the microplastics themselves keep breaking down and refuse to degrade completely, thus constantly raising the microplastic levels around us. The tiniest fragments are termed as nanoparticles – smaller than 1 micrometre – that are impossible to collect or clean up.

Microplastics in the surface ocean, 1950 to 2050

Microplastics are buoyant plastic materials smaller than 0.5 centimeters in diameter. Future global accumulation in the surface ocean is shown under three plastic emissions scenarios: (1) emissions to the oceans stop in 2020; (2) they stagnate at 2020 emission rates; or (3) continue to grow until 2050 in line with historical plastic production rates.



Source: Lebreton et al. (2019). A global mass budget for positively buoyant macroplastic debris in the ocean. CC BY

1950 ○ ————— ○ 2050

Once released in the environment, microplastics swirl around on the land and in the sea. They have spread throughout the water column and make up 95% of the plastics in the ocean. Scientists have found microplastics everywhere they looked - from the highest peak of Mount Everest to the deepest trough of the Mariana Trench. They are present in the Arctic snow, are falling with rain and keep drifting around in the air. Microplastics get stuck in fish gills and enter the digestive tracts of animals.

Latest research by German researchers published in the journal 'Environmental Pollution' in June 2022 reveals that, on average, 50 microplastic particles and fibres in one cubic metre of water were found in the near-surface water of the Indian Ocean.

A Diet Full of Plastic

Plastic microfibers have been detected in various items of human consumption - shellfish, shrimp and mussels apart from table salt, honey and beer that end up on our dinner table. Even the municipal drinking water systems are not free of the microplastics.



Therefore, we end up ingesting the micro and nano particles of plastic in several ways - orally through water, consuming food products containing microplastics, through the skin via cosmetics and also inhaling the plastic permeating the air. Therefore, we could easily be consuming more than 100,000 microplastic specks each day from different sources!

We were worried when microplastics were found in more than a hundred aquatic species. Now they are accumulating in our organs and have been found in our lungs, livers, spleens and kidneys. A study detected microplastics in human faeces while another found it in the placentas of newborn babies.

Polymer particles have infused our bloodstream too! In March 2022, a team of scientists from the Netherlands found microscopic particles of plastic in 80% of blood samples. Half of the 22 anonymous healthy adult donors had PET plastics (generally used in drinking bottles), a third contained polystyrene (used for packaging of food and other products) and a quarter had polyethylene (used to make plastic carrier bags).

It goes without saying that chemical pollutants and other contaminants present on the microparticles are delivered to the animal and human bodies that ingest them. It has also been ascertained that microplastics can reduce feeding, cause poisoning and increase mortality.

The full extent of the impact on human health is still unknown. There is, however, substantial evidence that toxic chemicals associated with plastic, like methyl mercury, plasticisers and flame retardants, enter the body and are linked to health concerns. Moreover, the microplastics can even absorb and retain harmful substances from the environment. The nanoparticles can even enter our cells and tissues, the effects of which can

range from disrupted cell activity to hormonal imbalance to organ damage.

Researchers in Germany are warning that the impact of microplastics in soils, sediments and freshwater could have a long-term negative effect on such ecosystems. They say terrestrial microplastic pollution is much higher than marine microplastic pollution – estimated at 4 to 23 times higher, depending on the environment.

Small Actions are Not Enough

Many countries have enacted or proposed bans on the intentional use of microplastics in certain consumer products. However, all intentionally-added microplastics are not covered, at times even when well-known alternatives already exist.

Conclusion

Microplastics may be harder to see, but the problem is growing constantly. The question is will we let the world drown in microplastics? ▶

Can We Recycle Our Way Out Of The Plastic Mess Overburdening the Earth?

It is much harder to get rid of plastic than to create it. While we have to be mindful about recycling plastic, simply giving the plastic we have used for recycling does not make us 'environment-friendly' consumers. There's a lot more we need to know and be cognizant of....

PLASTIC IS EVERYWHERE today and it is here to stay! Alas, the plastic we release into our environment does not go away. It wreaks slow havoc in multiple ways - leaching toxic chemicals into the soil and groundwater, choking or poisoning animals who unwittingly ingest it and impinging on our health too.

Fortunately, public consciousness has moved to a place where we neither want to exhaust the fossil fuels nor pollute the planet anymore. Yet, despite the best efforts, it is quite unrealistic to expect people to avoid all forms of plastic in their daily life.

Globally, about 420 million tonnes of new plastic is produced every year (Our World in Data: Nov 2020) and more than 14 million tonnes of plastic waste leaks into the oceans. The Great Pacific Garbage Patch - located between California and Hawaii - is the largest concentration of ocean plastic waste. It measures around 1.6 million square kms or three times the size of France. If things continue like this, by 2025 there could be 1 ton of plastic for every 3 tons of fish in the ocean.

After we drink a cup of coffee, the coffee is over, but the cup itself isn't. It will be around for centuries, breaking down into smaller and smaller particles and forming highly toxic microplastics.

Can Plastic Waste be Disposed in an Efficient Manner?

The current options for handling plastic waste and keeping it out of the ocean or other unintended destinations are - landfills, incineration and recycling.

Landfills are nothing but open pits in most countries and the poorly managed dumping ends up polluting the surrounding environment. Even the well-managed ones do produce greenhouse gases or leach into the soil and waterways. Incineration or burning of plastic releases toxic emissions that pollute the air and contribute to climate change. Even when incineration is integrated with 'Waste to Energy' solutions for energy recovery (burning plastic waste instead of fossil fuels to generate energy), the net impact on greenhouse emissions is usually negative.

Recycling involves reprocessing the plastic waste into functional and useful products. This is by far the best option from an environmental perspective as it involves the lowest energy use and global warming potential. Moreover, recycling will not only curb plastic pollution but also reduce the pressure on virgin materials for manufacturing brand new plastic products.

