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PLASTIC FREE LIFE





From the Editor's desk

We are happy to release the eighth issue of GSFC University's e-Magazine – **Science View**. I feel privileged to be a part of this issue of the magazine which is known to be **a magazine for the student, by the student**.

I would like to thank to all my team members who helped me during the course of making this issue successful. I also wish extend my gratitude to wonderful and enthusiastic students participated dynamically in materializing this Magazine issue. I am also heartily thankful to university management for providing me such an opportunity, furnishing their support and encouragement.

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(I) Foram Mistry:

B.Sc. Chemistry (III Sem)- 21sc01004

"EKTA SE SWACHHTA"

"Adbhigatrani Shudhyanti Manah Satyam Shudhyanti,
Vidyatpobhayam bhuttma buddhargyanen Shudhyanti."

These two beautiful short lines give a broad explanation of cleanliness in a wide range i.e., over the world. Body dirt is removed by washing with water and using soap and shampoo. All people make effort to achieve this cleanliness. But it is not sufficient. By cultivating good thoughts in mind and revealing the truth, one attains mental purity. To achieve a prosperous next world, the soul must be defecation and its purity is possible through learning and austerity. From our childhood only we learned to clean our surroundings, and our homes, schools not to litter the public place, and many more. Let me ask you a quirky question, what completes a tourist or traveller in summer? It's a plastic water bottle, a toxic water bottle you can't do anything without it. What is the cost of that bottle you think, not on the price tag but the costly precious environment!!!!? Recently a city in India, Puri declared tap water is safe to drink, the first one to say in 75 years. The central government had made a

Punit Sagar Abhiyaan is one of the indeed great programs by NCC CADETS. As we all know about Swachh Bharat Mission was launched by our Prime Minister of India on the 150th birth anniversary of Mahatma Gandhi on 2nd October 2014, to accelerate the efforts to achieve universal sanitation coverage and to put the focus on sanitation. To ensure that the open defecation-free behaviours are sustained, no one is left behind, and that solid and liquid waste management facilities are accessible, the Mission is moving towards the next Phase II of SBMG i.e., ODF-Plus. ODF Plus activities under Phase II of the Swachh Bharat Mission (Grameen) will reinforce ODF behaviours and focus on providing interventions for the safe management of solid and liquid waste in villages. Likewise same, on 1st

National Mission, it is the main priority of the Jal Sakti Ministry once the taps are drained and clean water is connected the marketing can be gained. In these humble waterbodies, can't we think how much aquatic animals are also sacrificing their lives? Water pollution had become a big challenge for us and in that core "plastic", an undegradable thing exists.



December 2021, the National Cadet Corps to keep the beaches free of plastic and other waste materials, launched a Campaign. On a wonderful day, i.e., 30th May 2022; NCC launched 'PUNEET SAGAR ABHIYAN', and continued till 5th June 2022 which is WORLD ENVIRONMENT DAY. Punit Sagar Abhiyaan was launched by NCC to clean beaches and other water bodies including rivers and lakes by removing plastics and other waste. The campaign seeks to raise awareness among the local population about the importance of keeping beaches and river banks clean. It tries to educate the local people and make them aware of 'Clean India'.



This Abhiyaan got a global partner too. National Cadet Corps (NCC) and United Nations Environment Program (UNEP) signed a Memorandum of Understanding (MOU) in the presence of Defence Minister Rajnath Singh in New Delhi on September 22, 2022. The argument was signed by DG NCC Lt. Gurbirpal Singh and Bishow Parajuli, Resident Representative, UN World Food Programme (WFP). The main motive is to achieve the universal goal of clean water bodies through "Puneet Sagar Abhiyaan" and "Tide Turners Plastic Challenges Programme". The MOU, to remain in force for 3 years, aims at consolidating, developing, and detailing their cooperation and effectiveness to achieve the common objectives in the field of environment. This program is supported by the Indian Navy, Indian Coast Guard, and various Sainik Schools. Recently, Bharat Scout and guide also requested them to join. Nobody but, NCC Cadets only found the area of waterbodies where the plastic had played a toxic role. Around 12lakh NCC Cadets and volunteers successfully collected over 100 tonnes of plastic waste from nearly 1,900 locations. 10 states and 4 union territories participated in this campaign which was impacting around 1.5 crore people. NCC Cadets along with NCC alumni, locals, and tourists from various places across India also participated in it. The waste collected during this campaign was disposed of in an eco-friendly manner in collaboration with government/private agencies. During this campaign, drawing, essay writing, poster making, article writing, poetry, debate, etc. were also organized at various places.

Conclusion

In starting only of this article where we discuss plastic water bottles, one of the most toxic things in the environment i.e., single used plastic. Do you think plastic water bottles contain minerals? Absolutely No! They don't contain natural minerals, but most of them are added. This is because of pollution which had played a silent role in the environment including water bodies. Plastic water bottles became a factory product, though they should be natural products. The news study from Barcelona tells, the impact of bottled water is 1400 times that of tap water on the ecosystem. It does not tap water is healthy, yes, it is unhealthy because it contains a compound name THM-Trihalomethane. It is a scientific study that THM causes bladder cancer. Due to large-scale pollution in the environment, we can't get simple clean pure water from natural water bodies. If we prefer direct water bodies water, it cost our life due to the toxic compounds it carries. On the other hand, if we prefer plastic water bottles, they became a nightmare for the environment. What you are gaining is now you are losing because now the and their energy enjoying this program. And I am particularly impressed, we had a defence ministry of Navy, Army, and Airforce behind it as backbone support."

