

Voice of Environment

Newsletter

Special Issue on
World Environment Day

Beat **PLASTIC** Pollution



Volume 01, Issue 02



Improving Waste
Management



Phasing Out
Microplastics



Reducing Single-Use
Plastics



Promoting Research into
sustainable plastic Alternatives

July, 2018

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Message

I have come to know that a Newsletter with Special Issue on Beat Plastic Pollution is being brought out by enthusiastic and committed youngsters. Such an effort is really needed to make people aware about the amount of plastic we use in our daily life and after they lost their utility due to wear and tear, they are just thrown as garbage. They would have been piled up more had there been no rag-pickers in the country, who help them to recycle and earn something.

The number of plastic bottles used for drinking water, cold drinks and juices is piling up as an Everest of plastic. What is required is gradual replacement of the plastic use in daily life such as use of paper, jute and other biodegradable material. I would say that my generation and the generation before mine have done nothing in this direction and we are sorry to leave behind the burden of this non-biodegradable waste for you to face the consequences.

Having realized this environmental problem of plastic waste by you people, we may see that there is still light at the end of this plastic tunnel. Let this Newsletter be a mission and vision for a less-plastic or plastic-less Mother Earth.

Best wishes,

(Dr. N. S. K. Harsh)



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Message

It is really, "ENOUGH IS ENOUGH " in all places as plastic and other non degradable stuff used and littered indiscreetly littering on the streets, dumping in the sewage, waterways which all landed in the sea. Plastics are non-biodegradable, synthetic polymers derived primarily from petrofossil feedstock and made-up of long chain hydrocarbons with additives and can be moulded into finished products . These polymers are broken in presence of suitable catalyst, into monomers such as ethylene, propylene, vinyl, styrene and benzene. These monomers are then chemically polymerized into different categories of plastics. The estimated plastic waste (PW) generation in 25940 tons/day (based on per capita PW generation)

Indiscriminate littering of unskilled recycling/reprocessing and non-biodegradability of plastic waste raises the following environmental issues:-

- During polymerization process fugitive emissions are released.
- During product manufacturing various types of gases are released.
- Indiscriminate plastic waste disposal on land makes the land infertile due to its impervious nature.
- Burning of plastics generates toxic emissions such as Carbon Monoxide, Chlorine, Hydrochloric Acid, Dioxin, Furans, Amines, Nitrides, Styrene, Benzene, 1, 3- butadiene, CCl₄, and Acetaldehyde.
- Lead and Cadmium pigments, commonly used in LDPE, HDPE and PP as additives are toxic and are known to leach out.
- Non-recyclable plastic wastes such as multilayer, metalised pouches and other thermoset plastic poses disposal problems.
- Sub-standard plastic bags, films etc. pose problem in collection and recycling.
- Littered plastics give unaesthetic look and choke the drain.
- Garbage mixed with plastics interferes in waste processing facilities and also cause problems in landfill operations.
- Recycling industries operating in non-conforming areas are posing environment problems due to unsound recycling practices.

The estimated plastic waste (PW) generation in 25940 tons/day (based on per capita PW generation)

It is appreciable initiative by Voice of Environment in dedicating the 2nd issue of the news letter on central theme "Beat Plastic Pollution" as adopted by UN for this year's World Environment Day.I am sure that the aforementioned news letter will bring in focus the problems and solutions of plastic pollution.

My best wishes to Editor and contributing authors contributing in the aforementioned Newsletter.

Ashok Ghosh

From the Editorial Desk:

Happy summer folks!

At the outset, let's ponder on a pertinent question asked by Sir David Attenborough while we debate whether the summer on this part of the world is happy or lethal. Sir David Attenborough, legendary British broadcaster and naturalist remorsees, *"We've seen albatrosses come back with their belly full of food for their young and nothing in it. The albatross parent has been away for three weeks gathering stuff for her young and what comes out? What does she give her chick? You think it's going to be squid, but it's plastic. The chick is going to starve and die."*

Plastic is a necessary evil of current times. It is literally woven into the very fabric of our lives. However, poor management of plastic waste is burying us in every corner of our blue planet right from the shores of Arabian Sea to the tropical paradise of Hawaii and the Pacific Islands, from cloud masked mountain peaks of Kilimanjaro to the Great Barrier Reef along the coasts of Australia. Our understanding for various negative impacts of plastic pollution is increasing and there is an elevated level of mass awareness in current times. The central themes of this year's Earth Day and World Environment Day are based on curbing the menace of plastic pollution across the globe. Recent researches and case studies point to the fact of deleterious effects of plastic pollution. A sperm whale found dead on the southern coast of Spain was killed by 29 kilos of plastic in the stomach. Autopsy reports reveal the presence of plastic bags, fishing nets, ropes and a jerry can within the intestine of the poor animal. Plastic bags have been the principal cause behind the deaths of the sperm whales in the Mediterranean since few years. Post Mortem of around 29 sperm whale species around the North Sea coasts reveals the grotesque consequences of plastic fallout. These are the victims of our remorseless progress. Legendary broadcaster and naturalist Sir David Attenborough discusses the grave issue during the portrayal of groundbreaking documentary, 'Our Blue Planet'. More than eight million tonnes of plastic reaches the sea every year. There will be more plastic than fish in the sea by the year 2050 and 99 per cent of the planet's seabirds will have eaten some. Humans are already eating plastic from the sea too. The average person who eats seafood swallows up to 11,000 pieces of micro plastic every year, according to a study by researchers at the University of Ghent. As Prince Charles puts it at a recent Our Ocean summit, *"Plastic is very much on the menu"*. It is our global responsibility to take out plastic off the menu card else eventually we all would die of different types of cancers and health issues by the end of the current century. As the leading daily Independent reports and I quote, 'Almost 80 per cent of the 8.3 billion metric tonnes of plastic produced over the past 70 years has been discarded into landfill or the environment, including the ocean.' Billions of people across the world and especially in the third world countries are drinking water contaminated with plastic and its' residues. The plastic thrown away since the 1950s will eventually form a layer sedimentary rock detectable by future generations. "The good news is that there are things we could do right now to stop this plastic scourge" said Greenpeace spokesperson Louise Edge. She called on companies to set a date for reducing the number of single-use bottles they produced, and asked consumers to use less plastic. In India, we are facing the menace of plastic pollution too. Our rivers are shrinking and floodplains are choked with plastic wastes. From Barak valley in Assam to river beds along the Ganges, from Himalayan valleys up north to the mighty rain fed rivers in the South, we are up, close and personal with the crisis. It is a nothing short of a national disaster and we must tackle the problem right now. *"The good news is that there are things we could do right now to stop this*

plastic scourge” said Greenpeace spokesperson Louise Edge. Ms Edge also called on companies to set a date for reducing the number of single-use bottles they produced, and asked consumers to use less plastic. ‘Swachha Bharat Abhiyaan’ and ‘Namami Gange’ initiatives introduced by Government of India soulfully dedicate to bring out sustainable solutions to this burning issue. The recently introduced ‘Swachha Bharat Internship programme’ by Ministry of Human Resource and Development (MHRD), GOI also tries to seek solutions to the issue by involving college and university students to deal with the emerging environmental issues. In this critical juncture, it is the duty of all budding environmentalists to create mega awareness across different societal levels to address the issue of plastic pollution. Strict rules, laws and regulations are in place but what lack is the implementation. India has banned all forms of disposable plastic in the capital; New Delhi and surrounding NCR but such measures do not attain sustainability due to lack of public awareness. National Green Tribunal (NGT) is deeply concerned with the issue of plastic pollution in biosphere. Every day, Indian cities generate 15,000 tonnes of plastic waste—enough to fill 1,500 trucks, at 10 tonnes per truck—of which 9,000 tonnes are collected and processed/recycled, while the remaining 6,000 tonnes, or 600 truckloads, usually litter drains, streets or are dumped in landfills, according to a January 2015 assessment report of the Central Pollution Control Board (CPCB). About 66% of plastic waste is mixed waste—polybags and pouches used to pack food, mainly from residential localities, the CPCB report said. India generates 5.6 million tonnes of plastic waste annually, and the country accounts for 60% of plastic waste dumped into the world’s oceans every year, estimates suggest. Three of the world’s ten rivers which carry 90% of plastic to the world’s oceans are in India—the Indus, the Ganga and the Brahmaputra, according to an October 2017 article in Environmental Science & Technology, a global journal. As of initial months of 2018 most of Indian states has banned plastics but it continues to choke waterways, landfills and air. The need of the hour is to be more organized and take the movement against plastics to the grassroots of the society. Voice of Environment is carrying forward a nationwide campaign to ban plastics. Recent awareness campaigns have been organized in famous Maa Kamakhya Temple in Guwahati, Assam to make the premises completely plastic free. Similar initiatives are carried in Kidzee School in Beliaghata, Kolkata- a premier playschool chain. Environmentalist Mr. Moharana Choudhury along with Assistant Professor Mr. Joystu Dutta highlighted the problem of plastic pollution during the publish of their jointly authored papers recently. More such awareness activities are in pipeline. Nationwide plastic ban and usage of alternatives to plastics such as cotton bags, jute gunny bags, and paper bags should be used in accordance with CPCB guidelines. We need to create role models and it should happen right from the top. If the secretariats, government offices and universities go plastic free, automatically a positive message would be further carried forward across all sectors. Voice of Environment and its’ entire team vows to make our planet beautiful again. Together, we Can and Will make the planet plastic free!



Photo Courtesy: Mr. Carmel Raju



Mr. Nilesh Singh Source: Internet

Plastic - A paraphernalia or paralysing paradigm

(Dr. Subhadeep Bhattacharjee)

I still recollect my childhood days when my parents used to go shopping with their jute or cloth bags. And I am not so old that I am talking about 1950's. It was just two decades before in early 1990's. After that an angel in disguise appeared in our society. That was none other than plastic. Suddenly all other materials of our household substances and daily commodities, which were previously used to be made of cloth, jute, wood, leather or even metals - started getting replaced by this "Angelic" matter. All of us were as ecstatic at the beginning as finally we found something, which is so durable, long lasting, waterproof and affordable to our pockets as well. Nevertheless, somewhere behind the screen the devil was feeling amused in our addictive behaviour towards this new utopia. Then comes the new millennia and the usage of this saintly matter reached its pinnacle.

A study by the European Union showed that the global production of plastic and plastic made materials was 1.5 million tonnes per year in 1950's, which became 322 million tonnes in 2015. Therefore, in just 65 years, the production of plastic and plastic based components was augmented almost 215 times. As per the factsheet of Earth Day Network, this amount of plastic produced in a year is roughly the same as the entire weight of humanity. For manufacturing plastic or plastic based substances, we need fossil feedstocks, large quantity of water and prolonged supply of electrical or thermal energy whereas these substances take more than 1000 years for breaking down into smaller fragments. Therefore, virtually every piece of plastic that was ever made still exists in some shape or form in the environment and it would take several generations of human to get rid of their hostile existence. Every day, worldwide, five to 13 million tonnes of plastic are being exposed into the terrestrial and aquatic environment. In oceans, areas called gyres, which have strong currents facilitated by circular wind movement, pull in waste and become densely populated by a stagnant surplus of plastic. In some gyres, there is five times more plastic than zooplankton. In the sea and the ocean, plastics disintegrate into tiny pieces - micro-plastics, which are subsequently eaten by zooplankton, which are at the core of the marine food chain and thereafter fishes consume these plastic infected zooplanktons. Afterwards, by the processes of "Bio-accumulation" and "Bio-magnification", these toxic micro-plastics end up into our daily food along with the large to small fishes. Earth day Network also suggested that there is more micro-plastic in the ocean than there are stars in the Milky Way.