Merely A Figure Among Ciphers

Yet, recycling is not a magic pill that can allow us to buy and use as much plastic as we want sans any guilt. The

A triangle formed by three circling arrows is the universal recycling symbol. The number in the triangle (ranging from 1 to 7) indicates the type of plastic. At times, it is replaced by a solid triangle as a generic indicator of recyclability.

fabric of recycling as we know it now is full of loopholes and limitations that allows plastic to continue to impinge on the environment.

Not all plastic is recyclable - Plastic is divided into seven different categories based on their polymer groups, properties and recyclability. This plastic recycling code system (resin identification code or RIC) was developed by the Society of the Plastics Industry, Inc. (SPI) in 1988 to standardise the materials used in different plastic products. It has been adopted almost universally and is being administered by ASTM International (a standards organisation) since 2008.

Most producers voluntarily mark their plastic products based on the polymer content and recyclability at the point of manufacture. This is typically listed on the bottom or side of the product to facilitate easy identification and recycling/disposal.

Generally speaking, 1 is the easiest to recycle while 6 and 7 are considered mostly non-recyclable. To be more specific, 1, 2 and 5 are considered recyclable. So, keep in mind that plastic bags cannot be recycled. Even straws are too flimsy to recycle. These things just end up in landfills or in the local environment.

Challenges in Recycling

All plastics cannot be recycled together: Even the plastics that can be recycled have to be

sorted based on their type as different polymers cannot be recycled together. However, many items have multiple

Of the 7 billion tonnes of plastic waste generated globally so far, only around 9% has been recycled! According to the Organisation for Economic Co-operation and Development (OECD), we are recycling less than 20% of all plastics while more than 80% remains at large in the environment.

The Ellen MacArthur Foundation reports that more than 40 years after the launch of the first universal recycling symbol, just 14% of the plastic packaging used globally is recycled, while 40% ends up in landfills, 14% is incinerated and 32% remains in the ecosystem.

Therefore, very little of the plastic we discard every day is recycled!



We cannot allow plastic to build up in the environment - but recycling is not the perfect solution by a long shot!

layers of different plastics and other materials – like chips packets, shampoo sachets and food containers - with each layer serving a particular purpose. It becomes too costly and time-consuming to separate and recycle the thin layers that have been stacked tightly together.

That's not all. At times, even items of the same polymer type can prove to be incompatible based on their additive content. Indeed, plastics also contain stabilisers, fillers and dyes; therefore, they have to be sorted based on their polymer type as well as colour to make them suitable for recycling. Clear plastics are preferred while black and strongly coloured ones are avoided as they discolour the products.

Just because a plastic has the recyclable sign, it does not mean it will actually get recycled! It can be rejected because it is a composite product or simply is of the wrong colour.

Dirty plastic cannot be recycled: Plastics that have food or other residue inside are not accepted as they contaminate the recycling stream. Therefore, it is crucial to wash and clean them before disposal. Even the labels and inks have to be removed completely, else they will show up as impurities in the recycled plastic and will be suitable only for low value applications. While some recycling units wash the products multiple times before recycling, most others simply throw away the dirty items.

It is very likely that something that is given for recycling can still end up in a landfill or incineration facility.

Recycling is expensive: Generally speaking, it is cheaper to produce new plastic products than to recycle existing plastic. It becomes economically unfeasible in the case of poorly sorted and contaminated plastic loads. These are directly discarded by the recyclers.

Recycled products are mostly inferior: New plastic is always more fresh and durable compared to recycled products. Both manufacturers and consumers prefer the better quality products. Moreover, some virgin material has to be added every time plastic is recycled to improve its quality.

Recycling is quite unorganised: In India, collection and segregation of waste plastic is mostly relegated to the unorganised sector. Waste pickers collect discarded plastics from roadside bins and dumps and pass them on to an informal network of scrap dealers and aggregators who separate the recyclable materials. This almost never includes flimsy plastic packaging. (as it has little or no commercial value).

Though around 60% of our plastic waste is recycled, it is mostly unorganised and downcycled. The recyclers lack the scientific rigor and technical competence to convert them into high quality plastics for mainstream use. They mostly use inferior quality recycling machines which can potentially make plastic toxic.

“The governments need to acknowledge the informal sector, by creating awareness and educating them on the importance of their work. Providing training and assistance along with directives/standards for operation and facilities for collection of the recycled plastics as they can penetrate in areas where the formal sector struggles or does not have the reach. They are the unsung heroes of our country.” - *Ashish Agarwal, Secretary, Recycle India Foundation, Kolkata*

Looking Ahead

We need to work on two fronts - improving recycling technologies and creating a market for recycled materials. Conventional recycling follows a mechanical process of sorting, cleaning, shredding, melting and remoulding. Each melting cycle breaks down some of the polymer chains, thus degrading the quality of the plastic in terms of tensile strength and viscosity. Moreover, the quality of the recycled item is constrained by contamination and sorting challenges.

Therefore, while we assume that the same piece of plastic can be repeatedly recycled infinite number of times, it actually becomes unusable after around 4 to 6 cycles and will end up in a landfill or incinerator. This kind of recycling merely delays disposal and cannot avoid it completely!

Moreover, most plastic is downcycled – wherein high-quality plastic is repurposed into new plastics of lower quality that are both weaker and cheaper – like plastic bottles to carpeting or fleece fibres. This further decreases the life of the plastic as it will have to be disposed after one to two recycles itself. Therefore, recyclers have to look to remake plastic into items of equal or greater value or

'upcycling'.

In the revolutionary approach of feedstock recycling, waste plastic can actually be chemically stripped down to its initial form – read, oil - which can then be used to produce fresh plastic. Another benefit of this 'infinite' recycling system is that it can accept all kinds of plastics! Chemical recycling is being trialled across the globe, but it mostly remains commercially unviable on account of the excessive energy consumption and capital costs.