This is a proud moment for us because here we had started a program not only thinking about India's cleanliness but also about world water bodies' cleanliness. NCC hence proved that "Ekta and Anushshan" matter when it came to talking about humanity

(2) Tejasvini Salunkhe:

B.Sc. Microbiology (III Sem)-21sc04016

"PLASTIC BAG POLLUTION"

Every year, around 500 billion plastic bags are used worldwide. 500,000,000,000. Five hundred followed by nine zeros. That's a lot of bags. So many that over one million bags are being used every minute and they're damaging our environment. Plastic bags are difficult and costly to recycle and most end up on landfill sites where they take around 300 years to photodegrade. They break down into tiny toxic particles that contaminate the soil and waterways and enter the food chain when animals accidentally ingest them.

But the problems surrounding waste plastic bags starts long before they photodegrade. Our planet is becoming increasingly contaminated by our unnecessary use of plastic bags.

Big black bin liners, plastic carrier bags carrying advertising logos, clear sandwich bags and a variety of other forms are all polluting our environment. They're lightweight, handy and easily discarded. Too easily discarded. While they were rarely found during the 60s and 70s, their usage has increased at an alarming rate since they became popular during the 80s. Just take a look around you. Plastic bags can be seen hanging from the branches of trees, flying in the air on windy days, settled amongst bushes and floating on rivers. They clog up gutters and drains causing water and sewage to overflow and become the breeding grounds of germs and bacteria that cause diseases. Plastic bags are now amongst the top 12 items of debris most often found along coastlines ranging from Spitzbergen in the north to the Falklands in the south. Animals and sea creatures are hurt and killed every day by discarded plastic bags - a dead turtle with a plastic bag hanging from its mouth isn't a pleasant sight but mistaking plastic bags for food is commonplace amongst marine animals. Plastic clogs their intestines and leads to slow starvation. Others become entangled in plastic bags and drown. Because plastic bags take hundreds of years to break down, every year our seas become 'home' to more and more bags that find their way there through our sewers and waterways. Every bag that's washed down a drain during rainfall ends up in the sea - every bag that's flushed down a toilet (many small bags are), ends up in the sea - every bag that's blown into a river will most likely end up in the sea. Add to that the enormous amounts of energy that's used every year in order to manufacture these bags and it's no



surprise that pressure is being put on governments to make changes and consumers to re-think their attitudes. One question that's often raised in connection with the plastic bag dilemma is what should be used to line bins if not plastic bags?

To answer that, let's go back in time to when plastic bags were yet to become commonplace. There's no need to go any further back than the 70s. What did we do? For one, we had far less garbage. Goods had much less packaging than is the case today so we didn't fill us bins as quickly. Peelings, eggshells, tea bags and coffee grounds were all composted, as was any paper that wasn't needed for lighting fires. What was left went into an unlined bin with anything sloppy being wrapped in newspaper first. If we choose carefully when shopping so as not to bring home more packaging than necessary - there's really no point in bringing it home just to throw it straight in the bin when we unpack - and keep a compost bin going, the amount of waste that goes into the kitchen bin will be halved, at least. Now that we have re-cycling plants, even less will need to be binned. Tins, bottles and paper (we generally have too much for the compost heap these days) can all be delivered to the local re-cycling point. If you really must line your bins, instead of buying plastic liners, it's possible to use newspaper. You won't be able to pull everything out, tie it up and put it out, of course, but you'll be able to tip it from your kitchen bin into the main bin without too much mess. People managed before; perhaps the comfortable lives we have today just make everything appear more difficult than it really is. Obviously, if you live in an area where the garbage collectors expect to find bin liners neatly arranged along the edge of the street rather than the bins themselves, you'll have to continue using plastic bags. That doesn't mean to say you can't lobby your local authority for change, though. Explain why you need to leave the bin outside and that it's their duty to support any move that will improve the environment.



Conclusion

By refusing to use plastic bags, you can make a huge difference to the pollution problem. Remember that each person uses about 83 bags a year. If there are four people in your family, that's 332 plastic bags less every year.

That's 332 bags less that will:

- Release toxins into the ground water from landfill sites
- Stay in the environment for hundreds of years while they break down
- Get into the food chain through animals that ingest small particles of plastic
- Waste energy during the manufacturing process
- Kill any of the estimated 100,000 marine animals that die each year of plastic pollution

These are all-important factors that have a profound effect on our environment and the creatures we share our planet with. Should we really put our own selfish needs before the needs of everything around us now and the lives of future generations? That's up to you to decide.

(3) Utsavi Patel:

B.Sc. Biotechnology (III Sem)-21sc02015

"PLASTIC: A WONDER OF TECHNOLOGY OR AN ECOLOGICAL DOOM"

While plastic is one of the greatest wonders of technology today, it is slowly bringing carnage upon our environment by saturating it. In this article, I have discussed that along with Nano plastics and various studies and experiments that concluded presence of microplastics in human body. Along with that, I have also noted plastic alternatives and latest trends regarding this topic. Plastic is used in nearly 55% of the products we encounter. This technological wonder has completely transformed all of our lives by being affordable, sterile, and convenient. But this marvel got a little out of hand and has saturated our environment. And, is slowly infiltrating our bodies. Polymers, such as polyethylene, polypropylene, polystyrene, polyvinyl acetate, polyvinyl chloride, and other long, repeated chains of molecular groups, are used to make plastics. Polymers can also be found in nature, such as DNA, cell walls, silk, and insects. Whereas synthetic polymers are produced by breaking down the crude oil into its constituents. Now as these synthetic polymers possess properties of being durable, and lightweight, they can be easily moulded into any shape. These properties of polymers made it simple to mass-produce plastic, resulting in a broad array of plastic items.



History of plastic

Plastics are now ubiquitous. For generations, cue balls were made of ivory from elephant tusks. John Wesley Hyatt, an American, accepted the challenge in 1863. He developed celluloid; a novel substance made from cellulose. Despite being the first official plastic, it was very combustible, making production dangerous.