Intensity of plastic pollution can be realistically presented by usage by a single country as 500 million plastic straws are used every day in the United States of America, which is enough to circle the Earth twice (source: Earth Day Network; <https://www.earthday.org/2018/03/07/fact-sheet-end-plastic-pollution>). Similarly, an approximate quantity of two million (20 lakhs) single-use plastic bags are being distributed worldwide in every minute while one million (10 lakhs) plastic bottles are bought every minute globally whereas less than half of those bottles could end up getting recycled. In Asia, China and India are the two biggest production sectors of plastics. In India, a small number of big corporations keep deteriorating the environment by producing plastic products in order to accumulate their capitals. Their destructive actions affect the environment and health of all the citizens negatively in India. This whole process is referred as the second contradiction of capitalism. So, plastic is a bigger threat than the global warming in the immediate sense, considering it is snuffing out in the lowest common denominator in our day-to-day food chain. There is little we can do to clean the oceans, as for a comprehensive clean-up effort would

bankrupt any country, no point how much wealthy it can be. However, we can definitely make a difference to this scenario by changing our lifestyle and social behaviour to prevent further environmental destruction both in the terrestrial and aquatic systems. Therefore, ending plastic pollution is all about avoiding plastic in the first place and if we are unable to do so, reusing or recycling the material without tossing it into the garbage towards the landfill or onto the ground must be prioritized from every households and colonies / societies. We must keep this in our minds that all the plastics thrown by us in the garbage landfill would finally embark towards a polluting journey, by any means, of the land or ocean. Since, we have only one planet and one ocean system without any spare possible, simply “Refuse” or say “NO” to single-use and disposable plastics, such as bags, bottles, straws, cups, plates, silverware and razors in your daily life - if not for your own sake - then at least for your children and grandchildren’s sake.

About the author: Dr. Subhadeep Bhattacharjee is currently working as a post doctoral fellow in University of Johannesburg, South Africa. An alumnus of Forest Research Institute, Dehradun in the subject of Environment Management and PhD in Tiger Ecology from Wildlife Institute of India and Saurashtra University, Subhadeep has more than 12 years of working experience with government and non-government organizations.

Impacts of Recyclable plastics on Human health

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Background: The term “plastic” derived from the Greek word “Palstikos” which meaning is “fit for molding”. Earlier, plastic was developed by using the natural material with their plastic properties and called the “Natural plastics”, then chemically modified natural materials e.g. Rubber, nitrocellulose etc. and finally the chemically synthesized “Synthetic Plastics”. In this way, we have wide range of plastics from natural to synthetic.

The first man-made plastic was created in 1855 by British inventor & metallurgist, **Alexander Parkes**, who used the natural cellulose in combination with Nitric acid and chemical solvents and patented as “Parkesine”. He demonstrated his products in 1862 in London during the “Great International exhibition”. The first totally human made, completely synthetic plastic came about in 1907 when Belgian-born, New York based, **Leo Baekeland** used hydrocarbon chemicals derived from coal to create “Bakelite”, which came to be used in radio and television casings, kitchenware and even toys. In 1933, “Polyethylene” was discovered by **Imperial Chemical Industries (ICE)**. From the 1940’s onwards, a wide range of other plastics were made from plastics, natural gases and coals for various uses and new applications such as packaging plastics for drinking water and foods etc.

Chemically, Plastics are **polymers** (Greek word which meaning is “many parts”) which are basically substances or molecules made up of many repeating molecular units, known as **monomers** (Greek Word which meaning is “one part”). The monomers of hydrogen and carbon (Hydrocarbon) are linked together in long chains to form plastic polymers. The length and structural arrangement of the polymer chains in part determines the properties of the plastics. The Densely packed polymers can create rigid plastics whereas loosely spaced ones can lead to softer more pliable plastic.

However, the polymers alone rarely have the physical qualities to be of practical value, so most of the plastics contain various **chemical additives** to facilitate the manufacturing process or produce a particular desirable property such as flexibility or toughness. As we discussed, these chemical additives can be very problematic from a health perspective.

Health Impacts: As we are aware that the manufacture of plastic as well as its destruction by incineration pollutes air, land, water and exposes workers to toxic chemicals, including carcinogens. Here, focus has been given on those chemicals which is leached from the plastics in food, drinking water and beverages while packed in plastic and even showing the “**sign of recycle**” (the with the three chasing arrows it) on PET Plastic. The most harmful chemicals are **phthalates and bisphenol -A (BPA)** which are leaching in packaged drinking water and food from the PET plastics. These chemicals are hormone-mimicking, **endocrine disruptors and carcinogens**.

Bisphenol-A (BPA): BPA is a synthetic chemical and primary constituent of polycarbonate plastics and resins. It is created by condensing acetone and phenol and is chemically known as **4, 4-dihydroxy-2, 2-diphenylpropane**. Several millions tons of BPA are produced annually and it is estimated that the global market for BPA is expected to rise to 8.4 million tons by 2018.

It is a hormone or **endocrine disruptor** because it mimics hormones in particular the human **estrogen hormones** which are involved in normal cellular function, reproduction, development and behavior. Some scientific studies linked BPA to numerous health problems including chromosome damage in female ovaries, decreased sperm production in males, early onset of puberty, various behavioral changes, altered immune function, sex reversal in frogs, impaired brain and neurological functions, cardiovascular system damage, adult onset (Type-II) diabetes, obesity, resistance to chemotherapy, increased risk of breast cancer, prostate cancer, infertility and metabolic disorders.

Phthalates: Phthalates are the synthetic chemicals which are being used as plasticizer or as a solvent to dissolve and carry fragrances in cosmetics and personal care products. Chemically, it is derived from the **phthalic acid**, which is made from **naphthalene**, a famous moth killer. These phthalates commonly found in certain plastics such as Polyvinyl Chloride (PVC), Polyethylene Terephthalate (PET), Diethylehexyl phthalate (DEHP), Dibutyl phthalate (DBP), Benzyl butyl Phthalate (BBP), Diisononyl phthalate (DINP), Diisodecyl phthalate (DIDP) and Di-n-Octyl Phthalate (DNOP). As we are aware that these all forms of plastics are being used in our society, nowadays and annual global production of Phthalates is estimated to be about 11 billion pounds.

Phthalates can enter the human body readily through the skin by touch and by phthalates contaminated substances. Certain phthalates have been identified as reproductive and developmental toxins exhibiting **endocrine disruptor** similar to BPA. Certain phthalates interfere with **testosterone** and other masculinizing hormones found in males and females. Some scientists linked the effects of phthalates to infertility, decreased sperm counts, reproductive tract malformations, penis and testicular deformities and also to breast cancer.

Conclusions: All forms of synthetic plastic whichever recyclable or non-recyclable are harmful to the environment and human beings. Even some scientist suggested the use of Bisphenol-S (BPS) and Bisphenol-F (BPF) in place of BPA while few scientists linked these chemicals to hormone disruptor and under study. So totally avoid the use of plastic for the better environment for future.

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Title: Beauty and bliss of eco periods!

Context: Ms. Jis Sebastian is celebrating 2 years of plastic free Menstruation thereby reducing 288 sanitary pads going into landfill!



Picture Courtesy and Copyright:

Ms. Jis Sebastian, PhD. Scholar (Cochin)
Kerela, India.

Fight against Plastic Pollution

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As the theme of the World Environment Day 2018 “Beat Plastic Pollution”, the global communities shake hands to control the pollution caused by the plastic. Various programs would be launched and many mitigation and control measures would be suggested by the various organizations and agencies for this means, the author is sure that among these suggestions only 10%-20% will be run on the ground only for sometimes. If 30% of these suggestions would be properly implemented by the global community for a decade; the present plastic pollution scenario may check down up to 60%. There are two issues; first, without checking the production of plastics how it's possible to control plastic pollution? Mainly up to 80% plastic pollution contributed by the plastic bottles, wrappers and other packaging materials made up by plastics. If we focus on reduction of its production and replace it by the other alternatives, how it would be introduced to the environment. We have to think about the alternatives as well. We can use recyclable papers and card boards for this and where it's not practically possible the synthetic plastic may be used by decreasing its thickness to certain levels that is suitable for easy recycling and decomposition. An innovative action is the need of the hour avoiding unnecessary plastic packaging of various products.

Secondly, we need to observe the measures we are following as an alternative to plastics. We are mostly using papers as wrappers and pouches made by papers. The entire load for paper and pulp supply to the industry would come only on the forests. It will promote deforestation which would lead to many another environmental problems. To beat one plastic pollution, we are moving on such way that's responsible for total environmental degradation. Now where is sustainability and how we can look further for sustainable development and healthy environment? As in all environmental issues, main approach focuses on the contribution and awareness of society. If society will voluntarily come forward to check down the plastic pollution by avoiding plastic products, all issues would be resolved. There's need to stand up for the society at a large for this purpose by not only running awareness programs but also take society together on the way to achieve our global goal.

We have to make it sure that all the plastic introduced in the environment should come in the chain of recycling. There is a need of building a common consensus among global organizations, governments, local administrations and the producers and distributors along with users of plastic to avoid manage, recycle plastic to maintain the global sustainability.

We need to beat plastic pollution before it beat our 'Mother Earth'.

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Volunteer to an eco-friendly campus life

Bharati Patel

This year's World Environment Day has given a reason to pledge a way to beat plastic pollution in our daily life. Although we all (the thoughtful ones) are already practicing it much before the theme was declared, still we have options to explore for more. I will begin with a short conversation, on the event day when one of my colleagues opted for a beautiful green dress for a programme organised to mark World Environment Day. The dress colour selection for the event was based on the fact that greenery (colour green) is an indication of healthy environment. Although she missed to figure out that the dress she has selected is made with thermoplastic and other similar fibres. It was an impulsive act contrary to the theme. Mention of this conversation is not to target people who wear synthetic fabrics but it just a context which initiated thought cycles in my mind. Is green the only colour of a healthy environment. Does greenery everywhere indicated a healthy pH level for life? What is the colour of a healthy environment? How people presume presence of a healthy life conditions? Our environment is made up of many life sustaining elements, if we talk about the basic ones they are - earth, water, air, fire and ether. Green earth is surely an indicator of sustainable life conditions but same concept cannot be applied to all the elements. Air and water have their own colour which signifies purity, and it is our duty to maintain this purity to sustain life. The most problematic thing with plastic is disposal. We lack method to dispose it locally and the only option is dumping. The key practices to manage plastic wastes are reduction at source, reuse and recycling of plastic products, collective composting, incineration and dumping. In lack of proper waste management system the individual or collective waste is dumped out of residence, colony, locality, or on roadside. The major plastic wastes include carry bags, packaged food covers and sanitary napkins. The dumping is only accumulation but not disposal. The most common method of waste disposal is burning or incineration. Does it really dispose-off the waste? I feel it is mere transfer of waste products to soil and air in the form of pollutants which will be affecting more number of individuals. Despite being expensive it is adding diversity of pollutants to our environment. As far as possible we can practice reduction of plastic at source by using biodegradable products such as paper bags, cloth bags also biodegradable sanitary napkins. Recycling and reuse definitely has some limitations and can be done for limited products but must be done as far as possible and for maximum possible number. Collective waste disposal mechanism can reduce the multiple heaps of waste and will also help to channelize disposal system. Above all the responsibility to manage such system cannot be authorized to a person, group or administration. It is a voluntary activity and the foundation lies in an individual's choice. The responsibility starts at source itself, what we choose to use. To manage waste collective disposal is another option to manage waste at community level.

The theme says, "Beat Plastic Pollution" - if you can't reuse it, refuse it; when and where to refuse is our choice. We cannot stop plastic packaging everywhere but an initiative to reduce the use in day-to-day life will streamline living without plastics. We have some form of this hazardous article in every shelf, food to clothing. We can choose to wear biodegradable (natural) fibres rather than synthetic. While reducing the use of plastics in food packaging will take some time, we may reduce use of plastic and polystyrene goods and cutleries. Sanitary napkins and dippers are one of the hazardous synthetic wastes but there are biodegradable options available for that too, need is to make it choice. There is need to adopt the green alternatives and make it lifestyle. While we are

grooming young generation to keep surrounding clean and healthy we can also buckle up to present model - how to do.