While recycling has a skewed approach right now, the market for recycled products is no better. Manufacturers, companies and governments are committing to recyclability, but both the economics and demand remain very weak. Therefore, plastic producers have to not only commit to designing recyclable products, but companies also have to pledge to using recycled products.

This will make the vision of a closed-loop and circular economy a reality, thus stemming the tide of plastic waste in the environment.

Conclusion

We are on a downward spiral with dysfunctional systems of recycling. The amount of plastic that is collected and recycled definitely needs to be improved. But what needs more attention is the quality of the recycling and the resulting secondary plastic! ▶





Payal Agarwal
Editorial Consultant

Inventive Answers Driving Towards a Sustainable Future

“We have been chasing the tail of plastic pollution since many years. However, there are still ongoing endeavours that are trying to come from behind and catch up with the colossal plastic waste monster before it swallows up the entire planet! Every small step counts here....”

– says *Payal Agarwal*

**ROADS BUILT BY
REUSING PLASTIC WASTE**

*Never Say Never – Inventive Options are
Being Developed to Beat Plastic at its Own Game!*

THE WORLD HAS been overrun by plastics to the extent that we are nearing an irreversible tipping point. According to the first global analysis of all plastics ever made by Science Advances (peer-reviewed journal published by American Association for the Advancement of Science), humans have produced around 8.3 billion metric tons of plastic, that too, most of it in disposable products. Of this, a whopping 6.3 billion metric tons has become plastic waste that is accumulating in the landfills or is moving around in the environment as litter. If present trends continue, by 2050, there will be 12 billion metric tons of plastic in landfills. The study further reveals that half of all plastic manufactured becomes trash in less than a year.

In India itself, about 26,000 metric tons of plastic waste is generated each day.

The fact remains that we just cannot live without plastic. However, we cannot allow it to threaten our food security, our health and the entire ecosystem anymore. Bans proliferate the globe as a rash reaction to curbing the gargantuan mess. According to UN tallies as of July 2018, 127 countries have adopted regulations regarding plastic bags, 27 of which have also banned other single-use products including plates, cups, cutlery or straws. Their actual effectiveness is another story altogether as plastic use and abuse continues to be rampant across the globe.

The real answer rests in innovative solutions for both reducing plastic usage and putting the plastic waste to better use.

Creative Ways Of Dealing With Plastic Waste

Rather than tossing out used plastic and mindlessly adding to the waste,

Nothing New is a sustainable sneaker brand – it saves 160 gallons of water (compared to traditional cotton canvas sneakers) by making them with 5.6 plastic PET bottles instead. Everything that goes into making the sneakers, right down to the lace and label – uses recycled plastic and hence the name 'Nothing New!' Adidas also uses plastic recovered from the ocean for the upper parts of some of their shoes and clothing like jerseys.



“About 6 bottles are being recycled to make a T-shirt, 6 bottles to make a bodysuit, nine bottles to make a sleepsuit, five for a legging and nine for a dress, PET is just as good as virgin polyester, but takes fewer resources to make.”

Anjana Pasi, Founder and Director of MiniKlub, a kidswear brand

new methods of using them are surfacing by the day.

- Clothing and footwear brands are incorporating recovered plastic in their merchandise. Recycled plastic fibre is being used to manufacture garments, thus reducing carbon emissions by 54% and energy consumption by 50%. Not only does this save 27 litres of water per piece, but it also proves to be better and more sustainable than 100% virgin polyester.

With the tagline, 'From Plastic to Fantastic' Alcis Sports (sub-brand of Paragon Apparels) is creating waves in the world of sportswear and athletic gear. Wondering why? Almost 50% of their apparel is made from recycled plastic PET bottles! Not only this, the company's technology makes the garments breathable, anti-sweat, anti-odour and extremely light as just 86 gm per piece on average.

The Indian cricket team's apparel for the 2015 World Cup was made from recycled PET bottles and their current jersey is made from the same material!

- Imagine plastic waste literally paving smooth and long-lasting highways for a bright future! It was way back in 2002 that Rajagopalan Vasudevan – a scientist and chemistry professor - first used plastic as a binder in gravel. He

states that every kilometre of 'plastic road' saves 3 metric tons of carbon dioxide (compared to incinerating the same plastic waste). Since then, more than 6,000 miles of roads in India have incorporated 'asphalt' made of plastic waste. Many other countries have started using this eco-friendly technology as well.

- Reusable building blocks – called Eco-Bricks – are being made using empty plastic bottles filled with clean, dried and single use plastics. They serve well for making tables, beds, stages or even walls.
- Plastic is also used to make benches, chairs and other furniture, especially for outdoor use, apart from mugs, buckets and other such items of daily use. A bus stop was made with used plastic bottles in a core metal frame.

Popular skincare brand, Nivea has taken the Plastic Pledge that it will use only refillable, reusable or recyclable packaging by 2025. This move will halve its use of virgin plastic! More of the ingredients and formulations will also be recycled to extend their life.

Additionally, startups are developing proprietary washing technology for cleaning the plastic waste of adhesives, inks, labels and other product-related contaminants so that it can be recycled into almost virgin quality plastic. Apart from this, they are also working on recovering the water that is used in the process.

Online Food Delivery Platforms Leading the Charge

Ordering food on Swiggy and Zomato apps has made life so easy and convenient. But do we ever pause



and think about the oodles of plastic wrapping that comes with the food we order? Not to mention the amount of plastic boxes used in every order.

These online food aggregators are themselves having second thoughts about the huge plastic footprint on account of the quantum of plastic used by their restaurant partners. Zomato came up with the 'Don't Send Cutlery' option in 2017 and made it the default setting on its app. This may seem like a small move, but 74% orders actually went without disposable cutlery which would have ended up in landfills!