Plastic usage and statistical data

Our phones, computers, furniture, household appliances, cars, drinking water sources medical equipment, and much more are all composed of plastic nowadays. Unfortunately, plastic has long ceased to be revolutionary and has become something meant to be discarded. Plastic pellets are melted at manufacturing plants and reformed in moulds to create resilient materials that form the product. Now, these materials are then wrapped, shipped, bought, opened, consumed, and discarded. Thrown plastic which is millions of tons accumulates in a landfill. As more plastic waste is generated every day, the mass of this waste expands. As this plastic is compressed in earthen layers. Rainwater flows through the waste and water-soluble compounds are absorbed, some of these are highly toxic. These compounds create a 'leachate' which is a harmful stew, which spreads into groundwater, soil, and streams, poisoning our ecosystems and damaging our wildlife. Since synthetic polymers are durable, plastics take about 500 to 1000 years to decompose. 40% of plastic is used for packaging. Since its invention, a total of 8.3 billion metric tons of plastic have been generated. Out of which more than 6.3 billion metric tons of plastic have been waste since the year 1907. Only 9% of it was recycled. And 12% of it was burnt. While 75% is still in the environment, harming it away. Around 8 million tons of plastic end up in the oceans every year, with this rate plastic will outweigh all the fishes in ocean one day.

Microplastics

Microplastics are invisible forms of plastic that are nano plastics smaller than millimetres in size. Microplastics are extensively utilised in cosmetics and toothpaste, but the majority of them end up as floating debris that is constantly exposed to ultraviolet radiation and breaks into smaller bits. Around 51 trillion such particles float around in the ocean, where they are even more easily swallowed by all kinds of marine life. According to recent, article published by The Guardian, various studies conducted, concluded that microplastics particles are detected in most of the samples that were analysed. Almost most more than 90% of experimented people had microplastics in their bodies, especially in lung's tissue. Microplastics were even found in human blood, which then results in lodging of these particles in organs while travelling in the body.

How plastic is negatively impacting our environment?

Marine animals ingest plastic, which leads to their deaths. About more than 100,000 seas animals die every year. Plastic may cause acceleration in stomach, intestinal blockage in marine organisms which causes their declination rate to spike up. Because, it is everywhere, marine animals keep getting trapped in plastic and swallowing it. 90% of seabirds consumed plastic in 2015. A dead sperm whale was found on seashore and apparently, it had eaten 32 kilos of plastic bags and nets. Animals frequently mistake the plastic bags for food and eat them, and as a result their digestive processes are obstructed. Plastic in large amounts has harshly affected birdlife, every year more than 1 million birds die of choking, tangling up in plastic. Sea birds have declined about 70% in last 60 years.

SAY NO TO PLASTIC BAG



Conclusion

Plastic pollution is a complicated problem. We found a miraculous material and had an immensely good time with it. So, "While plastic is an incredible substance made for us economy, it is the absolute worst material ever made for our ecology." Hence, we need to use it carefully or we might end up in the world we didn't wish for.



Based on the technological developments in the field of plastic alternatives research, our environment can be protected better.

- 1) The ultimate banning of plastic bags; Almost 77 countries have banned single use plastic.
- 2) Recycling plastic instead of discarding it; Plastic recycling is defined as the act of reclaiming scrap or waste plastics and reprocessing them into useable products, sometimes in radically different forms than they were originally.
- 3) We can only develop a technique to decompose plastic; nevertheless, replacing plastic with any other material for everyday usage is rather difficult, therefore there is still no way to stop its use. However, if we look at the other side, we can still consider using fungus or modifying microbes to increase the activation energy of the breakdown process.
- 4) Scientists in Australia discovered that the super worm *Zoophobias morio* can survive on diet of polystyrene. The plastic is digested by the beetle larvae via a stomach enzyme, according to the researchers. Over the course of three weeks, the University of Queensland researchers gave three groups of super worms varied diets.
- 5) Plastic Road is a recycled plastic cycling route in the Dutch city of Zwolle. The recycled plastic equivalent of almost 218,000 plastic cups may be found on the first road. In Overijssel, a second plastic road was completed in November 2018.

- 6) Renewable biomass, such as vegetable fats and oils or cassava starch, is used to make bioplastics. A company called Evo ware creates sandwich and burger wraps, as well as soap packaging, in collaboration with local seaweed farmers made of seaweed, these wraps and packaging are nature friendly, sustainable and degradable. *Aspergillus Tubingen* is a fungus with a black pigmentation that thrives in warm environments. It can degrade polyurethane, according to microbiologists at Pakistan's Quaid-i-Azam University. In landfills, the fungus could be used to break down plastic.



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**“REDUCTION OF POLYMERS OF PLASTIC:
WAY TO PLASTIC FREE ENV”**

Introduction:

As we know all know that the current scenario the world moves toward with plastic-free life. Many NGOs are working to make the environment clean. Plastic-free life means we have changed that material/component into environmentally friendly plastic material. Peoples have to change their rooting lives to avoid plastic as much as they can't use it or scientist are working on this project on how they can manage the plastic from their surroundings. Reusing plastic ends any other ways like now they work on fuel from plastic, using plastic in the construction area, making faster biodegradable plastic, etc.

As we know Plastic is everywhere but what Is Plastic?

Polymers include plastic. Although not all polymers are problematic, not all polymers are plastics. In actuality, natural polymers serve as the basis for life. In nature, polymers, which are enormous molecules made of repeating chains of smaller molecules called monomers and primarily made of carbon and hydrogen ("organic compounds"), can be found. Our bodies contain polymers, including proteins, DNA, and starches. Polymers are used to create the shell, horn, fingernail, and hair. Natural rubber and cellulose, which makes up the majority of the cell walls of green plants, are both polymers. Polymers include resins like shellac, which the lac bug secretes and is frequently used to finish furniture, and amber, which is a resin from a fossilized tree. Because natural polymers have evolved over millions of years.

Why is going plastic-free important?