About the author: Bharati Patel is a Research Fellow at JNTBGRI, Palode Thiruvananthapuram (Kerala)

Oh Plastic! Please Don't Stick To Earth

N. Ganga Vidya

There are tens of thousands of different kinds of plastics and its formulations. Plastics are omnipresent in helmets, cell phones, televisions, laptops, roofs, walls, flooring, food packages, and spectacles to slippers, paperclips to space ships, even artificial heart valve and other limbs. Plastics make possible many things people don't recognize as plastic at all - like paints, protective coatings and linings, adhesives and glues, and sealants and insulation. Plastics may be "organic" soft and flexible. Plastics have additives that make them bacteria/termite proof, fire-resistant, shatter resistant, give them a rainbow of colors, make them flexible, fill them with bubbles to make them better insulators; or even add fibers to make high-tech composites.

Then why do people despise plastic? Why are there so many enemies for plastic?

When all the above products is not of use immediately or not of use in its present form or not of use because it has taken a different form or if it has a time value or if it is precious, rare or is depleting in availability for some and is of no use to others then it is ascribed as 'Waste'. Effective waste management is important, the waste we create has to be carefully controlled so that it does not harm our environment and our health.

Plastic so stubbornly sticks to earth and does not disintegrate and earns a lot of enemies and a title POLLUTANT.

Type of litter	approximate time it takes to degenerate
Organic waste - vegetables fruit peels, leftover foodstuff, etc.	a week or two
Paper	10-30 days
Cotton cloth	2-5 months
Wood	10-15 months
Woolen items	1 year
Tin, aluminum, and other metal items used for cans	100-500 years
Plastic bags	one million years
Glass bottles	Undetermined

Source: <http://edugreen.teri.res.in/explore/solwaste/types.htm>

Plastic Pollution - Is there any way out?

Plastic pollution is a curse of modern times. This article is not interested in whining or complaining. This is meant to shift attitude. Here are a few points, which will help us to gain a collective shift in our society.

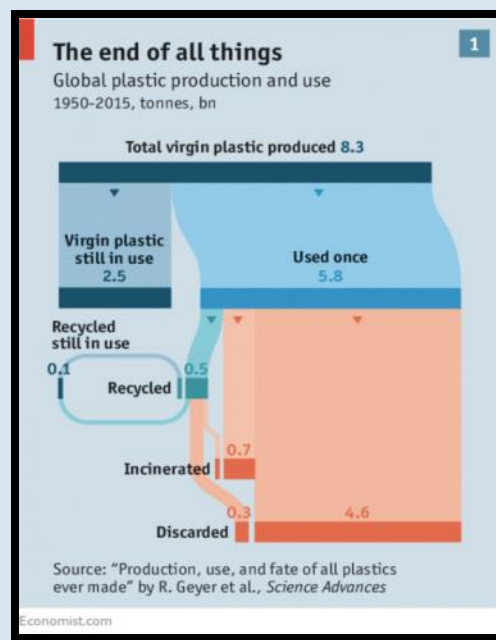
From this source site we get the following data to understand the pollution quantum in numeric terms. <https://www.sas.org.uk/our-work/plastic-pollution/plastic-pollution-facts-figures/>

In 1950, the world's population of 2.5 billion produced 1.5 million tons of plastic; in 2016, a global population of more than 7 billion people produced over 335 million tons of plastic. This is set to double by 2034. Humans buy about 1,000,000 plastic bottles per minute across the globe. It is estimated that 4 trillion plastic bags are used worldwide annually. Only 1% of plastic bags are returned for recycling. 500 billion disposable cups are consumed every year. Styrofoam cannot be completely recycled. Most of the Styrofoam disposed of today will still be present in landfills 500 years from now. Every day approximately 8 million pieces of plastic pollution find their way into

our oceans. There may now be around 5.25 trillion macro and micro-plastic pieces floating in the open ocean weighing up to 269,000 tons. A full 32% of the 78 million tons of plastic packaging produced annually is left to flow into our ocean which is equivalent of pouring one garbage truck of plastic into the ocean every minute. This is expected to increase to two per minute by 2030 and four per minute by 2050. By 2050, this could mean there will be more plastic than fish in the world's oceans.

All we can do is just control further damage. As the maximum possible damage has already been done.

The theme chosen for this year's World Environment Day happens to be beating on the plastic pollution. A very innocent but first step to change will come with each of us becoming aware how each of us individually has a large role to play. Can we replace use and throw items such as grocery bags, water bottle, plastic wrap, disposable cutlery, straws, and coffee-cup lids by bringing own bags to the store, silverware to the office, or travel mug to teashops before it becomes habit? It is better to stop buying water and carry a reusable bottle preferably with a built-in filter. Men and Boys also must learn to cook. Not only is it healthier, automatically plastic containers and shimmy bags are avoided. If unavoidable, it is better to take empty tiffin boxes to the restaurant and bring food home. It is advisable to buy all retails in a single purchase to last at least a month and



avoid purchasing single-serving of curds, travel-size toiletries of shampoo, oil, soap, toothpastes etc. It is better to purchase refills for most of kitchen based ingredients, ketchups, oils and other food and cleaning liquids and house old items. Refilling of containers even if plastic may be declared waste only after a minimum of 4 reuse lives which means a 6 months container now will last 2 years is suggested. It is smart to bring your own garment bag to the dry cleaner and cloth bags for carrying laundry and other items. Toys and game items and other electronic gadgets, which will anyways have use life of only 6 months to one year is to be purchased online as second hand so that we may avoid generating of new plastic bags. Like we pass down things from the first child to the next it may now be passed on from our last child to the first child in another family.

Bamboo and other wooden furnitures are a good alternative to plastic based items. Plastics are fundamental to industry and everyday life. Our concept of take-make-dispose any product needs to have a thinking shift in order to take-make-dispose and **RETAKE** so as to escape some footprints that can never be erased. Making a kilogram of virgin plastic releases 2-3 kgs. of carbon dioxide. And the carbon footprints accumulated is beyond comparison.

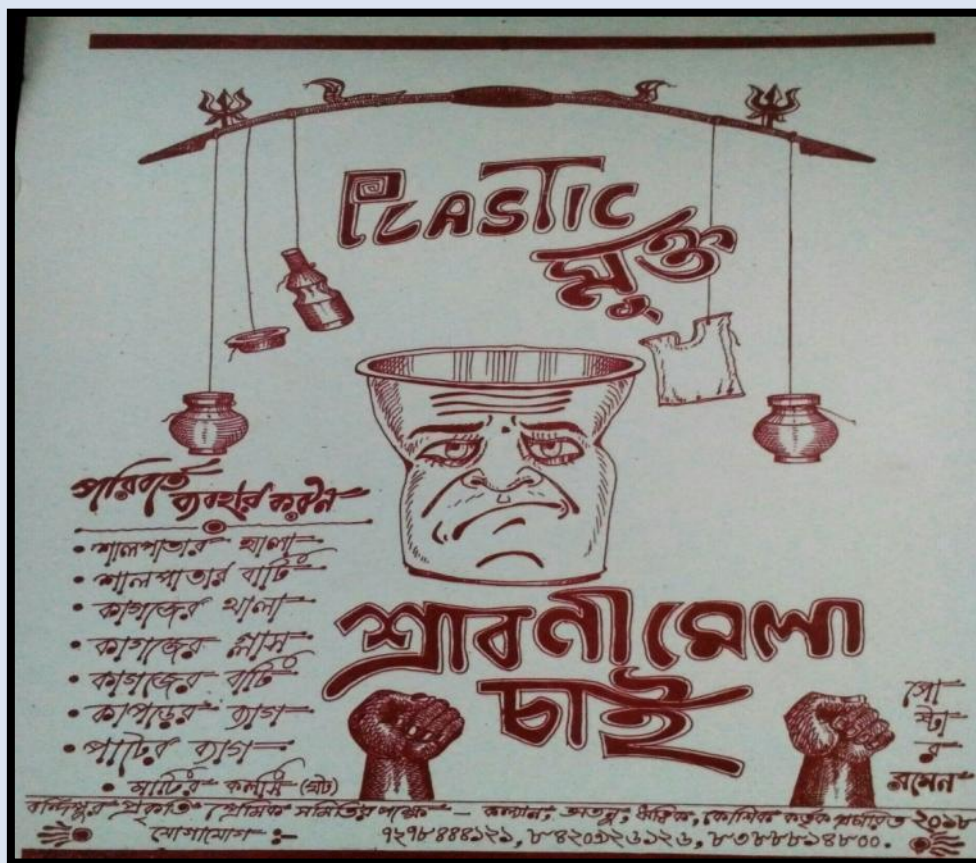
The relatively low density gives plastic the advantages of light-weight excellent thermal and electrical insulation properties, some plastics can be made to conduct electricity, it is corrosion resistant making them durable and suitable for use in harsh environments. Some are transparent, making optical devices possible. They can easily be molded into complex shapes, allowing other materials to be integrated into plastic products, and making them ideal for a wide range of functions. Furthermore, physical properties of a given plastic can be modified with the addition of reinforcing fillers, colours, foaming agents, flame retardants, plasticizers, etc., to meet the demands

of the specific application. This leaves all innovators blank trying to find substitute for PLASTIC. A complete industry can come to a halt for example medical and allied services if we try to wait for the substitutes. It is not so easy to eliminate plastic by discussing water bottles, plastic bags and cellophane wraps and disposable cups and syringes and cleaning beaches. Plastic is so deeply intertwined and buried into our lives that it has become a way of life. And finally imagine a world without condoms! There is no substitute for that plastic. We can discuss a lot more which makes this very useful thing powerfully negative. Whether agree or disagree there are a lot of good servants and bad masters the FIRE, WATER, WIND and let us add PLASTIC to that list.

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Snapshots of Awareness Campaigns in Assam by Team Voice of Environment





The image above is designed for the purpose of mass awareness regarding Plastic Pollution in populated and popular places such as *Shravani Mela* of West Bengal.
 Poster Courtesy: Mr. Kalyanmoy Das (All Rights Reserved)



Can crocodile #BeatPlasticPollution (Indian Marsh Crocodile photographed in a drainage line along with plastic floating around it). Pic Courtesy: Chimay Joshi- Mulund, Mumbai (Maharashtra)

Replacing and Recycling Plastic from our Lives

Raakhee Suryaprakash

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India hosted this year's World Environment Day on June 5, 2018 with the theme '*Beat Plastic Pollution*'. The nation, its institutions and its people came together to organize massive clean-up and plastic recycling initiatives. Now to keep this momentum going its vital as we in India alone trash some 9.5 million tonnes of plastic in a year! The River Ganga functions as a conduit taking a considerable portion of our plastic waste into the oceans. This in turn causes a massive plastic problem in our oceans as depicted in the documentary *A Plastic Ocean* - a must-see for a reality check of the effect of our plastics on the environment and wildlife. With June 8 being World Oceans Day, we need to address our plastic polluting the oceans and endangering life directly and indirectly as well.

Many Indian states, cities and districts have announced bans on plastic but tackling the plastic problem necessitates a multi-pronged approach. Starting with individual action, adopted at the family and household level, then building into a grassroots community- and institutional level movement that can put an end to the manufacture of new and unrecyclable plastic such as food wrappers by curbing the demand. This movement to 'Re/Re-plastic' our consumption includes 'replacing the plastic' in our lives and 'recycling and up-cycling' ruthlessly the plastic waste and ocean plastic as well as the plastic that is still deemed essential in our lives.

Replacing Plastic

The first step is replacing what plastic we can - especially single-use plastic. Our biggest plastic nemesis - what we all recklessly use and abuse is the plastic shopping bag which then becomes the garbage bag in most households. The cloth bag needs to become something we always carry. If there is any possibility of shopping we need to carry our own bag. And we need to be vocal and visible as examples in refusing plastic bags offered by the shopkeepers and baggers at supermarkets. It's still not the norm despite the bag being banned in many places. We need to be agents of change. The biodegradable bags made of starchy vegetable wastes and tubers such as the Envigreen bags have been in the markets since 2016 thanks to young Indian innovator Ashwath Hedge. It is a good substitute to the plastic shopping bag or garbage bag. There are also many YouTube origami tutorials on how to make bin liners from newspaper and waste paper instead of using polythene and plastic bin liners.