Swiggy launched 'Swiggy Packaging Assist', a marketplace that provides access to a variety of packaging solutions for restaurant partners, including eco-friendly ones. And many of the restaurants made the switch to green packaging options. Swiggy took up the Extended Producer



**Mr. Trash Wheel
in action**

UK has developed the Azure barrier that uses durable, tide-sensitive booms to direct plastic to extraction points along the bank. Netherlands has the ground-breaking Great Bubble Barrier - a wall of bubbles which gurgles across the water pushing plastics larger than 1mm aside while allowing fish and other marine life to pass unharmed.

Floating drones are also being deployed across rivers and seas for collecting the discarded plastic trash.

Then there is the Interceptor – a larger version of the Trash Wheel – that is working to rid the oceans of plastic a bit at a time. The trick is to catch the plastics before they break down into microplastics and become impossible to recover from the water column in the open ocean!

“From now on, every meal you order through Zomato will be 100% plastic neutral, which means we will voluntarily recycle more than 100% of all plastic utilised in your order's packaging. We have started working with cutting edge ISO-certified plastic waste management organisations, who will partner with municipalities across India, to collect and responsibly process plastic waste.”

- Deepinder Goyal, Zomato Founder and CEO

Ditching Plastic for Better Alternatives

We live in a plastic-filled world where avoiding it is a formidable challenge. In this scenario, ingenious minds keep striving to come up with economically viable alternatives to plastic bottles, plastic packaging and other single-use plastics.

Disposable crockery is being designed from plant residues like tomatoes, peppers, straw and grass that can no longer be used for other purposes. Then there is the fun element of edible spoons that use different flours, spices and flavours so that they can actually be eaten after use!

Conclusion

These are but a few examples, there is a lot more happening in the plastic waste use, plastic recycling and sustainable plastic alternatives space. People are brimming with new and innovative ideas. But we still need more research and new technology to prevent plastics from leaking into the ocean, to overhaul or recycle the recovered waste and to develop new methods of using plastic waste. Only then can we even hope to tilt the scales in our favour once again! ▶

Responsibility (EPR) for 100 tons of plastic a month and planned to increase it manifold.

Zomato is not to be left behind and has been working on supporting restaurant partners in switching to affordable, sustainable and yet, high-quality packaging alternatives. In April 2022, it pledged to go 100% 'plastic neutral' for its deliveries while setting the target to deliver more than 10 crore orders in sustainable packaging over the next three years.

Small Steps....Big Solutions

There are projects for collecting plastic debris from inland waters before they reach the oceans on the one hand and systems for cleaning the oceans on the other. Inventive technologies are being used for this purpose – there are litter interceptors such as Mr. Trash Wheel in USA that uses a conveyor-belt system powered by currents and solar energy, to pick up plastic waste like cups and food containers.

Kagzi Bottles is India's first paper bottle made of compostable paper waste. This sustainable solution has become possible through the innovative use of natural materials. The biodegradable bottles can be used to store shampoos, conditioners and hand washes, etc. Not only do they not contain any plastic, the unbelievable part is that they are still cheaper than plastic bottles!



“One person uses an average of seven plastic bottles per month only for toiletries. Kagzi bottles could be an alternative for all types of packaging, not just toiletries but beverages, liquids and powders too,” says founder of the sustainable startup, **Samiksha Ganerwal**.



Adithya Chaudhary
Policy and Communications
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Shivya Kanojia
Policy and Communications
Professional



Leading the Charge for Helping the Future Generations

HUMANS DEVELOPED USES for plastic but looked at this from a very narrow lens without giving a thought as to where all this used plastic will end up. Today, plastic pollution has become a global pandemic and has not only found its way into landfills but also into lakes and oceans. According to a 2018 article in *Down to Earth*, India contributes about 16.5 million tonnes of the 300 million tonnes of plastic waste¹ produced per year globally. Despite government laws, around 40% of this material winds up in landfills or sewers.

However, there is a small but growing group of businesses and individuals that are upcycling plastic garbage to creative and useful use, while the rest of the world goes about its business unaffected by what is a serious problem. Although these warriors are trying to develop ground-breaking solutions that appear straightforward and simple to use, they face several obstacles. However, these handful of people continue on their mission undeterred and keep taking small steps in the right direction. These so-called plastic warriors are working unceasingly to transform and enhance the environmental conditions of the country.

One such example in India can be seen in the southern city of Bengaluru where waste plastic is being used to pave roads. The waste plastic has been salvaged from the city's rubbish which in hindsight is now as precious as gold. Since 2002, the company responsible, KK Plastic Waste Management has used this waste plastic to pave over 2000 km of roads in Bengaluru extending the normal lifespan of these roads by at least two years if not more.

KK Plastic currently runs a plastic reuse/recycling plant in Bengaluru that can process up to 30 metric tonnes of plastic per day. It is the only business with an exclusive patent method for reusing plastic waste as an additive in the construction of roadways. The technology has undergone extensive research, for which the company closely collaborates with government research institutions. The next time you cruise along the streets of Bengaluru, consider the recycled plastic garbage driving your wheels.

Dinesh Parikh and Sachin Sharma, a Delhi-based team and founders of GEM Enviro Management, identified a gap between the dearth of materials available at recycling facilities and the overflowing landfills, and began an attempt to turn abandoned plastic products into useful objects in 2013. The organisation enlisted the help of an organised group of rag pickers to collect the waste plastics. This has allowed these rag pickers to earn significantly more money thanks to this straightforward approach, which in the process reduced over 1.4 lakh carbon dioxide emissions.

The task wasn't simple. GEM Enviro Management had to work hard to persuade corporations to part with their leftover plastic before mobilising an army of workers to gather this plastic garbage. The next step was to sort out

the plastics before turning them into fibre to produce sustainable products.