Not just because plastic is poisoning our oceans, plastic-free living is crucial. Additionally, it's critical to keep in mind that plastics harm both animals and people, as they contain toxins that pollute groundwater and have detrimental effects on our endocrine systems.

What Causes Ocean Damage from Plastic?

Sea creatures may become trapped in plastic bags or the rings that connect beverage cans. As a result, they may suffocate, go without food and starve, or be unable to flee from predators. sometimes, sea turtles mistake plastic bags for jellyfish and eat them. they suffer internal damage and risk passing away. Plastic is discovered inside about 70% of dead sea turtles. it's predicted that by 2050, there will be more plastic in the ocean than fish. Nearly all seabirds have consumed plastic.

Usage of plastic in our daily lives which we have to control or avoid like:

Packaging, food conservation, provision of convenience, safety and hygiene, environmental benefits of plastic packaging, building and construction, like windows pipes insulation, transportation, electrical resources efficiency, fire safety, agriculture, medical, health, blood vessels, prosthesis, hearing aids, sports, designing.

There are many things which we have to follow in our daily living, like very common own we have to deal with plastic whatever quantity we have in the home not buy any new plastics. Avoid plastic bags for garbage or use recycled plastic urban compost tumbler which allows you to decompose garbage instead of throwing it away. Therefore, the use of plastic bags. To reduce plastic use, take a look around the bathroom and replace plastic containers with non-plastic alternatives. Wooden handles can be used in place of plastic ones on combs, hairbrushes, and toothbrushes. Bulk purchasing is advantageous in this situation because plastic is the predominant material for small kitchen package types. Copper scrubbers can also be used in place of plastic scouring pads. To reduce the use of plastic, stainless steel ice cubes and Popsicle makers can be used instead of plastic ones. Wood or stainless steel can be used in place of plastic cutlery and other kitchenware. People would be healthier if the world banned all plastic. The majority of unhealthy foods are stored in plastic containers for future use. Plastic wraps are commonly used to keep vegetables and fruits fresh. Frozen convenience foods are typically packaged in plastic bags to keep them fresh while in the freezer. Canned foods are also coated with epoxy plastic. If you avoid purchasing these items, you will be taking a step toward a plastic-free lifestyle.

There are some factors which we have to follow:

Like we can develop our ingenuity and creativity and learn how to be more self-sufficient.

We connect with our communities. Hitting the limits to personal changes helps us recognize where to focus our energies in companies to change. By letting others see our changes, we set an example of a different way to be.



(5) Kanadiya Vivek:
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**“PLASTIC-FREE ENVIRONMENT-
A GIFT TO THE SOCIETY”**

This paper explores the plastic-free environment and the steps taken by the government. An eco-friendly environment is important for us to live healthily. A clean environment promotes a healthy Atmosphere and it also saves energy. Pollution is the major cause of the adverse change in the Natural environment. Every year the government organizes awareness programs on World Environment Day. But this year 2019 our government has taken a New Year resolution to bring a Plastic free environment. Plastic waste is one of the biggest environmental problems across the World. The entire business family is struggling to find alternatives to plastics. Though the government and several organizations have undertaken many steps and initiatives to make India plastic-free, What the country really needs is for every individual to contribute in their own way. The objectives of the paper are: to bring a plastic-free environment in green India; to create awareness among people about plastic pollution; to find out the impact of the plastic ban on manufacturers of Plastic; to skip plastic with cleaner and greener substitutes; to protect India from harmful Environment; and to provide measures to promote a healthy environment. Plastic bags play a major role when carrying groceries from shop to home and getting takeaway from favoured restaurants. Plastic play's indispensable role in our lives and society. Unfortunately, the development of non-Biodegradable plastics causes injuries to our lives. It is a time to create awareness among people About plastic pollution and the aim of our government is to form a green and clean India. Now the Government banned non-biodegradable plastic covers, plates, cups, water packets, straws, and bags. However, plastic sachets used to pack milk, curd, and oil, besides those used to wrap medical Products will be exempted from the ban. The steps taken by the government is appreciable and Plastic free society is a gift for us and future generations.

Environment and plastic pollution

Due to the hectic growth of the population, people produced more garbage and pollute the environment. In day-to-day life, they require easily disposable products such as soda cans, plastic carry bags, and bottles of water. But, unfortunately, the accumulation of these products has led to increasing amounts of plastic pollution around the world. Plastic is a less expensive and widely available item in the world today. When disposed of, it does not decompose easily and pollutes land and air when it is burnt. Plastic consists of major toxic pollutants and it has the

tendency to cause great harm to the environment in the form of air, water, and land pollution. Plastic pollution promotes a negative impact on the natural environment and creates problems for plants, wildlife, and the human population. A walk on the bank of any river, lake, or beach is sufficient to know the consequences of this ubiquitous ugliness floating. According to Ocean Crusaders, an organization dedicated to fighting plastic pollution 5.25 trillion pieces of plastic debris are in the ocean. According to the National Oceanographic and Atmospheric Administration, plastic debris kills an estimated 100000 marine mammals annually, as well as millions of birds and fish. The following are the factors of plastic pollution: Plain old trash, plastic overused, plastic-made fishing nets, disposal of plastic and garbage, and burning plastic is highly toxic. In light of the above, it is clear that plastic spoils the entire society. We should take responsibility to avoid the use of plastics in day-to-day life. The major long-term effects of plastic are given below: Plastic upsets the food chain, groundwater pollution, land pollution, and air pollution, plastics kill animals as well as human beings, plastic is poisonous, and spend more to clean affected areas. At present, the government has taken steps to eradicate non-biodegradable plastic products mainly polythene covers, which affect the environment impeding, water flow. Plastic burning also causes problems of air, land, and water pollution. The government banned non-biodegradable plastic covers, plates, cups water packets, straws, and bags. However, plastic sachets used to pack milk, curd, and oil, besides those used to wrap medical products will be exempted from the ban. The steps taken by the government is palpable and plastic free society is a gift for us and future generations. Measures to promote a healthy environment.