Next is the plastic water bottle problem. As the Story of Bottled Water from the Story of Stuff project demonstrates the plastic bottle remains in the environment for more than a thousand years. So investing in a good water bottle we can refill and carry is responsible action that reduces the demand for bottled water or worse those plastic water pouches. Biodegradable bottles and even edible water pouches are available in many international and First World markets and need to find their way into our markets. They are made from seaweeds and other such completely biodegradable and non-toxic materials.

Replacing the plastic toothbrush with a bamboo brush or tooth powder is another good place to start to tackle our plastic addiction. Diapers and Sanitary Napkins need to be replaced by more eco-friendly options while working to get the toxic waste to a reliable incineration facility whose emissions are monitored, cleaned and off-set. Cloth diapers, reusable diapers, the menstrual cup as well as cloth and reusable sanitary napkins need to be promoted. The Green Humour cartoon

strip by Rohan Chakravarty on May 6, 2018 brought out a comprehensive illustrated of eco-friendly menstrual hygiene products. As food delivery becomes more common and takeaway instead of home cooking becomes the norm for our convenience the insidious plastic takeout and delivery containers, plastic cutlery, takeaway cups and most heinous and redundant of them all the plastic straw are the next big plastic habit to kick. This involves a little more effort than just an individual or family level plastic-free lifestyle choice. We need to come together to use our consumer power to enable our food suppliers to go plastic free. There are tonnes of plastic cutlery and box substitutes that are available in the market. Takeaway containers, cups, and plates made from bagasse and pressed banana leaves, edible “biscuit like” cutlery are available to the Indian consumer thanks to Indian innovators and inventors. So by adopting these products companies can demonstrate their support to Swadeshi products as well as promoting the plastic substitute products that fit the ‘Make In India’ and ‘Start Up India’ bill. Apps such as Zomato have the option to go green and request that plastic cutlery is not included in your order. An easy step to kick the plastic habit is to use that option and ensure that it is followed through.

Now the plastic straw though redundant is still hard to eschew. But nothing like seeing the video of the sea turtle bleeding through its nostril because of a plastic straw being stuck in it to make one cringe from plastic straws. Carry your own reusable metal/bamboo/wheat straw when you go to have that coconut water! Inform juice bars and bars about the pasta straw and refuse the plastic stirrer completely. Look for outlets that have these plastic substitutes and become regulars there. Use the power of your patronage to promote businesses that use eco-friendly plastic substitutes. These are all products made by Indians for Indians that need to be the norm. These plastic substitutes need to show up on our shop shelves especially in the supermarkets and hypermarkets.

Recycling & Up-cycling Waste & Ocean Plastic

Even if all of us remove plastics from our daily lives, there’s still the countless tonnes of plastic wastes in our landfills, water bodies, rivers and oceans to tackle. The non-biodegradable entity needs to be recycled responsibly. For this a concrete value needs to be put on recycled plastic and needs to be monetized for the poorest of the poor. As the founder of The Plastic Bank, David Katz puts it, it’s time to look at plastic waste as a precious resource that can’t be wasted! While there are plastic eating enzymes and mushrooms being tested the immediate priority must be efficient recycling of all plastic waste.

Ocean plastic is being made into Adidas shoes and warm fleece blankets and material. Levi’s has shown how it uses 8 plastic bottles to make some lines of jeans. Fisher folk need to be educated that they can monetize the plastic that comes up with the fish in their nets. It’s happening in Kollam, Kerala. It is being sought to be promoted among Tamil Nadu’s fishing communities through a boat race organized off Elliot’s Beach on 17th June. Despite the efforts of The Ocean Cleanup project initiated by Boyan Slat to clean-up the Great Pacific Garbage Patch more local efforts are needed. There is a Central American effort using a simple floating barrier – itself made of waste plastic netting and bottles on mouths of rivers and estuaries that collects the majority of plastic trash flowing from inland. There is also a Mexican startup that converts waste plastic and ocean plastic into affordable shelters and homes of about 430 square feet that cost less than Rs. 19,000 (\$280). Plastic bottles filled with waste are used as substitutes for bricks to make affordable and durable shelters. Kevin Jacob and his team in Kerala have found a way to make plastic waste into durable plastic bricks way back in 2016. These need to be promoted in construction.

A young boy, Ashton Cofer came up with a way to up-cycle Styrofoam into activated carbon which can be used to filter water. A twelve-year-old girl from Bhopal, AnaktaPrabhu, demonstrated that thermocol and nail polish remover can make a mouldable material that be used to make toys and knick-knacks. Plastic bags are being pyrolyzed into fuel/diesel substitutes or carbon nanotubes. Our IITs have developed indigenous technology for this oiling of plastic. An Indian scientist is part of the international team of chemists working to transform polythene bags into carbon nanotubes. Most recently the innovation of Ramya Selvaraj & Divya Priya of IIT Madras has gained national and international acclaim. A solar-powered, mobile plastic pyrolyzer that can tackle most types of plastic. This can help generate additional revenue and provides an alternative to expensive petrol and diesel for the workers involved in collecting waste. This incentivises maximum recycling. Already roads are being made more durable across India using waste plastic. There are no excuses left for inefficient recycling of plastic waste.

Many state-wide and nation-wide efforts in honour of World Environment Day. These include clean-up of beaches and water bodies organized by Environmentalist Foundation of India and its remarkable volunteers and the collection of plastics to be recycled into furniture organized by the *The Hindu's* Friends of Chennai and partners. The Mumbai based lawyer Afroz Shah spearheaded the efforts to reclaim Versova Beach from plastic and other waste and won acclaim from even the UN Environment Programme after enthusing Mumbaikars to get involved in the clean-up. The return of Olive Ridley sea turtles this nesting season to the Versova Beach is nature's way of endorsing such coastal clean-up efforts. These initiatives show that with citizen action and corporate support through innovative corporate social responsibility (CSR) programmes that support such efforts the ticking plastic bomb can be defused before all life is imperilled by the predatory plastic problem.

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Snapshots of Plastic Pollution in Shravani Mela of West Bengal



Snapshots of Waste Management: Some Success Stories from Visakhapatnam, Andhra Pradesh and Ambikapur, Chhattisgarh

मानवता के लिए चुनौती है प्लास्टिक प्रदूषण से जीतना

डॉ. अजय कुमार तिवारी

प्लास्टिक और जिन्दगी दोनों में चोली-दामन का साथ हो चुका है लेकिन वर्तमान में प्लास्टिक जिन्दगी पर भारी पड़ गया है। मानवता के लिए प्लास्टिक प्रत्येक स्थिति में चुनौती बन चुका है। जल, पृथ्वी, वायु के साथ-साथ भूजल को भी प्लास्टिक ने दूषित कर दिया है। प्लास्टिक के आविष्कार ने समाज को लोहा, लकड़ी, स्टील, रबर का विकल्प दिया तो साथ निस्तारण नहीं होने की चुनौती भी वैज्ञानिकों सोचने पर मजबूर कर दिया। प्लास्टिक कई शताब्दियों से ज्यादा उपयोग में लाया जा रहा है। प्लास्टिक के निर्माण के दौरान कई खतरनाक रसायन निकलते हैं जो धरती के प्रत्येक जीव के लिए घातक है।

प्लास्टिक ने नदियों, महासागरों, नहरों, झीलों के साथ-साथ पृथ्वी के प्रत्येक तल को प्रदूषित कर दिया है। सिंथेटिक पॉलीमर में शामिल कई कार्बनिक और अकार्बनिक यौगिक प्रदूषण में महती भूमिका अदा कर रहे हैं। प्लास्टिक आमतौर पर लगभग 500-1000 वर्षों में खराब हो जाता है लेकिन प्लास्टिक के नष्ट होने का समय और न ही इसके दूषण की अवधि बताई जा सकती है। प्लास्टिक को थर्मोप्लास्टिक, थर्मोसेटिंग पॉलिमर के रूप में वर्गीकृत किया जाता है। एथीलीन ऑक्साइड प्लास्टिक में मौजूद रासायनिक विषाक्त पदार्थ है जो पर्यावरण में खतरनाक प्रभाव डाल रहे हैं। एथीलीन ऑक्साइड को समाप्त करना मुश्किल है। एथीलीन ऑक्साइड जीवित प्राणियों के घातक है। प्लास्टिक में पाया जाने वाला विनाइल क्लोराइड, जिसका इस्तेमाल प्लास्टिक पाइपों के निर्माण में किया जाता है जो कैंसर कारण भी है।

प्लास्टिक सस्ता और हलका होने के कारण उपयोग बढ़ता जा रहा है। प्लास्टिक जमीन, पानी हवा कहीं भी हो इसे नष्ट करना सम्भव ही नहीं है। प्लास्टिक को नष्ट करने प्रयास होने पर यह आसानी से विघटित नहीं होता है। विघटित नहीं होने की स्थिति में मिट्टी, हवा पानी को प्रदूषित करता है। प्लास्टिक के एक बार प्रयोग के बाद अधिकांश लोग प्लास्टिक की बोतलें और पॉलिथीन बैग को फेंक देते हैं। प्लास्टिक से भूमि और साथ ही महासागरों में प्रदूषण दर बढ़ता है। प्रत्येक वर्ष 100 मिलियन टन से अधिक प्लास्टिक का उत्पादन दुनिया में होता है जिसमें से 25 मिलियन टन नष्ट होने योग्य प्लास्टिक नदी, नाले, जमीन, समुद्र में एकत्रित हो रहे हैं। प्लास्टिक बैग, प्लास्टिक की बोतलें, अनुपयोगी इलेक्ट्रॉनिक सामान, खिलौने आदि, विशेषकर शहरी इलाकों में नहरों, नदियों और झीलों के जल के निकास को रोक रहे है। प्लास्टिक से होने वाले जल प्रदूषण पर नजर डालें तो पाते हैं कि दुनिया में लगभग 70,000 टन प्लास्टिक महासागरों और समुद्रों में फेंक दिया जाता है। मछली पकड़ने के जाल और अन्य सिंथेटिक सामग्री को जलीय जीव, पालतु पशु आदि भोजन समझकर खा लेते है। जलीय जीव और पालतु पशुओं के शरीर के अंदर प्लास्टिक के जैव-संचय हो सकते हैं। प्लास्टिक के तत्व पानी के माध्यम से या सीधे किसी भी जीव के शरीर में जाएगा तो नुकसान करेगा ही। पानी को सिंथेटिक सामग्री नुकसान पहुंचाते हैं। पानी की गुणवत्ता और जैविक तत्वों की संरचना में भी कमी आ जाती है। प्लास्टिक कचरा भूजल को प्रभावित करता है। बदलते परिवेश में गांव भी शहरों का अंधानुकरण करने लगे हैं। शहरों में कचरा एकत्रित करने के लिए निगम की व्यवस्था होती है। कुछ प्रतिशत प्लास्टिक एकत्रित हो भी जाता है लेकिन ग्रामीण परिवेश में प्लास्टिक की कोई भी सामग्री हजारों वर्षों तक के चुनौती साबित होती है। गांव में प्लास्टिक संग्रहण तथा कचरा निस्तारण की कोई व्यवस्था नहीं होती है। भारतीय गांव व शहरों में प्लास्टिक एकत्र होने के कारण गंदगी बढ़ती है जो मच्छरों व अन्य हानिकारक कीड़े के लिए प्रजनन आधार बन जाता है। मच्छर और हानिकारक कीड़े बीमारियों के वाहक होते हैं। प्लास्टिक के पाइपों से पानी की आपूर्ति, प्लास्टिक की बाल्टी, टब में पानी का रखा जाना घातक है।