Plastic pollution is a major challenge both in our neighborhoods and in communities all around the world. According to statistics² mentioned in *National Geography*, almost 8 million pieces of plastic waste enter our oceans every single day. These waste items eventually find their way into wildlife, which may then find their way into humans. Even while everyone acknowledges that plastic pollution is a serious issue, there are only a few who make enough progress to address it. To remedy this problem, there exist a few 'Waste Warriors' who are working tirelessly to save the universe from what is looking like an impending environmental crisis.

Globally, women make up a sizable portion of the informal waste sector. This is frequently ignored, and seen as bringing shame to their families because of the job they undertake due to their passion for making a difference. Two strong ladies who are currently fighting against plastic pollution are:



Upcycling plastic waste into graphite provides possible alternative to landfills

Priyanka Tiwari, who was raised in Delhi but was born in Rajasthan. Priyanka relocated to the village after marriage where the lack of a proper management structure and functionalities left her unimpressed with the surroundings. The challenges included improper waste management, faulty drains, and a lack of crematoriums. During the 2021 Panchayat election, Priyanka nominated herself for the position of sarpanch and was successful in winning the election.

After taking her oath as Sarpanch, Priyanka banned plastic in the Panchayat of Rajpur and began giving out cloth bags to store owners, street sellers, and homes in the village. Those caught using plastic bags were fined Rs. 500 for the first time and Rs. 1000 for their second offense. The license for the shop would be revoked if they persisted in breaking the restrictions. Within a year of her appointment, Priyanka has spearheaded the look of her village and has earned her Panchayat Rs 9 lakh as part of the Chief Minister's Award. As a Sarpanch, she is looking to put these funds to good use by building a reverse osmosis water plant.

¹<https://www.thehindu.com/brandhub/plastic-recycling-the-only-answer-to-plastic-pollution/article61633316.ece>

²<https://www.nationalgeographic.com/environment/article/plastic-pollution>

Vani Murthy, the 60-year-old homemaker-turned-changemaker who goes by Worm Rani on Instagram, is inspiring youngsters to compost and manage waste sustainably in urban spaces through her short and informative videos. She became a founding member of the Solid Trash Management Roundtable (SWMRT), Bengaluru, which places the responsibility of waste management on the residents, after learning about composting from wet management specialist, C Srinivasan during a workshop in Vellore. Even legal action was taken to enforce Bengaluru's requirement for garbage segregation at the source. The composting queen has spent an incredible effort to connect with youth and motivate them through her initiatives.

Numerous obstacles stand in the way of India's progress. Solid waste management is one of the serious issues that requires attention. In India, the current method of waste management entails the collection of waste from sources using a community collective bin system, followed by transportation to a low-lying landfill system with intermediate Municipal Solid Waste processing (MSW). The practise of open dumping is causing a number of issues, including pollution and health risks. Waste Management is a major problem which needs to be addressed and Vani Murthy has left no stone unturned to resolve the issue.

Tech entrepreneurs Amita Deshpande and Nandan Bhat left their comfortable professions five years ago to create 'Aarohana Ecosocial', which hires rural women to weave recycled plastic into products like file covers, home decor items, totes, and yoga mats. One Aarohana beach bag is made from approximately 50 little plastic carry bags, and the company's creators estimate that since August 2015, they have recovered approximately 776,500 bags. The pair now intends to approach more tribal communities in Maharashtra to encourage employment by offering to teach them the weaving techniques necessary to produce their higher-end goods.

Being a warrior is not easy. It's a hard life - on some days you have to pick up garbage that you may have dropped, dig through trash bags you have already thrown away, walk barefoot through dumps, and carry large loads of recyclables. These warriors are generating employment in addition to assisting the earth in escaping the grip of the climate crisis. Not only in India, where there are millions of trash workers, but also in many other nations throughout the world, where many more people earn a living by doing this every day.

According to a report³ published by The Hindu, recycling could increase employment by six times and result in cost savings of over Rs 14 lakh crore, or about 11% of India's yearly GDP, by 2030. Plastic is recycled at a rate of 60% of the 62 million tonnes of solid garbage that our nation produces annually, with the informal sector performing the majority of this work.

Polyethylene Terephthalate (PET) is a food grade plastic, used the world over for food and pharma packaging has the highest rate of recycling, with 95 per cent of PET products being recycled. According to a report⁴ published by The Hindu, the recycling sector in India directly or indirectly employs up to four million people. It is one of the best ways for money-making for people ranging from garbage pickers to recycling units, because plastic, especially PET bottles, attract high recycling prices.

The issue is not plastics. However, more thought needs to be given to the management of plastic trash, a problem that is currently being severely addressed throughout the world.

Nobody could have predicted how plastic would transform our lives a century ago and what it has led to due to the mismanagement of the waste being generated. In conclusion, there is no doubt that the world will offer thanks and gratitude way into the future for the wars fought by this ferociously devoted group of plastic warriors! ▶

³<https://www.thehindu.com/brandhub/plastic-recycling-the-only-answer-to-plastic-pollution/article61633316.ece>

⁴<https://www.thehindu.com/brandhub/plastic-recycling-the-only-answer-to-plastic-pollution/article61633316.ece>

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Dr. Alka Mukne
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Can we Turn Off the Tap on Plastic Packaging in Food and Drugs?

“The use of plastic in food and pharmaceutical packaging has been under the scanner for years. Before banning plastic packaging completely, the alternatives have to be viewed through the lens of safety and feasibility.”

– Dr. Alka Mukne

THERE IS NO time to lose anymore as plastic can very well end the world! And from a sustainability point of view, the most prominent yardstick of the extent of our plastic usage is the packaging.

Hence, there have been several calls for doing away with plastic packaging in the pharmaceutical and food industries in an attempt to curtail the huge toll of plastic waste on the environment. Most of this is single-use plastic which is used just once and thrown away.

According to Life Out Of Plastic (LOOP), they have an average useful life of 12 to 15 minutes and yet can take up to 500 years to disappear. Accordingly, there is a rising demand for innovative and sustainable solutions that will not have an adverse impact on the ecology.