At present, this plastic ban does not allow people to use any of the 14 items. But if there are any plastic bags containing vegetables or fruits from the supermarket they should be properly disposed of. Residents were advised to hand over them to conservancy workers and not to throw away banned plastics in bins. Residents should keep these wastages separately and later they will be cleaned by conservancy Workers. The following measures can be undertaken to promote a healthy environment: Carry Reusable bags to shop friendly; get rid of bottled water; avoid plastic food containers; educate Businesses to skip plastic with harmless substitutes; get involved to make a plastic-free Environment; and recycle everything and it saves energy. This is the time to replace plastic with Eco-friendly products. All of us join together to fight this menace and preserve our green Environment.

Conclusion

In the present economic scenario, the usage of plastic is everywhere and it pollutes the entire Environment. To promote a green environment the government has banned plastic and conducted Awareness programs for the public. Everyone should contribute to an initiative to bring a plastic-free India. The government can start units for making bio-degradable bags or at least help plastic Manufacturers convert to these eco-friendly materials. Residents their part should ensure Minimum use of plastics, and maximum reuse as well as safe disposal. People should reduce,

Refuse, reuse and recycle plastic bags. We can eradicate plastic pollution by reusable beverage Mugs, and reusable cloth shopping bags, avoiding drinking water or juice in plastic bottles, shopping for Organic clothes, swap sponges, using candle or incense sticks for fresher air, avoid to use straws, reducing the use of electronics, use cloth diapers instead of plastic one, look away from packaged foods and use of knowledge. The government should take steps to promote awareness about plastic-free Environments among students' communities. Banning the manufacture of plastic is not a solution for a green environment. The government may campaign for a reduction in consumption through education and Awareness programs.

(6) Dev Patel:

**B.Sc. Industrial Chemistry
(III Sem)-21SC03001**

“BREAKING DOWN PLASTIC CHAIN”

Plastic planet: How tiny plastic particles are polluting our soil?

The millions of tons of plastic swirling around the world's oceans have garnered a lot of media attention recently. But plastic pollution arguably poses a bigger threat to the plants and animals – including humans – who are based on land. Very little of the plastic we discard every day is recycled or incinerated in waste-to-energy facilities. Much of it ends up in landfills, where it may take up to 1,000 years to decompose, leaching potentially toxic substances into the soil and water.

Researchers in Germany are warning that the impact of microplastics in soils, sediments and freshwater could have a long-term negative effect on such ecosystems. They say terrestrial microplastic pollution is much higher than marine microplastic pollution – estimated at four to 23 times higher, depending on the environment. The researchers conclude that, although little research has been carried out in this area, the results to date are concerning: fragments of plastic are present practically all over the world and can trigger many kinds of adverse effects.



Toxic effects

In 2020, the first-ever field study to explore how the presence of microplastics can affect soil fauna was published in the Proceedings of the Royal Society. The paper notes that terrestrial microplastic pollution has led to the decrease of species that live below the surface, such as mites, larvae and other tiny creatures that maintain the fertility of the land. Chlorinated plastic can release harmful chemicals into the surrounding soil, which can then seep into groundwater or other surrounding water sources, and also the ecosystem. This can cause a range of potentially harmful effects on the species that drink the water. Generally speaking, when plastic particles break down, they gain new physical and chemical properties, increasing the risk that they will have a toxic effect on organisms. And the larger the number of potentially affected species and ecological functions, the more likely it is that toxic effects will occur. Chemical effects are especially problematic at the decomposition stage. Additives such as phthalates and Bisphenol A (widely known as BPA) leach out of plastic particles. These additives are known for their hormonal effects and can disrupt the hormone system of vertebrates and invertebrates alike. In addition, nano-sized particles may cause inflammation, traverse cellular barriers, and even cross highly selective membranes such as the blood-brain barrier or the placenta. Within the cell, they can trigger changes in gene expression and biochemical reactions, among other things. The long-term effects of these changes have not yet been sufficiently explored. “However, it has already been shown that when passing the blood-brain barrier nano plastics have a behaviour-changing effect in fish,” according to the Leibnitz Institute of Freshwater Ecology and Inland Fisheries.

How do microplastics get into our water?

One of the main sources is our clothing. Minuscule fibres of acrylic, nylon, spandex, and polyester are shed each time we wash our clothes and are carried off to wastewater treatment plants or discharged to the open environment. According to a recent study cited by Water World in 2016, more than 700,000 microscopic plastic fibres could be released into the environment during each cycle of a washing machine. This has not yet been studied in the case of handwashing, which is more common in developing countries, but the effects could be significant there as well. Another study commissioned in the same year by clothing company Patagonia and conducted by researchers at the University of California, Santa Barbara, found that washing a single synthetic jacket just once released an average of 1.7 grams of microfibrils. In 2019, it was estimated that 1.5 million trillion microfibrils were present in the oceans around the world.



Microbeads

Microbeads are solid plastic particles that typically range from 10 micrometres (0.00039 inches) up to 1 millimetre (0.039 inches). Numerous countries around the world have introduced legislation to ban the manufacture of cosmetics and personal care products containing microbeads. Such laws have already been passed in Canada, Ireland, the Netherlands and the United Kingdom.

HOW TO REDUCE PLASTIC USE TO PREVENT PLASTIC POLLUTION?

There is a lot that parents can do to educate their children about the harmful effects of plastic and avoiding plastic use. Parents and children can play an active part in protecting the environment by taking some responsible steps to reduce everyday plastic use. Let us take a look at some simple ways to reduce plastic use. Also read about the harmful effects of plastic pollution, why it is important to prevent plastic waste, and some fun activities to avoid using plastic.