प्लास्टिक का पेयजल से सीधा सम्पर्क होने पेयजल की गुणवत्ता बिगड़ती जा रही है। प्लास्टिक में जहरीले रसायन स्टाइरीन ट्रिमेर, बिस्फेनोल और पॉलीस्टायर्न के उप-उत्पाद उपस्थित होते हैं। बिस्फेनोल हानिकारक रसायन है जो जानवरों की प्रजनन प्रणाली को नुकसान पहुंचाता है। जानवरों के अंदर प्लास्टिक के जैव-संचय, प्लास्टिक प्रदूषण सबसे हाल के प्रभावों में से एक है। जमा प्लास्टिक हानिकारक रसायनों को मुक्त करता है। हानिकारक छोटे टुकड़ों में भी विभाजित हो जाती है, और जानवरों की मृत्यु के बाद, उनका शरीर विघटित होता है, लेकिन प्लास्टिक के टुकड़े अन्य जानवरों के लिए खतरे के रूप में रह जाते हैं। प्लास्टिक प्रदूषण का सबसे जहरीला और घातक प्रभाव गिद्धों के विलुप्त होने के रूप में देखा जा सकता है। गिद्ध विलुप्त होने की स्थिति में पहुंच चुके हैं। पशुओं की शरीर में घुले प्लास्टिक के तत्व खाने से गिद्ध को जीवन चक्र खराब हो गया और घातक रसायनों से गिद्धों की जिन्दगी छिन लिया। हवा भी प्लास्टिक के कणों का वाहक है। प्लास्टिक के पदार्थ जब जलाये जाते हैं तो धुआं के साथ निकलने वाला प्लास्टिक के कण दम घूटने के लिए मजबूर कर देता है। प्लास्टिक के जलने से वायुमंडल के प्रदूषण बढ़ता है। प्लास्टिक को रीसाइकिल किया जाता है, तो मजदूरों की आवश्यकता होती है, जो जहरीली रसायनों में श्वास लेते हैं, जिस कारण उनको त्वचा और श्वसन के लिए खतरा बढ़ जाता है। प्लास्टिक की समस्या का समाधान मनुष्य को ही खोजना है। यद्यपि प्लास्टिक से बने सामान सुविधाजनक होते हैं लेकिन इस प्लास्टिक ने पृथ्वी की तस्वीर और भी बदसूरत बना दिया है। पर्यावरण को प्लास्टिक से बचाने के लिए शॉपिंग के लिए जितना संभव हो पेपर या कपड़े से बने बैग का उपयोग करना चाहिए। घर पर प्लास्टिक बैग लाने से बचना चाहिए। पानी और जमीन पर फेंके गये डंपिंग प्लास्टिक के परिणाम के बारे में समझना हुए उचित निस्तारण सुनिश्चित करने का प्रयास करना चाहिए। प्लास्टिक का पुनर्नवीनीकरण किया जा सकता है। प्लास्टिक का इस्तेमाल कई अलग-अलग तरीकों में जैसे बैग, पर्स, पाउच को बनाने में किया जा सकता है। बायोडिग्रेडेबल प्लास्टिक बैग उपलब्ध हैं। बायोडिग्रेडेबल प्लास्टिक बैग का उपयोग लोगों का आदत में डालना होगा। समाज को प्लास्टिक के दमकते आकर्षण से उबरना होगा। प्लास्टिक प्रदूषण समाज की लापरवाहियों से बढ़ रहा है। सावधानी से प्लास्टिक का प्रयोग करें तो निस्तारण के साथ समास्या का समाधान हो सकता है। प्लास्टिक के विकल्प को पुनर्नवीनीकरण युक्त बनाना होगा। प्लास्टिक के प्रति पर्यावरण के अनुकूल प्रयोग से ही भविष्य की पीढ़ियों को बचा सकते हैं।

आत्म परिचय

गंगा किनारे गांव महुवर कला, जिला चदोली उत्तर प्रदेश में १ जुलाई १९७१ को जन्म, १२ वी तक की शिक्षा बाल्मीकि इंटर कालेज बलुवा वारानाशी में हुई १८८२ में स्नातक और १८८७ में स्नातकोत्तर की शिक्षा महामाना की कर्मस्थली काशी हिन्दू विश्वविद्यालय में हुई छबीसवी सदी के प्रमुख भारतीय दार्शनिक के आलोक में गीता दर्शन का अध्ययन विषय पर शोध उपरांत डॉक्टरेट की उपाधि प्राप्त हुई । २००६ ने दैनिक जागरण वारानाशी , २०१३ मार्च से जनसंदेश टाइम्स लखनऊ २०१५ से राजस्थान पत्रिका अंबिकापुर सरगुना में वरिष्ठ उपसंपादक , रिपोर्टर के रूप में काम करता रहा । इस दौरान प्रथम पृष्ठ खेल अर्थ सम्पादकीये आदि पत्रों पर काम करने का सुनहरा अवसर मिला । कला साहित्य दर्शन खेल आदि विषयों में विशेष अभिरुचि हैं।

Plastic Pollution: through the Indian kaleidoscope

Joystu Dutta

Plastics are wonder materials of current times. They are lightweight, versatile and durable but in spite of their ubiquitous presence in many of our scientific and technological advancements; from automobiles and computers to replacement heart valves and domestic routines – they are now seen as a burning challenge to animals, marine life and future generations of humans. Every year, nearly 8 million tons of plastic are dumped into our oceans, a number that is expected to increase tenfold by 2025. And, according to the World Economic Forum, if we keep producing plastic at the current rates and follow unscientific plastic waste disposal mechanisms, the amount of plastic pollution in our oceans will outweigh total fish abundance by 2050. Recent reports of plastics and microplastics pollution in every remote corner of the oceans has raised public awareness of the challenges posed by our increased use of synthetic plastics. In some cases this has raised the call for more alternatives such as paper, jute, glass, biodegradable plastics to replace synthetic plastics. However, a UN report in 2016 indicated that biodegradable plastics are not the panacea for the marine challenge of plastic litter in the ocean. Plastic pollution is also directly linked to increased GHG emissions and elevated carbon-dioxide levels in different trophic levels of ecosystems across the world. The lethal instances of marine

India being a peninsular country is surrounded by ocean on all three sides of the mighty mainland. The problem of plastic pollution and ocean littering with plastics and allied derivatives is a matter of utmost concern. Increasing trends of population, pollution, mushrooming of plastic based industries, lack of mass awareness, administrative negligence has lead to increasing the problem in waters around the coastal plains of India. Plastic pollution is a problem in the mainland too with lack of proper waste management infrastructure, lack of recycling options, and of course not much of voices are raised to address the grave concern. This has led the problem to catapult to humongous proportions. The current status of India with regarding to the plastic pollution is alarming. Plastics waste contributes significantly to the total municipal solid waste (MSW) generated in India. Experts have estimated that annual waste generation in India will increase to 165 million tonnes by 2030. This means that around 66,000 hectares of land is needed to set up a landfill site which is 10 metres high and can hold up to 20 years' waste. That is almost 90% of Bengaluru's area. A Central Pollution Control Board (CPCB) study in 2015 revealed that approximately 25,940 tonnes of plastic waste are generated in India per day, with 60 major cities contributing 4,059 tonnes of plastic waste per day (~8% of MSW). Average Indian uses 25 pounds of plastics every year, a tenth of what an average American uses. Plastic Waste Management Rules 2016 as enforced in India is a particular legislation to combat plastic pollution but it lacks implementation in word and spirit. CPCB and SPCB are the respective central and state regulatory authorities to monitor and check plastic pollution in our country. Some cities and regions of India have banned these ultra-thin bags which are made of polyethylene, a non-biodegradable petrochemical product. State governments across India are finding it an uphill task to enforce plastic bans irrespective of metropolitan areas or semi-rural regions, small cities or gram panchayats.

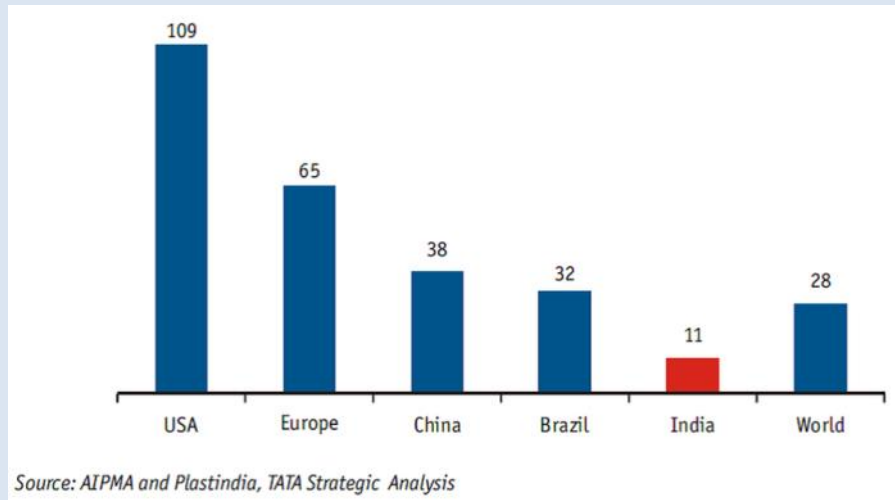


Fig. Per capita plastic products consumption (Kg/person)

weblink: <http://ficci.in/spdocument/20872/report-Plastic-infrastructure-2017-ficci.pdf>

India's economy is still on the developing mode and plastic is correlated with development. Plastic use is a parameter of modern day growth. So, blanket ban of plastic consumption in India is a monumental challenge. Also, such bans can only be successful in presence of feasible and universal alternatives to plastic. Recent estimates predict a 10% compound annual growth rate (CAGR) in plastics consumption over the next five years, reflecting a similar growth in the preceding five years. On the other hand, there is a public unrest to the banning of plastic bags including ultra-thin bags of polyethylene and Styrofoam-based products in different states of India. It is needless to mention that the local administration has failed to offer proper sensitization programs for public against plastics and its derivatives. The central government is also considering banning polyvinyl chloride, or PVC, a plastic used in infrastructure building that, when improperly disposed of, leads to the release of toxic compounds into the environment. However, deep dark clouds of despair have silver linings of positivity too. There are hundreds of start-ups in India which holds big promises in relation to plastic waste management in our country. Banyan Nation, a Hyderabad-based start-up focusing on plastic waste recycling, has raised \$800,000 to fuel its expansion plans. Impact Investment Exchange (IIX), Shujog, and global investment firm KKR-assisted Banyan Nation, expects to scale up its business by improving the supply chain in waste recycling value chain and bringing together a network of brands in the FMCG, pharma and other sectors. Mani Vajpayi, Co-Founder and CEO, Banyan Nation, said: "The informal nature of the recycling value chain makes it almost impossible for Indian brands to use recycled plastic for their product and packaging needs. Raj Madangopal (Co-Founder and CEO) and I decided to give up our jobs in the US to create a business that changes the way India recycles plastics. Our goal is to become a trustworthy and responsible recycling partner". Jaideep Khanna, Co-Founder of Artha Capital, who committed the \$800,000 in capital said, "The consequences of our collective inaction seem negligible now, but over time will be devastating to the environment. We must each do our bit to stem the tide. Banyan, by laying the foundation for a formal recycling system, is doing just that." Some companies in India including dedicated start-ups have helped empower the informal recycling sector, giving waste pickers dignity and steady incomes. Another firm has worked with the informal sector and engineered the production of high quality recycled plastic. These companies, large corporates and governments could cooperate to implement innovative means to realise the

value of plastic disposed of while simultaneously investing in phasing it out. For example, a Canadian company monetises plastic waste in novel ways. It has one of the largest chains of waste plastic collection centres, where waste can be exchanged for anything (from cash to medical insurance to cooking fuel). Similar such initiatives are taken up by Green Waves Environment Solutions based in Visakhapatnam, Andhra Pradesh where they exchange e-wastes through door step collection with meaningful domestic products. Such rays of hope indeed provide us with necessary oxygen to fight the Plastic monster. Systems level approach as that of Banyan Nation is the need of hour to tackle the devastating trend of plastic accumulation across the nation. The scourge to counter plastic crisis in our country, however stems out from poverty amidst many other reasons; social, economical, political, cultural and a cocktail of such interplaying factors.

Ex-Indian Prime Minister Smt. Indira Gandhi once said, “Are not poverty and need the greatest polluters” which is generally and largely re-read as; “Poverty is our greatest polluter”. Plastic pollution is not to be understood in isolation but in correlation with other forms of pollution; water, soil, air etc. It is a complex and diversified issue. India is in the stage of coping with the concert of several factors that culminates into present day environmental issues; the nation is currently gripping with. We need to tackle this problem more holistically and sustainably. One of the biggest obstacles to the implementation of plastic bans on the ground, say activists, is the lack of political will.