However, eliminating plastic from packaging can be dubbed as a Pavlovian response as it plays a crucial role in both sectors. We cannot even gauge the quantum of loss, wastage and contamination of food if it is not packaged, that too right from harvest to retail counters to final consumption. While metal, glass and paper/fiber are used to some extent, food is primarily packed in plastic. And it is packaging that preserves the food thus increasing its shelf life even as it protects from pest and disease thus ensuring food safety. To top this, recent estimates from Zero Waste Scotland suggest that the carbon footprint of food waste generated can be higher than that of plastic!

Cucumbers wrapped in plastic film can last for 14 days as compared to unwrapped ones that last for only 3 days. Selling grapes in plastic bags/ trays has reduced their in-store wastage by 20%.

Pharmaceutical formulations like tablets, capsules, syrups, drops and sprays are commonly packaged in plastic. The prominent criteria here is materials that will neither alter the efficacy/stability of the formulation nor render it toxic. This is why plastic, glass and aluminium are the preferred packaging systems in the pharma industry. However, the latter two prove to be unfeasible due to factors like expense, fragility, weight, non-flexibility or lack of resistance to changing weather conditions. Plastic on the other hand is not only free of these restrictions, but PET, HDPE and PP polymers have also been established as safe by multiple studies, scientific testing and regulatory approvals. Even the National Green Tribunal (NGT) declared that the use of PET bottles for packaging of pharmaceuticals is safe. What's more, they can be recycled for non-medical and non-food applications too.

When it comes to introducing new sustainable alternatives in pharmaceutical packaging, can we sacrifice efficacy of the medicine till the date of expiry at the stake of environment-friendliness?

Is Recycled Plastic a Safe Option?

While there is such a hue and cry about banning plastic packaging and lack of sustainable alternatives, recycled

plastic cannot be used for packaging food and pharmaceuticals either, at least not in India.

The Food Safety and Standards Act of India (FSSAI) had banned the use of recycled plastic or newspaper for packaging food items in 2018. Even the Plastic Waste Management Rules, 2016 state that carry bags or other products made of recycled plastic shall not be used for storing, carrying, dispensing or packaging ready to eat or drink foodstuffs. This was propelled by concerns around the quality of recycled plastic given that used plastic has over 4000 legacy chemicals which can easily migrate to the food.

However, in September 2021, the FSSAI proposed to allow the use of recycled plastics as food contact materials. This move immediately came under intense fire by scientific experts who were vehement that, "majority of the recycling industry in India uses recycling machines of inferior quality which could possibly make plastic more toxic..... Specific standards for plastic recycling have also not yet been set in India, so it will be difficult to understand the recycled plastic's composition, and continuous recycling (could backfire) if quality degrades too far or more toxins are produced."

It should be noted that countries that permit recycled plastic in food packaging hold the manufacturers responsible for ensuring that the recycled product is of



suitable purity. Some countries permit chemically recycled plastic to be used only in parts that do not come into direct contact with food (like multi-layer structures). Many other countries are conducting studies to gauge the safety of recycled materials in food contact materials.

Following the uproar, this year, the FSSAI issued an update to the draft amendment mandating that all recycled plastics used need to adhere to national standards. It included details like the acceptance criteria for using food upgrade recycled PET resin material in bottling or packaging operations. The industry still needs further guidelines on aspects like source of the plastic waste, type of polymers that can be used, food materials that can be packaged, temperature that the packaging can be subject to while in contact with the food and so on.

It is not just about toxic chemicals in recycled plastics. Even virgin plastic can contain bisphenols (BPA being the most popular) and phthalates that leach into the food and play havoc with the body functions.

The prudent approach is to opt for recyclable plastic in the packaging and ensure that it is collected, sorted and reprocessed in an efficient manner.

The Other Options Are....

What the world needs is green or sustainable packaging solutions that use manufacturing techniques and packaging materials that do not harm the environment. New options like plant-based packaging using corn starch, sugarcane and cassava and 'tree-free' ones made of hemp, recycled cotton fibre and sugarcane board are entering the market, but they are extremely limited right now.

All of them are not always sustainable either. As Prabir Das, Head, Packaging Tech Services, OSD, Mylan Laboratories, stresses, "Many people think that cellulose or paper-based materials are better over plastics. However, we need to remember that we destroy more greens to get cellulose or paper and use more energy and resources to convert them in usable form. Product safety and security is also compromised with such materials..... So, a balance is required while choosing an alternative."

What is even more important is to optimise the materials we already use by cutting down on the use of unnecessary and extra plastic packaging wherever possible. For instance, Aurobindo Pharma implemented measures like reduction in size and wall thickness of the bottles as well as downsizing pack sizes which diminished material consumption by 80%. Therefore, the trick is to use plastic packaging sparingly and effectively.

In a similar vein, the prudent approach is to opt for recyclable plastic in the packaging and ensure that it is collected, sorted and reprocessed in an efficient manner. For this, we need to establish more guidelines for Extended Producer Responsibility where manufacturers are required to pay for the collection and recycling of waste their products become.

"Packaging is necessary. We can't do without it. But, it's what we do with the packaging after we have used the contents. That is what is important, and in what way can we reduce the impact on our natural resources. The World Packaging Organization sees a future without waste. Those who are producing the packaging, must take responsibility of recovery and recycling. The world can't afford another Great Pacific Dump." - **Professor Pierre Pienaar, President, World Packaging Organisation at PPL Conclave 2021 held by Express Pharma**

Conclusion

Plastic is indispensable in the healthcare and food industries. While the current trend of over-packaging is definitely questionable, it will be imprudent to do away with plastic packaging altogether, at least until other innovative and effective alternatives are developed. A working mechanism with all stakeholders should be developed to come up with rational solutions. ▶

"From user industry perspective, I strongly believe that future belongs to those who innovate on principles such as think beyond, make simple and value addition." - **R Chandi Prasad, Head, Packaging Development, Aurobindo Pharma**



Ryan A. Marshall
Policy and Communications Professional

Economic Opportunity for **PLASTICS RECYCLING** in India

REUSE
REDUCE
RECYCLE



AS A NATION, India is taking great strides and developing rapidly. However, as is always the case, with the good comes the bad, and so along with increase in development comes a fast rise in generation of waste. Waste in India like the rest of the world is either solid waste, automobile waste and/or plastics waste. According to the Central Pollution Control Board (CPCB), more than 34 lakh tons of plastic waste was generated in 2019-20 and 30.59 lakh tons in 2018-19.¹ The data also shows that India's plastic waste generation has more than doubled in the last five years with a year-on-year increase of 21.8%.