How to reduce plastic use

Here are some simple ways to reduce plastic use:

Stop using plastic carry bags and covers. Switch over to reusable cloth bags instead. Never use disposable plastic straws, spoons, knives, and forks. Use glass containers instead of plastic ones in your kitchen. Use your own vessels for takeaways at hotels. Pack your children's lunch, snacks and water in stainless steel containers. Don't use plastic serving plates and tumblers when you host any event. Avoid buying foods that are packed in plastic.

Importance of reducing plastic use

Plastics are choking the world. Here are some serious facts to ponder: Almost half of the plastics produced globally are disposable plastics designed for single use. This means they are used once and then thrown away, creating large amounts of waste. For example, disposable plastic bags take less than one second to make, are used for 12-20 minutes, but last thousands of years! Every year, we use a trillion plastic bags worldwide. For each minute you spend reading this article, two million more plastic bags are produced!

Five fun activities to avoid using plastic

Here are five fun tips to involve your child in plastic awareness activities.

1. Plastic-free July

We learn best from our experiences. Join a fantastic global challenge to reduce the use of disposable plastics. Sign up for a day or whole month; focus on specific disposable plastics or challenge yourself to say no to all disposable plastics! This experience for your family is guaranteed to change the way you think and use plastics!

2. The bad plastic family hunt

As a family, join forces in a treasure hunt with a difference. Investigate your own home and search for unsafe or disposable plastics. Go through your kitchen cupboards, bathroom, bedroom and pantry. Search for the resin codes and pick up any unsafe plastic. Remember that codes 7, 6 and 3 are not good for you and your family. Collect plastic items that you use just once (disposable plastics) as these contribute massively to plastic pollution. Make two piles of plastic (unsafe and disposable) on your dining room table, and as a family, brainstorm on how you can replace these items with plastic-free alternatives.

3. Zero plastic waste birthday

Start small but make it a habit to protect the planet from plastic pollution. Celebrate your next birthday with a party that does not pollute the planet for the next 1,000 years, by avoiding plastic use. Choose reusable tableware (ceramic, stainless steel, or glass). Challenge yourself to make your birthday all about having fun and not polluting the environment!

4. Water taste challenge

Did you know that bottled water is 1,000 to 2,800 times more expensive than tap water? Or that producing and transporting a 1-liter plastic water bottle release a hundred times more greenhouse gases than 1-liter of tap water? Take the water taste challenge and see if you can find the difference between bottled water and tap water. Get a family member or friend to blindfold you, eat something sweet or salty, and then take a sip of water from two different sources (bottled water and filtered water). Try to guess which one is bottled water and which is the tap/filtered water source. Did you get it right? If not, then it is not surprising as bottled water is in fact just glorified tap water, and thousands of people who have done the same test could not tell the difference either!

5. Microbeads test

Microbeads are small round pieces of plastic that are added to personal care products and cosmetics including scrubs, face wash, shower gel and shampoos. They are flushed down the drains and eventually end up in our rivers, lakes and oceans. Check for microbeads that have snuck into your bathroom without you and your family knowing it. Take a scrub or shower gel with microbeads that you find in your bathroom. Mix two tablespoons of this in a glass of water and stir it well. Pour the water through a black T-shirt, filtering the microbeads out. Feel the microbeads, and as a family make a conscious choice to avoid this hidden type of plastic pollution. These activities provide both adults and children an opportunity to learn about the impact of plastics on our environment and inspire them to make an eco-friendly choice. The small step you and your family take today will go a long way in saving the world from the plastic menace. Inspire your children to say NO to plastics and be an example to others.



(7) Meet Joshi:

**B.Sc. Industrial Chemistry
(III Sem)-21SC03002**

“PLASTIC WASTE MANAGEMENT: SUBSTITUTION OF RECYCLING THING “

Plastic pollution has become one of the most pressing environmental problems as the rapidly increasing production of single-use plastic products exceeds the world ability to deal with them. Plastic pollution is most visible in developing Asian and African countries, where garbage collection systems are often inefficient or non-existent. But even the developed world has problems with the correct collection of discarded plastics, especially in countries with a low recycling rate. Plastic litter has become so ubiquitous that it has prompted efforts to draft a global treaty negotiated by the United Nations. Plastics made from fossil fuels are just over a hundred years old. The production and development of thousands of new plastic products accelerated after World War II, transforming the modern age so much that life without plastics would be unrecognizable today. Plastics have revolutionized medicine with life-saving devices, made space travel possible, lightened cars and jets – saving fuel and pollution – and saved lives with helmets, incubators and clean drinking water equipment. However, the conveniences offered by plastics have led to a throwaway culture that reveals the dark side of the material: today, single-use plastics make up 40 percent of the plastic produced each year. Many of these products, such as plastic bags and food packaging, have a lifespan of only minutes to hours, yet can persist in the environment for hundreds of years.

Some key facts:

- Half of all plastics produced have been produced in the last 15 years.
- Production has increased exponentially, from 2.3 million tons in 1950 to 448 million tons by 2015. Production is expected to double by 2050.
- About 8 million tons of plastic waste from coastal countries escapes into the oceans every year. the equivalent of placing five garbage bags full of trash at the foot of every coastline around the world.
- Plastics often contain additives that make them stronger, more flexible and more durable. But many of these additives can extend the life of products if they become trash, with some estimates ranging from at least 400 years before they break down.

- Most of the plastic waste in the oceans, Earth last sink, comes from land. Garbage is also carried into the sea by large rivers that act as conveyor belts, picking up more and more trash as they move downstream. Once they reach the sea, much of the plastic waste remains in coastal waters. But once it gets into ocean currents, it can be transported around the world.
- On Henderson Island, an uninhabited atoll in the Pitcairn Group isolated halfway between Chile and New Zealand, scientists have found plastic items from Russia, the United States, Europe, South America, Japan and China. They were carried into the South Pacific by the South Pacific Current, a circular ocean current. The production of plastics is constantly growing at a rapid pace. It is estimated that about 3% of all plastic produced ends up in the ocean each year.