“Every few years, particularly before elections, politicians play to the gallery with such announcements about banning plastic bags,” said Rishi Aggarwal, an environmental activist from the Mumbai-based think tank, Observer Research Foundation (ORF). “But they are not interested in implementation. Maharashtra had banned bags below 50 microns long ago, after the Mumbai floods of 2005. But that did not lead to any change, did it?”

According to Aggarwal, bags below 50 microns in thickness are the only ban imposed in the Centre’s amended Plastic Waste Management Rules, 2016. The rest of the rules simply lay down the basic duties of urban and rural local governing bodies to ensure the safe disposal of plastic waste and to encourage reduced use of plastics. Environmentalists across the country are skeptical on the successful implementation of such rules and regulations. “The rules talk about waste segregation at source,” said Aggarwal. “Has the Maharashtra government been able to successfully enforce that? Are they providing enough facilities for ragpickers. If they cannot enforce these basic rules without a plastic ban, how will they enforce them with a ban on all plastics?” However, we still believe that our hopes shall win.

India went big in their commitment to Beat Plastic Pollution on June 5, 2018- World Environment Day with an announcement to eliminate all single-use plastic in the country by 2022. This unprecedented ambitious move against disposable plastic will drastically stem the flow of plastics from 1.3 billion people and business in the fasted growing economy in the world.

Prime Minister Narendra Modi hailed World Environment Day as the start of a global movement to defeat single-use plastics, highlighting India’s rapid economic development can be done in a way that is sustainable and green.

“It is the duty of each one of us, to ensure that the quest for material prosperity does not compromise our environment” Modi said. “The choices that we make today, will define our collective future. The choices may not be easy. But through awareness, technology, and a genuine global partnership, I am sure we can make the right choices. Let us all join together to beat plastic pollution and make this planet a better place to live.”

“This has been the biggest, most resonant World Environment Day ever, thanks to the leadership of our global host India,” Erik Solheim, Head of UN Environment, said. “India has made a phenomenal commitment and displayed clear, decisive and global environmental leadership. This will inspire the world and ignite real change.”

The announcement was a powerful finale after weeks of activities around the country, seeing millions of Indians - policymakers, celebrities, business Moghuls and small entrepreneurs, innovators, environmentalist, and activists - come together to collectively take action on plastic pollution. Among the highlights from the national celebrations was Modi’s commitment to join UN Environment’s Clean Seas campaign, which seeks to turn the tide on marine litter. India has 7,500 km of coastline - the 7th longest in Asia. As part of this commitment, the government will establish a national and regional marine litter action campaign as well as a program to measure the total marine plastic footprint in India’s coastal waters. Other notable steps towards a pollution-free India included a partnership between UN Environment and the Indian Board of Control to ‘green cricket’ across the country, and a pledge to make 100 national monuments litter-free. Such initiatives are welcoming and indeed would go a long way if properly implemented across the length and breadth of our geographical landscapes. In this connection, contributions of individuals, institutions and non-governmental organizations cannot be undermined. It is time we rethink, reduce, segregate and recycle every time we encounter a piece of plastic so that it stops damaging our environment and our lives, writes Megha Shenoy, a research scholar and environmental activist based in ATREE, a Bengaluru based organization. Such positivity and awareness should penetrate deep down to every national of this subcontinent and then we can win our Plastic war in true word and spirit.

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Effect of plastic pollution on health of wildlife of India

D.K.Belsare, R.K.Singh, S.D.Belsare and R.H.Deshmukh

The plastic pollution in forests and lakes in India is common and the chemicals like phthalates, alkylphenolic compounds are released in water and soil (Schantz and Wildholm, 2001, Belsare 2011). These authors already suggested that these biologically active concentrations of endocrine-disrupting chemicals, particularly water soluble phthalates, bring about subtle changes to permanent alterations, including disturbed sex differentiation with feminized or masculinized sex organs, changed sexual behavior, and altered immune function. Impaired reproduction and development are linked to endocrine-disrupting chemicals in a number of species and have resulted in local or regional population changes. In mammals, the best evidence comes from the-field studies on Baltic Gray and Ringed seals, and from the Dutch semifield studies on Harbor seals, where both reproduction and immune functions have been impaired by polychlorinated biphenols (PCBs) in the food chain. It resulted in population declines, whereas impaired immune function has likely contributed to the mass mortalities due to virus infections. There are no such field studies on Indian wildlife, but these environmental contaminants are probably associated with abnormal thyroid function in wild cats and waterfowls. It is already established that these chemicals block sodium-iodine transporter system of thyroid cell wall and subsequently iodine hormone pump system (Belsare 2011).

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About the author: Dr. (Prof). D.K. Belsare, M.Sc. Ph.D., D.Sc., F.N.A. Sc., F.Z.S.I. is a retired Professor & Head of the department of Bioscience. Barkatullah (Bhopal) University, Bhopal. He is the first scientist to spread the message of environmental awareness & wild-life protection for the benefit of common man and their importance in human welfare and survival. He organized seminar/symposia/workshop from 1980 to 1985 for general awareness among the people and presented paper on wildlife conservation for ecological services. He has made significant contributions to Wildlife & Biodiversity Conservation in tropical region with reference to Indian sub-continent. Prof. D. K. Belsare and allied authors represent Himmatrao Deshmukh Biodiversity Center, Tiwasa, Maharashtra. They are carrying out some amazing researches on biodiversity assessments across the subcontinent.

Designing Tools for Behaviour Change is Essential to Beat Plastic Pollution

Junkee Justin Ahn, Jonela Balasta, Vanya Bisht, Pallavi Chandra, Rimjhim Aggarwal; Sarthak Rohilla, Anchal Sharma, Vijay Chariar


The problem of plastic persists because we choose to continue creating it. Yes ‘we’, the same people who live most of our lives with the hope that we could help make the world a better place. We travel from place to place, talking to whoever is ready to listen, spreading the message of the causes we so vehemently believe in. And yet it is we, who despite knowing that plastic is a problem that could possibly bring the world to an end, choose to continue using it because it is the convenient thing to do. From our alarm clocks in the morning to the toiletries we use to freshen up, the clothes we wear, the utensils we eat in, the water bottle we carry around, the pen we use to write, more or less everything we use is made of plastic. It is not that there are no alternatives. If we go around looking for materials to replace the plastic in our lives, we will find plenty. But, this is where the problem is: we never look around. We have become so complacent in the trap of convenience.

We are a group of students from Arizona State University (ASU) who had partnered with some students in the School of Planning and Architecture, Delhi (SPA) to find ways to reduce the consumption of single-use plastic bottles in college campuses. In an open survey conducted at ASU, we found that despite the fact that many drinking water fountains are available throughout the campus, many people still choose to buy plastic bottles because they are easily available and easy to carry around. Similar results were found in SPA campus. So, we had to adopt the strategy of designing creative tools for motivating behaviour change among college students. But one of our main barriers was that it is hard to capture the attention of college students, let alone change their behaviour.

In today’s social media driven society with enormous amount of texts, images, and videos generated every day and the diminishing attention span of people, it can be difficult to get one’s message across to a large number of people. As people spend more time on social networking sites, the demand for new content everyday is increasing; however, the size of the content is continuously reducing. In websites such as Facebook and Twitter, people tend to read and share more of the posts which take only a few seconds to read but still resonated with them in some way, while they tend to skip through the posts which are longer even though they might have something important to say. In such changing times, if we want to create an impact we need to keep coming up with fresh content regularly which immediately catches the attention of people. One way of grabbing attention is by using the tool of laughter. A short and simple message that makes people laugh but think at the same time has the potential to be shared widely across social media and thus reach to a larger audience.


Therefore, we decided to design internet memes, using popular dialogues from Hollywood and Bollywood movies, and twisting them a bit so that they convey the desired message of reducing plastic bottle consumption by encouraging people to carry their own water bottles. These memes will be displayed on strategic locations (such as canteens, provision shops, television screens in campus shuttles, etc.) in both the campuses, and shared on social media platforms of both the universities. Additionally, our team members from SPA have created designs for improved earthen water containers which when supplemented with the memes can drastically reduce the consumption of single-use plastic bottles on campus.

Contributors: Junkee Justin Ahn (ASU), Jonela Balasta (ASU), Vanya Bisht (ASU), Pallavi Chandra (ASU), Dr. Rimjhim Aggarwal (ASU); Sarthak Rohilla, Anchal Sharma (SPA); Dr. Vijay Chariar (IIT Delhi). ASU represents Arizona State University, USA and IIT is Indian Institute of Technology. SPA is School of Planning and Architecture, New Delhi.




Ek plastic bottle ko decompose karne ki keemat tum kya jaano Ramesh babu?


It takes 500 years to decompose the plastic bottle you used for only 5 minutes
CARRY YOUR OWN WATER BOTTLE TODAY!




Ek baar jo maine commitment kar di uske baad toh main khud ki bhi nahi sunta




Commit to Carrying Your Own Water Bottle Today!




Aaj mere paas paisa hai, bangla hai, gaadi hai, naukhar hai, bank balance hai, aur tumhare paas kya hai?



Mere paas Bottle hai




CARRY YOUR OWN WATER BOTTLE TODAY!




Main udna chahta hun, daudna chahta hun, girna bhi chahta hun....bas plastic bottle ka paani nahi peena chahta

If you don't buy pepsi everyday for an entire year, you could save enough money to travel to Singapore
Carry Your Own Water Bottle Today!




Basanti! Iss plastic bottle ka paani mat pina!



Carry Your Own Water Bottle Today!

Beverages sold in plastic bottles contain micro-plastics and pesticides that can enter human body and cause cancer.




Life Mein 3 Cheezon Ke Peeche Kabhi Nahi Bhaagna Chahiye...

Bus, Train aur Paani

Carry Your Own Water Bottle Today!

If you don't buy bottled water every day for an year, you could save enough money to take your partner out on a fancy date!

All Meme Credits: Vanya Bisht, (Arizona State University) USA.

Plastic Pollution of Yamuna River in North Delhi

Tanu and Aarohi Srivastava

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Indian rivers are very sacred as they are being worshipped as gods and goddesses. Rivers in India are getting polluted due to large scale dumping of plastic bags, polythene bags, households plastic wastes despite this socio-religious connections. The pollution load is affecting the quality of the river water to detrimental stages. This is the prime reason why condition of Yamuna river has worsened to alarming levels today. Once amazingly resplendent, Yamuna today is reduced to a sewage drain carrying lots of waste discharges from industrial zones, workshops, commercial zones, business centers, households, religious zones etc. Twenty one major wastewater drains are present in NCT-Delhi, out of which eighteen drains join Yamuna River and rest of them joins Agra/Gurgaon canal. Najafgarh drain is considered as the biggest polluter of Yamuna River after Shahdara drain. In Delhi, people living on the boundaries of the Yamuna river also discharge lots of their households' waste into the river. The large amount of the plastic waste dumping into the river is the main cause of the river pollution. Floating plastic wastes such as polythene bags, plastic water bottles etc. can be easily visible in the river Yamuna. The plastic pollution of the river Yamuna is also disturbing the aquatic biodiversity as the main reason of the diversity loss is due to the increase in the BOD and COD levels of the river water. In the upper stretch of the Yamuna, the zooplanktons and phytoplankton species are completely vanished. Soil Erosion can be seen due to the increasing pollution. The extent of deleterious condition of the river water is due to plastic pollution and the need of the hour to have a check on the same. The below pictures depicts existing conditions in Shastri Park, Geeta Colony and Kashmere gate stream in North Delhi. The condition of river is worse in all three areas.

We conclude saying that the levels of Yamuna river water pollution is very severe in Delhi and Plastic waste is one of the major cause of it. Thus, the need of the hour is to minimize or restrict plastic usage to reduce further aggravation. "We have a solution, **Stop Plastic Pollution**"

About the author: Tanu is a student of Amity University, Noida and Aarohi Srivastava is a student of Forest Research Institute, Dehradun. They take active interests in understanding and resolving critical environmental issues and challenges of current times.