The most efficient and effective way to deal with this mountain of waste is through segregation and recycling. Recycling plastics waste is the recovery of different categories of plastic materials that can be remoulded into other forms for reuse. India today is definitely witnessing an uptick in the level of plastics recycling which is being driven largely by the growing consciousness of people to try and use sustainable options for all things possible. This has also forced organisations to focus on using materials that can be easily recycled especially in the categories of plastics. Another important reason for the increase in the recycling of plastics waste is due to its ability to be used in multiple industrial applications like automotive interiors, product packaging, food and beverage packaging, pharmaceutical packaging and even in electronic components to name a few.

While plastics recycling maybe increasing in the country, there are still several barriers that need to be overcome. For starters, not many are aware of the various grades of plastics and how each grade has its own unique characteristics and degradation process. To a lay person, all plastics are bad, and this is purely due to the lack of information and awareness. The next issue is that Recycling of plastics is largely informal and done by ragpickers who will often collect only that kind of plastics that pays them the most. While recycling has improved by leaps and bounds across the world due to the adoption of technology, in India, plastic waste is still sorted manually by hand. The lack of the implementation of technology leads to inefficiencies and inconsistencies in the entire process.

According to our Hon'ble Vice President, M. Venkaiah Naidu, "The growth rate of the plastics recycling market in India is projected to be 6.5% (Y-o-Y) and is expected to touch a market size of US \$53.72 billion by the end of 2023". He also stated that more than 30,000 plus plastics processing units have provided employment to well over four million people in the country. Also, with the average level of consumption being close to 12KG, India stands amongst the top 5 consumers of polymers worldwide².

As of June 2021, the United Nations Development

Programme's (UNDP) Plastic Waste Management Programme in India has helped to process 83,900 metric tonnes of plastic waste. The Programme has set a target to recycle over 85,000 metric tonnes of plastic waste across more than 50 Indian cities by 2024.³ According to a study carried out by the Federation of Indian Chambers of Commerce and Industry (FICCI) and Accenture in 2020, India is assumed to lose over \$133 billion of plastic material value over the coming next 10 years until 2030 owing to unsustainable packaging out of which almost 75% of the value, or \$100 billion, can be retrieved⁴.

Growing support from the government in countries like China, India, Brazil, Southeast Asia, and European nations to promote the use of recyclable plastic products is a step in the right direction for these markets. India in particular has banned the use of Single-Use Plastics since July 1, 2022. During the time of COVID-19, the global market for Plastic Recycling was estimated to be around US\$33 Billion in the year 2020 and is expected to reach a revised size of US\$47.3 Billion by 2026, growing at an impressive 6.1%⁵.

One of the most recyclable, reusable Plastics is Polyethylene Terephthalate or PET. The world over recycled PET has replaced virgin PET when it comes to the manufacturing of packaging bottles due to government regulations on virgin PET. Recycled PET is also widely used in the manufacturing of fibres, furniture, and carpets.⁶ In India alone, recycling can create six times more jobs and generate around ₹14-lakh crore of additional cost savings by 2030, which equates to around 11 per cent of our annual GDP⁷.

As a country and given how India is walking down the path towards becoming 'Aatma Nirbhar', the potential for reuse and recycling of products has never been higher. However, there is an urgent need for a more comprehensive policy and simplification of existing regulations to establish a formal ecosystem and 'ease of doing business' for recyclers⁸.

A change in mindset is needed to shift human behaviour and in India, formal training and incentivization needs to be given to over four million kabadiwalas and rag-pickers to efficiently transfer sorted waste to the recyclers. These rag-pickers should be supported with a minimum wage, given an official identity, and trained on environmentally safe scrap-handling practices. This will allow a mental shift in the rag pickers themselves which would improve their social standing in society and with some government assistance move up the ladder to become recyclers. This will then serve to highlight the economic opportunity for plastics recycling in India and be the epitome of the true rags to riches entrepreneurial journey in this so-called uneconomic sector. ■

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The Spectre of Plastic Pollution

Both the omnipresence and volume of plastic usage is a cause for huge concern. Plastic has infiltrated the most remote and pristine regions of the planet. The debris is affecting the environment, the economy and mankind on varied levels. We take a look at what consumers have to say about this pervasive issue.



WHILE THE WORLD continues to badger plastic, we cannot deny the valuable role it plays across varied aspects of our life. Alas, the same properties that make plastics so useful — durability and resistance to degradation — is making it difficult to manage. Yet, we cannot blame plastic alone. It is our lifestyle of convenience that is the crux of the problem as we have literally become addicted to single-use plastics. So, why not find solutions to this issue rather than completely taking plastic out of the equation?

– **Nikhil Nayak, Chhattisgarh**

Humans are drowning in plastics and we are poised to take the planet down with us! We have brought this colossal threat on our heads and it is our actions alone that can save the environment. Why don't we stop using plastic that is unnecessary? All of us together can help tackle plastic pollution simply by changing the way we use plastics. Every piece of unnecessary plastic that is re-used will prevent centuries of potential environmental harm!