Since the widespread introduction of plastics after World War II, a total of 8.3 billion metric tons have been produced. Of this amount, 6.3 billion tons became waste by 2015. Only 9% of this waste plastic is recycled and 12% is incinerated. The remaining 79% ends up in landfills or in the environment, where it will remain forever in one form or another because plastic does not decompose. World production of plastics has grown from two million tons in 1950 to 380 million tons in 2018. In 2017, the world produced nearly 350 million tons of plastic (without fibres). About half of all plastics on Earth have been produced in the last thirteen years. If the current trend continues, around 2050 there will be about twelve billion tons of plastic in landfills and in the environment. More plastic is thrown away than we can clean up, even if we do our best. The only way to reduce and prevent plastic pollution is to produce and use much less plastic. For many countries, the rainy season is also the season for plastics. Heavy rain washes the banks of the rivers. These rivers carry all the plastic debris that used to be on the shores into the sea. After that, a part is deposited on the beaches. In Bali, the famous tourist beaches have been covered in a thick layer of plastic again and again; in January 2018, after five days of rain, a & quitters' emergency & quote; was declared. Bulldozers were used to clean the beaches. The beach in Durban, South Africa was also full of plastic bottles after heavy rains. In countries like France, Spain and Italy, half of all waste still ends up in landfills. Much of this plastic blows into the ocean, and floating plastic is easily driven by the wind.

plastic
free
future

Now let discusses how to make the environment plastic free. Plastic pollution is a big challenge for people and the planet. Find out how individuals, groups and governments can tackle plastic pollution, clean up the world cities and help stop plastic in the oceans. Plastic is incredibly useful and convenient, but it also causes pollution that harms health and the environment. In some parts of the world, formal waste disposal services cannot cope with the amount of waste generated. This is the case in Bangladesh, where Practical Action works with informal waste management workers, local NGOs and the government to find solutions to the waste crisis. Inadequate waste management means that plastics, including recyclables, are dumped in open spaces and rivers. Plastics in rivers can block waterways and pollute fresh water sources. Burning plastic releases toxic gases that can cause illness. Plastic waste in landfill releases carbon dioxide and other greenhouse gases, including methane, which contribute to the climate crisis. A lot of plastic waste ends up in the sea. Plastics in the oceans harm marine life and become part of the food chain. Solutions are being developed around the world to combat plastic pollution. Learn about solutions that are already making a difference in Bangladesh and around the world, and learn how you can take small steps to reduce plastic waste in your life. Raising awareness of challenges such as: In 2018, the Royal Statistical Society of Great Britain statistic of the year was all about plastic waste. 90.5% of plastic waste ever produced has not been recycled. At an estimated 6,300 million metric tons, the researchers calculated that about 12 percent of plastic waste has been incinerated, while about 79 percent is either in landfills or polluting the environment.

By sharing messages with others through your social networks, you can help raise awareness about the dangers of plastic pollution and the importance of positive action. Don underestimate the difference you can make - just a few social posts each month can help raise awareness of the issue of plastic waste and change people behaviour. Reducing plastic consumption:

Many countries around the world have committed to reducing the amount of plastic produced and used. In 2016, France became the first country in the world to ban the production and sale of single-use plastic cups, cutlery, plates and takeaway food. box. The law requires all disposable tableware to be made from 50 percent bio-based materials that can be composted at home. The hands-on event works with the government of Bangladesh to raise awareness of plastic pollution and improve waste management in the country. Our bike rally in Faridpur (pictured) in March 2022 encouraged the city younger residents to sort their household plastic waste so it can be more easily collected and recycled.

There are ways to reduce plastic consumption in your home:

1. Consider cooking from ingredients if you can – it cuts down on both packaging and food waste.
2. Avoid unnecessary packaging by shopping at stores that use paper bags instead of plastic. It is even better to shop that avoid packaging altogether.
3. Glass is another potential alternative to plastic. How about having your milk delivered in retro glass bottles by a traditional milk delivery service?
4. Did you know that some tea bags contain plastic? Look for compostable varieties or switch to loose leaf tea to avoid this. Despite our best efforts to reduce plastic consumption, it is difficult to completely avoid plastic.

By thinking carefully about how you reuse your plastic products, you can get the most out of each item and avoid another pollution problem.

1. Save old water and juice bottles and use them to water your plants.
2. Keep plastic jars and pots and use them to store small household items.
3. Use old salad dressing containers to mix and store your own homemade seasonings.
4. Cut off the bottoms of large plastic bottles and use them as small pots or planters.



Conclusion

Recycling plastics into new products:

Recycling plastics saves natural resources and protects ecosystems, with less plastic ending up in rivers and oceans. It produces lower carbon emissions because less energy is used to obtain and process new raw materials. It also keeps potentially methane-releasing waste out of landfills – a crucial step in the fight against climate change. In some parts of the world, recycling plastics opens up opportunities for entrepreneurs like Rajon (pictured) to make a living as a vital link in the recycling chain. We are working with informal waste management workers in Faridpur, Bangladesh to lead the way in transforming the way the city different types of waste are managed.

Take positive action and recycle more plastic in your home:

1. When you are at the supermarket, look for products that use biodegradable packaging rather than plastic.
2. Make sure you recycle everything you can - check your local recycling service website for a full list of what you can put in your recycling bin.
3. Sign up for the Marine Conservation Society Plastic Challenge for a fun way to help your family keep track of their recycling habits.
4. Use your consumer voice by calling stores that use excessive packaging and urging grocers to provide reusable containers.