SHASTRI PARK



GEETA COLONY



KASHMERE GATE

Plastic debris observed in the gut of fishes caught off Mumbai

Dhanashree Bagade and Sujit Sundaram

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With advance in technology, we are distancing ourselves from our natural environment and the use of non-renewable products has become rampant. In the process, we are exploiting our environment, leading to pollution. Use of plastic and other synthetic materials have lead to major disposable issues, as they do not disintegrate naturally and are not bio-degradable. Plastic is a material which consists of wide range of synthetic and semi synthetic organic compounds and due to their low cost, ease of manufacture, versatility and imperviousness to water, they are used in multitude of products. Few years ago, we had zero waste, but with the introduction of use and throw, one-time use theory and disposable products, solid waste management has become an issue. Beach debris and marine litter are increasing in alarming proportion and currently this is the biggest challenge to the marine ecosystem and this litter is widely spread on beaches, floating in seawater and the rest which gets settled in seafloor, becomes a threat to marine fauna either by ingestion, entanglement or habitat degeneration by spoiling their feeding and breeding grounds. An estimated 12 million tones of plastic enter our oceans every year, harming plants; animals etc. and ultimately enter our food chain. The typical character of marine litter is that they are non-degradable and are mostly buoyant. These two characters make them enter different realms of the marine environment, where they remain for a very long period interfering with the life of marine fauna. Plastic pollution is moved throughout the world oceans by winds and surface currents. While routine lab analysis was carried out on fishes caught off Mumbai coast for studying its biology etc., it was observed that the gut of some of the fishes contained plastic debris. The species which had plastic in their gut are *Euthynnus affinis* and Golden anchovy. The iconic fish of Mumbai waters, *Harpodon nehereus* (Bombay duck) which is a popular food fish along the Northwest coast of India also contained plastic debris in its gut content (Fig.1) and that's a matter of grave concern. The plastic debris ingested by fish comes not only from industrial activities but also from landfill runoff, sewage overflows and also from everyday household activities. Most plastic items never fully disappear; they just get smaller and smaller. Many of these are swallowed by fish and thus find their way in to our dinner plates. A growing concern linked to the plastics in sea water is related to the potential impact of these particles in the marine trophic web through ingestion by several marine organisms, ranging from zooplankton to top predators. Due to Bioaccumulation it may adversely affect human beings through the food chain. Micro-beads are another source of plastic pollution. The tiny, sand-like grains of plastic are used in hundreds of household products, often as abrasive scrubbers, including face washes, body washes and toothpaste. They are too small to be efficiently filtered by wastewater treatment process and have been found in aquatic habitats and fish. Effects of micro plastics on marine fauna after ingestion are - physical blockage or damage of feeding appendages or digestive tract, leaching of plastic component chemicals into organisms after digestion and ingestion and accumulation of absorbed chemicals by the organism.

We have to beat plastic pollution by at least banning single use plastic. Only 9% of all plastic waste has been recycled. Around 12% has been incinerated, while the rest 79% has accumulated in landfills, dumps or the natural environment. It's high time we use alternative materials such as paper and polymers that are biodegradable. The Areca palm leaf products and other natural products made out of leaves and bamboo should be produced from sustainable

resource, through eco-friendly process and when disposed they are bio-degradable. The use of these bio-degradable products helps in a long way to save our planet. The need of the hour is to arrive at a proper waste disposal plan and biodegradable products would cater as a first step towards this endeavor.

About the author: Ms. Dhanashree Bagade represents Mangrove Foundation, Mumbai and Mr. Sujit Sundaram represents Mumbai Research Centre of Central Marine Fisheries Research Institute.



Fig. Plastic debris found in the gut of Bombay duck (*Harpadon nehereus*) caught off Mumbai

Plastic Mulch- a way for Sustainable Agriculture

Rakesh Kumar and Savita Kumari

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Plastic mulch is a product used to suppress weeds and conserve water in crop production and landscaping¹. Crops grow through slits or holes in the thin plastic sheeting². Plastic mulch is often used in drip irrigation using different colors of mulch to affect crop growth³. The use of plastic mulches along with the use of drip irrigation has many benefits such as:

- Earlier planting dates
- Soil moisture retention
- Weed management
- Reduction in the leaching of fertilizer
- Improved crop quality
- Reduction in soil compaction
- Reduction in root damage

The use of plastic mulch alters soil temperature. Dark mulches and clear mulches applied to the soil intercept sunlight warming the soil allowing earlier planting as well as encouraging faster growth early in the growing season. Plastic mulches reduce the amount of water lost from the soil due to evaporation. This means less water will be needed for irrigation. Plastic mulches also aid in evenly distributing moisture to the soil which reduces plant stress. Plastic mulches prevent sunlight from reaching the soil which can inhibit most annual and perennial weeds⁴. Clear plastics do not prevent weed growth. Holes in the mulch for plants tend to be the only pathway for weeds to grow⁵.

The use of drip irrigation in conjunction with plastic mulch allows one to reduce leaching of fertilizers. Using drip irrigation eliminates the use of flood and furrow irrigation that applies large quantities of water to the soil which in turn tends to leach nitrogen and other nutrients to depths below the root zone. Drip irrigation applies lower amounts of water with fertilizers injected, and thus these fertilizers are applied to the root zone as needed. This also reduces the amount of fertilizer needed for adequate plant growth when compared to broadcast fertilization. Plastic mulches keep ripening fruits off of the soil. This reduced contact with the soil decreases fruit rot as well as keeps the fruits and vegetables clean.

The plastic mulch covering the soil decreases the crusting effect of rain and sunlight. The reduction in weed quantity means a decreased need for mechanical cultivation. Weed control between beds of plastic can be done using directly applied herbicides and through mechanical means. The soil underneath the plastic mulch stays loose and well aerated. This increases the amount of oxygen in the soil and aids in microbial activity. The use of plastic mulch creates a practically weed-free area around the plant, removing the need for cultivation except between the rows of plastic.

Root damage associated with cultivation is therefore eliminated. Due to these factors, the use of plastic mulch can lead to an improvement in the overall growth of the plant. There are disadvantages to using plastic mulches in crop production as well. The benefits from using plastic mulch come at a higher cost than planting in bare soil. These costs include equipment, the plastic film used as the mulch, transplanters designed for plastic beds, and additional labor during installation and removal of mulch films.

Specialized Mulch Application equipment must be used to install plastic mulch beds into a field. These machines shape the soil and apply the plastic to the prepared soil. Transplanters designed for plastic mulch can be used to plant the desired crop. Hand transplanting is an option, but this is rather inefficient. The removal of plastic mulch also contributes to a higher cost through additional labor and equipment needed. Specialized designed undercutting equipment can be used to remove the plastic from the field after harvest. Approximately 70 percent of global freshwater consumption is used in the agricultural sector, yet water use efficiency in many countries is below 50 percent. Nuclear and isotopic techniques provide data on water use including losses through soil evaporation and help optimize irrigation scheduling and improve water use efficiency⁶.

Global freshwater is becoming increasingly scarce, due to improper management, indiscriminate use, and a changing climate. Water scarcity and quality problems in many parts of the world are a serious challenge to future food security and environmental sustainability. Addressing these issues requires improved management of land and water.

Using science for sustainable water conservation approaches:

To ensure food security and sustainable water management for agriculture, there is an urgent need to produce more crop per drop of water used in the agricultural sector and hence ensure that water use efficiency is increased without negative impacts on downstream water quantity and quality.

Improvements in the handling of water resources must be built on an integrated approach to soil-water-plant-nutrient management. This should include optimizing irrigation scheduling and more efficient irrigation systems, such as drip irrigation. Soil fertility needs to be improved to ensure that crop growth is not limited by nutrient or physical constraints and every drop of water can be fully utilized for growth. Efficient water uptake by crops can be achieved through demand-based irrigation scheduling that takes account of different crop's water needs, growth stages, and the prevailing environmental conditions.

Agricultural water use efficiency can be improved by minimizing soil evaporation losses relative to plant transpiration in the field. The ability to quantify soil evaporation and plant transpiration provides information on irrigation amount for specific crop types and growth stages, which play key roles in the conservation and management of water.

Mulching with different irrigation practices is one of the techniques to improve soil productivity and water use efficiency. A field trial was conducted to study the effect of plastic mulch and different irrigation levels on water use efficiency and yield attributes of spring maize. There were four treatments; flood irrigated flat sowing without plastic mulch (**FIF**), flood irrigated flat sowing with plastic mulch (**FIFM**)⁷ furrow-irrigated ridge sowing with plastic mulch (**FIRM**), and furrow irrigated raised bed sowing with plastic mulch (**FIRBM**).

Plastic mulch and different irrigation levels increased the water use efficiency up to 22.43 % in **FIRBM**, 10.97 % in **FIFM** and 4.60 % in case of **FIRM**. **FIFM** and **FIRBM** showed 7.84 % and 7.12 % more leaf area index respectively, as compared to **FIF** (control) treatment. The number of grains increased per cob up to 41.28 % in **FIRBM** and 33.81 % in **FIFM**, as compared to the control. Mulching has also been shown to increase the grain yield up to 6.25 % in **FIRBM** and 4.17 % in **FIFM** (Sajid et al., 2015).

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Plastics- Happily choking the planet

Shikha Shalini

For a convenience of minute or two, we resort to the plastic bags which carry all our basic needs. The central theme of World Environment Day (WED) 2018 is to beat the plastic pollution. It is the need of the hour where this convenient carrier is choking the planet must be addressed. The plastics in our everyday system not only pollutes the soil and water but also gives rise to one of the major concerns to deal with like Waste Management. Developing countries such as India is suffering from the waste management concern, where plastic disposal has been one of the major issue. The sewage treatment plant is one of the major hard-hit area where the plastics clogs the drain and stops the sewage flow. Moreover, when these plastics enters the river system in form of waste dumping it affects the aquatic biota. Absolute ban of plastic is the answer to the humongous problem our blue planet is facing. The policy formulation on the manufacturing and monitoring of production and sale of plastic is needed so as to stop the planet from choking from plastic pollution.

About the author: Ms. Shikha Shalini is a M.A. student, School of Ecology and Environment Studies, Nalanda University, Bihar-India.



Different Activities on World Environment Day 2018

#BeatPlasticPollution #UNEP #WED2018#VOE



VOICE OF ENVIRONMENT members came together with Basistha Temple Management to create the auspicious premises of the temple- a clean and green as well as 'Plastic Free zone' on the occasion of World Environment Day June 5, 2018. The theme for this year's WED is Beat Plastic Pollution. Management authorities, Volunteers and common public took active interest in the day long campaign. Press Bureau and other Media gave wide exposure to the well managed activities.

VOE in Media

THE ASSAM TRIBUNE, GUWAHATI 5

Organisations draw up Environment Day programmes

STAFF REPORTER

GUWAHATI, June 4: A number of organisations will be celebrating World Environment Day tomorrow with varied programmes.

The Regional Science Centre (RSC) Guwahati is going to celebrate World Environment Day tomorrow on its Khanapara premises with a variety of participatory activities involving schoolchildren.

RSC Guwahati will organise tree plantation on its premises, besides painting competition, nature game and live demonstration about butterfly and common insects, open house science competition, and science film show on the occasion.

A popular science talk will be delivered by Dr Parag Jyoti Deka, Project Director of Pygmy Hog Conservation Programme.

WWF-India will observe the

The Assam Science Technology and Environment Council will celebrate the day in the Pub Kamrup College campus, Baihata Chariali from 11 am. The events include a plantation drive and an open session. Minister for Science and Technology Keshab Mahanta will be the chief guest at the open session.

Voice of Environment will observe the day in the Basistha Temple campus with an awareness campaign in pursuance of its mission 'Clean Eco-friendly Plastic-free Zone' from 10 am.

"As this year's World Environment Day theme is 'Beat Plastic Pollution', we believe this would be a perfect stage to conduct awareness programmes to realise the goal of making the historic site of Basistha Devalaya a plastic-free zone," said Voice of Environment in a statement.