– **Shradha Sonthalia, Hyderabad**

Plastic is made from fossil fuels. It also contains an assortment of synthetic organic polymers and additives that give each plastic product its unique properties. This brings its own benefits but is laced with issues that make plastic a key environmental concern. What we need is an approach that will motivate and support

consumers in choosing sustainable products.

– **Samar Naadir, Aurangabad**

While most of us keep cribbing about the problem of plastic pollution, there is a next generation of heroes that are coming up with promising solutions to the crisis. Exciting innovations are on the anvil. A growing number of young activists are also taking a stand in light of climate change. Will we join the tribe and do something or simply cower from the wolf that is pawing on our front door?

– **Edlyn Dias, Goa**

Plastic has an almost constant place in our lives. It is almost impossible to find something that does not come wrapped in plastic! Food wrappers, plastic bottles, plastic grocery bags, etc. are littering everything from our roadsides to the beaches to the mountain tops. The world is waking up to the problem. Governments, industry and other stakeholders are starting to act on some level or the other. Many people also want to make a difference, but unnecessary plastic is still being forced upon us!

– **Sandeep Jones, Thiruvanthapuram**

I want to say just one thing on the matter of plastic pollution - Is it so difficult to change our habits, our behaviour and our lifestyle? There are so many things we can do if we put our mind to it!

– **Daljeet Singh, Amritsar**

UPDATE ...



Moving a Step Ahead

Update on the June edition on

Promoting Safe and Quality Healthcare:

ACCREDITATION THE WAY FORWARD

(WorldAccreditationDay 2022)

#WAD2022 - Accreditation and Conformity Assessment Bodies to Find Solutions For Global Issues

THE NATIONAL ACCREDITATION Board for Certification Bodies (NABCB) and National Accreditation Board for Testing and Calibration Laboratories (NABL) together commemorated World Accreditation Day 2022 on 9th June with a physical event in New Delhi. Centred on the theme of 'Accreditation: Sustainability in Economic Growth and the Environment', the aim was to explore how accredited conformity bodies can support eco-friendly practices and policies.

All stakeholders involved with accreditation and conformity assessment – from conformity assessment bodies, regulators, government organisations and assessors to industry bodies and consumer organisations – were invited to join the celebration. Eminent speakers from government and regulatory bodies spoke on accreditation, sustainability, conformity assessment and Sustainable Development Goals during the event with a focus on the sustainability in economic growth and the environment.

NABCB even organised a #WAD2022 quiz competition as a run-up to the event which received an overwhelming response.

NABL also conducted Qualmacon in the second half on the day. This is a conclave for personnel responsible for the quality management system in their respective organisations in the field of testing and calibration.

It is hoped that accreditation will go a long way in supporting in achieving the global goals! ▶

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PROMOTING SAFE AND QUALITY HEALTHCARE

ACCREDITATION THE WAY FORWARD

INTERVIEW
Padma Shri Prof. (Dr.) Mahesh Verma
Chairperson-NABH

RESEARCH FEATURE
Creating an Ecosystem
of Quality in Indian
Health Care

#WorldAccreditationDay
9th June, 2022

PLUS ROUND UP • MY MARKET • THE PRESCRIPTION

25 QUALITY COUNCIL OF INDIA
GCI Creating a Foundation for Quality

NABL NABCB

WORLD ACCREDITATION DAY 2022

09 JUNE 2022
09 AM to 01 PM

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India Habitat Centre
Institutional Area,
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For more info
<https://www.qcin.org/>

Accreditation: Sustainability in Economic Growth & the Environment

Use Accredited Conformity Assessment Bodies
A step towards AatmaNirbhar Bharat

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www.ilac.org

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YOUR OPINION MATTERS

We are truly humbled by the praise and acknowledgment that is flowing in from varied sources. Please feel free to send in your comments, views or feedback on The Aware Consumer magazine at bejonmisra@theawareconsumer.in – we will publish your opinions and implement your feedback while ensuring that your voice is heard on the right platforms.

Letters to the



(June issue: Promoting Safe and Quality Healthcare: Accreditation The Way Forward)



I am glad to note that the overall format of the issues of Aware Consumer is improving every time. Here, the interactions with Padma Shri Prof. Dr Mahesh Verma, New Chairman of NABH are very informative. He has

correctly pointed out the hesitance of Hospitals to come for accreditation.

– **Ashok Madan, Delhi**
• akmadan.idma@gmail.com



The health section of Aware Consumer, a renowned publication for those involved in consumer affairs, is a fantastic resource for the most recent information about medical advancements. After reading it, I realized that one can locate well-written articles examining research that is trending and be the first to know the newest research findings in the field of healthcare. I highly appreciate the team's efforts in providing such thorough coverage of the NABH segment.

– **Sanjay Singh, New Delhi** • sanjay.nbqp@qcin.org



The current issue of The Aware consumer is appropriate for present scenario of the health care system. Content is also good and able to present the views properly. I am wishing that further issues will also focus on the needs

of the health care system.

– **Dr Anubha Srivastava, Varanasi**
• hianubha27@gmail.com



One word, Enlightening!

That is exactly how I felt, after reading through the magazine. I have never come across such an engaging, well written and equally well researched magazine, Period. The comprehensive articles and stories told in this publication are informative as well as easy-to-read through!! I can now say that I have a good understanding of NABH and the Indian Healthcare Industry in general.

The magazine helped me understand the importance of Quality and Accreditations in the context of the Healthcare sector as well as the necessity of a National Accreditation Body like NABH! The infographics and statistics in the magazine really helps in getting a clear visual of the topics discussed and the various projects and functions of the NABH!! I highly recommend everyone to read through this at least once!

– **Mohit V Ahirwar, Delhi** • mohitahirwar7@gmail.com

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WATCH OUT

for the next issue in September dedicated to
“Improving Accessibility and Affordability in
Renewable Energy for Consumers”

A symbol that ensures Patient Safety & Quality of Healthcare



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