The Chiriakhana Suraksha

'Make Basistha Temple plastic-free zone'

GUWAHATI, JUNE 7: In keeping with the MoU signed between Basistha Devalaya (Temple) Authority and Voice of Environment (VoE) on May 27 this year, VoE organised 'Clean, Eco-Friendly Plastic Free Zone' awareness drive on World Environ-

saplings to the guests and temple authority for adopting it and planting it at temple premises. After that an open public meeting was held in presence of devotees and visitors, temple pandits, vendors and shopkeepers.

Special guest Dr

He stressed on the immediate need to take measures for Basistha Ganga River as it is facing serious environmental issues.

Environmentalist Moharana Choudhury highlighted the importance of waste management and its disposal aspects in the



ment Day here recently, stated a press release.

On Tuesday the programme started from 10 AM onwards to build awareness among devotees/visitors to make Basistha Temple a 'Clean, Eco-Friendly Plastic Free Zone.' As the theme of this year's Environment Day is "Beat Plastic Pollution", Voice of Environment started the day with plantation programme. VoE member and environmentalist Moharana Choudhury and Minakshi Dutta handed over plant

Dhrubajyoti Hazarika, president, Temple Authority, and Bor Doloi Grindramohan Sarma were felicitated. Social worker and medical officer at Basistha Health Centre Dr Sulekha Chakaraborty and Basistha Temple police station outpost in-charge were present on the occasion.

They spoke on plastic and cleanliness of the temple area. The Doloi supported this initiative as can set an example in the country and send a positive sustainable message.

surrounding of temple premises as it is directly related with water quality and sustainability of Basistha Ganga River which is flowing through the city as Bharalu.

Majority of the visitors supported the cause to end the use of plastic. An interaction-cum-interview was held with visitors, devotees at temple premises with videography to know their views by the VoE members led by Mcdonald Choudhury, Minakshi Dutta, Kanhaiya Poddar respectively.

বশিষ্ঠ মন্দিৰক প্লাষ্টিকমুক্ত কৰাৰ প্ৰয়াস

মহানগৰ বার্তা, ৫ জুন : বশিষ্ঠাশ্ৰম দেৱালয়ত ভয়ছ অৱ এনভাইৰনমেণ্ট আৰু দেৱালয় কৰ্তৃপক্ষৰ উদ্যোগত পৰিবেশ দিৱসৰ লগত সংগতি ৰাখি আজি এখন সজাগতা সভা অনুষ্ঠিত হয়। বিশ্ব পৰিবেশ দিৱসৰ মূল বিষয় প্লাষ্টিকমুক্ত অনুকূল পৰিবেশ গঢ়ি তোলাৰ উদ্দেশ্যে অনুষ্ঠিত কৰা এই সজাগতা সভাত ড° প্ৰব্ৰজ্যোতি হাজৰিকাৰ লগতে ভয়ছ অৱ এনভাইৰনমেণ্টৰ সদস্য, দেৱালয় সমিতিৰ লগতে স্থানীয় ৰাইজ উপস্থিত থাকে।

Appeal for Devotees/Visitors

Dear Devotees/Visitors,

We appeal you to stop carrying plastic & polybags when you are coming to worship in the auspicious Basistha Temple premises. Please carry a paper, cotton or eco-friendly bags in place of dangerous plastics & polybags. Please also don't request polythene bags from local vendors and salesmen. Do not allow them to sell stuffs in polythene bags. Complete ban of Plastic & Polybags would be a part of Lord Shiva special blessings to all of you devotees.

Appeal for Shopkeepers/Vendors/Salesmen:

Dear Shopkeepers/Vendors/Salesmen,

We need your kind, constructive & fruitful cooperation in discharging our responsibility to make Kamakhya Temple premise a plastic free site. Shopkeepers/Vendors/Salesmen have the greatest responsibility and it's your first & foremost duty to stop selling plastics & polybags to the visiting devotees. You can easily make available paper bag or other available options like cloth bags, cotton bags etc. in place of plastic & polybags. We shall help you making available such low cost eco-friendly alternates.

Plastic (Management & Handling) Waste Rules 2015 prohibits manufacturing & selling of plastic below thickness of 50 microns. Even Government of Assam has banned plastic & polybags in the Guwahati City. Leaving apart such legislations, think at self, can't we keep Basistha Temple Premise Plastic Free. Yes we can tougher make the difference.

Appeal for Priests/Pandit ji:

Respected Priests/Pandit ji,

Appeal for Priests/Panditji:

Respected Priests/Pandit ji,

VoE hopes that you understand how **plastic & polybags** are hazardous to your health & causing a severe degree of pollution not only within the temple premise but it's affecting the ecology of **Basistha** area. We need your precious cooperation in generating awareness among our visiting Devotees. We all know that these devotees have deep respect for the priests & they shall hear you when you would say them stop carrying plastic & polybags while coming to worship the sacred & holy temple premise.

Let us join us in making **Basistha Temple** premises '**Clean, Eco-Friendly & Plastic Free Area**'

Activity Report

Dated: June 5, 2018

Basistha Devalaya (Temple) Authority and **Voice of Environment (VoE)** has jointly started a mission of 'Clean, Eco -Friendly Plastic Free Zone' on the occasion of World Environment Day June 5, 2018 in keeping with the MoU signed between the two parties on May 27, 2018. The program started with awareness programmes among devotees/visitors to make Basistha Temple a 'Clean, Eco -Friendly Plastic Free Zone.' The events were based on the central theme of this year's Environment Day which is 'Beat Plastic Pollution'. Basistha Temple is one of the historic and iconic temples in the country which is having great ecological importance especially for Basistha Ganga River which is flowing as *Bharalu River* through the Guwahati city. The temple is having great mythological faith as it is well known for great saint Basistha (Vasishtha) and his Ashrama but the area is facing many environmental challenges with the passage of time. Voice of Environment started the day activity with plantation program as VoE members Moharana Choudhury and Minakshi Dutta handed over the plant saplings to temple authorities for planting it in and around the temple premises. After that an open public meeting was held in presence of panditjis, devotees, visitors, and vendors/shopkeepers. The session was chaired by *Doloi* (Temple authority). Mcdonald Choudhury and Kanhaiya Poddar felicitated the chair and special guests on the occasion. Dr. Dhruvajyoti Hazarika; circle officer Dispur Circle, Kamrup Metro District, ACS (President, Temple Authority), Grindramohan Sarma (Bor Doloi), Dr Sulekha Chakaraborty, social workers, Medical officer, Basistha Health Center and In charge of Basistha Temple police station were in attendance. Guests spoke on menacing issue of plastic pollution and cleanliness of temple area. Doloi supported this initiative hailing it as prestigious, mythologically important as well as iconic. He further added that Basistha Temple is one of the famous tourist places of Assam and such initiatives would set an example. VOE member and environmentalist Mr. Moharana Choudhury has highlighted the waste management issue and its disposal aspects in and around temple premises as it is directly related with adjoining Basistha-Ganga river water quality. Circle officer recalled how plastic is an universal problem as it is directly clogging our drainage systems creating a havoc. Majority of visitors supported the cause to end plastic and declare the temple a 'heritage place'. The last session was interaction cum interview with visitors and devotees at temple premises assisted with videography to know their viewpoints on the issue. Voice of Environment members led by Mcdonald Choudhury, Minakshi Dutta, Kanhaiya Poddar successfully carried the session. VoE believes there is need of active participation and cooperation from local communities, devotees/visitors, local shopkeepers, NGOs with temple authorities can change the current scenario for a bright future ahead.

VOE Celebrates World Earth Day 2018

NGO launches drive to make Kamakhya temple an 'eco-friendly plastic free zone' on Earth Day

CHRONICLE NEWS SERVICE

Guwahati / Silchar : In a bid to make the planet a better place to live by fighting the menace of climate change the NGO Voice of Environment marked the occasion of Earth Day by launching the mission 'Eco-friendly plastic free zone' inside the premises of the iconic Kamakhya Temple. This year's theme for Earth Day is 'End Plastic Pollution'.

A communiqué issued by the NGO in this regard says that in keeping with the MoU signed between the Kamakhya Devalaya Temple Authority, Voice



The guests and participants of the 'Eco-friendly plastic free zone' drive launched by Voice of Environment on Earth Day which was observed recently.

of Environment' and SC&RS on December 22, 2016, we organized a programme on the occasion of Earth Day on April 22, 2018 from 10 AM onwards to build awareness among devotees/visitors to make Kamakhya Temple an 'Eco-Friendly Plastic Free Zone.' As the theme of this year's Earth Day is 'End Plastic Pollution', we believe this would be a perfect stage to conduct awareness programs to take the campaign forward of making Kamakhya Temple an 'Eco-Friendly Plastic Free Zone. On the occasion the NGO felicitated the special Guest Mohit Sharma, Bor Doloi

(President, Temple Authority) Kabindra Sharma, Saru Doloi (Vice President Temple authority) and other officials of temple along with Ranjan Borthakur, senior member and representative from partner supportive organization Earth Day Network India and Green Guard organization, Assam. The guests dwelt upon cleanliness and the hazardous effects of plastic use. Doloi supported the initiative and stressed that the temple is iconic tourist place of Assam as well as north east India and this cause can set an example in the country as well as the globe to send a positive sustainable message.



MONDAY, APRIL 23, 2018

Earth Day pledge to make Kamakhya temple plastic-free

STAFF REPORTER

GUWAHATI, April 22: On the occasion of Earth Day today, the Voice of Environment organised a function at the Kamakhya Temple to make the shrine and its surroundings an 'eco-friendly plastic free zone'.

The initiative was taken in consonance with this year's Earth Day theme 'end plastic pollution'.

The occasion was marked by various programmes including an interaction-interview with visitors and devotees on the temple premises.

A felicitation ceremony was also organised by the team members to honour the temple authorities.

Mohit Sharma, Bor Doloi (president, temple authorities) and Kabindra Sharma, Saru Doloi (vice president, temple authorities) were the special

guests on the occasion, besides other officials.

Earth Day Network India and Green Guard Nature Organisation, Assam supported the initiative.

The speakers highlighted the problem of plastic waste and the necessity of cleanliness, and the temple authorities assured their support to the initiative in turning the iconic tourist spot into a plastic-free zone.

On the other hand, Railway Higher Secondary School, Maligaon, also celebrated the day at its campus under the aegis of its 1987 batch students with a variety of programmes. A plantation drive, recitation of poetry and songs marked the day.

Maharshi Vidya Mandir, Panikhati, celebrated the day at its campus with a plantation drive, a drama by the students and a Mukoli Bihu.



UB Photos



Reasons that call for celebration!



शहर GREEN करे—It's Our Turn to Lead
Earth Day Network's 48 cities campaign in India to commemorate the 48th Anniversary of Earth Day

#END PLASTIC POLLUTION

WINNER
Voice of Environment
for building awareness among devotees/visitors to make Kamakhya Temple an 'Eco-Friendly Plastic Free Zone'

Karuna A Singh
Country Director Earth Day Network India, May 2018

GUWAHATI

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Mega Awareness Campaign among students organized in Visakhapatnam, Andhra Pradesh by Green Waves Environment Solutions.

A note from the Editor

Team VoE is dedicated to the excellence of finding sustainable solutions of emerging environmental issues and challenges. VoE also discusses about the current scopes and trends of environmental science as a potential subject in current times. The articles of the newsletter are independent viewpoints of the author(s) concerned and the editorial team or Team VoE is not to be held responsible whatsoever if any particular viewpoint is not in direct interest of person(s) concerned. Team VoE would also not be responsible for such communication, if any between the readers and authors. We believe in positive and honest feedbacks and look forward to **Letters to the Editor**- a new section to be introduced from next issue of the newsletter. VoE Newsletter calls for constructive comments, feedbacks and suggestions from the readers. We also want to hear about potential topics to be covered in next issues of the newsletter. Topic for the next issue is **Waste Management**. We call for articles within 1000 words. All monographs/photos/interesting facts/ case studies/ research articles is to be shared in the mail id: voiceofenvironmentngo@gmail.com with CC to editorvoe@gmail.com.

Thanks Team VoE