Raising awareness of solutions: “With the help of Practical Action, I joined the co-op. There are many benefits to my health and safety. I managed to save some money through a savings association. It makes it easier for me to pay for necessities like clothes and shoes for my children.” Taslima Begum, a plastic waste collector explored some of the solutions being developed to tackle plastic pollution – from national government initiatives and the work of Practical Action in Bangladesh to individual actions making a big difference. You can help spread the word about these solutions by sharing them with others. Share the stories of waste pioneers like Taslima on your social network. Post your own efforts to reduce, reuse and recycle your plastics. Or join with others in your community to encourage local businesses to take positive action to reduce plastic waste. Don't forget to tag us in your social media posts. We love to hear your stories!



(8) Krishna Gajjar: B.Sc. Biotechnology (I Sem)-22SC02023

“IT’S YOU WHO DECIDE! PLASTIC A FROM L. BAEKELAND!?”

The journey of plastic from being discovered to becoming a necessity is over 100 yrs. long. The pioneer of fully synthetic plastic was Leo Baekeland. Along this journey, plastic has gradually become an inseparable part of our lives. Its development has reached a level where complete eradication from its use is nearly impossible. It is one of the highest used materials in industries. You can find it everywhere in your surroundings and is a part of everyday necessities. Its discovery has highly affected our life. Its low cost and high longevity have increased its importance.

As development has taken place their production has increased over years. Initially, that is in the 1950s the amount of plastic produced was manageable. With the development of science and technology, we have discovered many uses for plastic. Due to these 400 million tons of it are produced every single year. we have forgotten that everything easy to deal with has its consequences. We have focused on only the better ways to use it but not on reducing its toxicity. It is non-biodegradable and releases toxic chemicals over a period of time. Low-quality plastic even affects our health. The chemicals used in plastic are ruining our environment. Dumping it in landfills and oceans is affecting our aquatic and terrestrial life, even killing a lot of organisms living there. It even causes air pollution as the plastic waste that is not dumped is burnt. Not realizing the sincerity of this process as these things don't take place in front of our eyes can be dangerous. Even if we see the news, it is only small glimpses of what is happening. It has become a disease that is ruining our ecosystem internally. Burning plastic releases harmful gases including greenhouse gases that are disturbing the thermos equilibrium of the ecosystem. It is shocking to know that out of 7 billion tons only 10% of plastic is recycled. We have reached a critical moment where further exploitation by us would create nothing but problems slowly engulfing us and the environment.

Does that mean we should stop using plastic? Can this issue be solved? No, complete eradication of plastic is not possible and yes, this issue can be solved easily if each of us supports it. Scientists have been working on this issue. They have created biodegradable plastic. They even have been working on microbes that can fasten the process of plastic degradation. These are the ways in which we can treat the plastic produced in the future. What about the plastic that has been dumped? As every problem has a solution some of us have found its solution too. The waste plastic can be converted into blocks that can be used on

footpaths. We can even make roads and bricks out of plastic. It is astonishing to know that plastic bricks are 7 times stronger than normal concrete bricks. This proves that with the correct help of science and technology we can save the world and even make it a better place to live. Isn't it confusing That even after having a number of solutions we are not able to deal with this disease? The reason behind this is us. Even when we know the right, we keep following the wrong. We can help ourselves from this danger with our own help. We need to pay attention to it. Plastic should be excluded from the bottom line i.e., starting from houses. Government and NGOs have been taking the initiative to solve this. But this is not possible until they get the support of locals. This responsibility needs to be done without any excuses for one's safety. If it's not done sincerely then eradication will become a dream and nothing else. Such drives should be promoted by us. We need to know that the little money we save is important for the safety of the earth where our ancestors have been staying and where our future generation is going to grow. We should also actively take participation in drives organized by the government and NGOs. Proudly be a part of such drives that aims at crumbling these plastic piles. Moreover, parents must play a vital role in bringing awareness about plastic waste and its harmful effects on their children right from the beginning. Other than awareness drives, drives targeting manufacturers must be run. Such drives make the manufacturers realize that people obviously support sustainable packaging rather than cheaper but harmful plastic. We are only making our life harder. We should refuse from using nondegradable plastic items and accept their replacements. We should increase the use of cloth and paper which were already used during the ancient times when plastic was not well known. Make a practice of buying the goods in bulk as our forefathers used to do. Such practice will certainly bring down the considerable amount of plastic used in small packaging. But as the popular phrase says nothing comes easy in this world. One must take pains if one wants to change things so let's take a step forward.



Conclusion

We use it unknowingly as plastic bottles, food packets, and straws. This needs to be stopped at this critical moment as further exploitation would have dangerous consequences. There are many ways through which we can help ourselves. Even with the advancement in science and technology we have failed to solve this issue. This issue seeks attention and needs to be resolved.

There are many camps organized by NGOs and the government. These initiatives have been productive but need to be supported by the locals ^ elaborate – even not partial eradication – awareness from starting ..drive One should start avoiding plastic by replacing it with cloth and paper. Even in cloth, the ones obtained from nature should be preferred. Even after this, we don't reach a solution. Plastic produced also needs to be decomposed through a proper and safe method. Here come the roles of biotechnologists and microbiologists. Studying the material and the way the microbes would react with them can help us decompose the plastic. The faster the decomposition occurs the lesser it would harm us. This issue can not only be solved by biology but also by other methods. one can convert plastic into other materials through chemical reactions.

The plastic that can be modified can also be used to create new useful things. For example, the way plastic is converted into blocks and used on footpaths is one of the best ways. the discovery of using plastic for building roads and footpaths has played an important role. Except this, we can find alternative materials from nature that can be decomposed or recycled easily.



(9) **Rushali More :**
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“SPIRULINA: A SUSTAINIBLE SOLUTION TO PLASTICS”

Abstract

Every year, over 8 million tons of plastic waste end up in oceans and affect lots of marine species. Millions of animals are killed every year because of plastic. Some studies reported liver damage and cell damage as well as disrupting reproductive systems of many species such as oysters producing fewer eggs. While microplastic has finds its way to enter our body through ingestion, inhalation, dermal contact, and interrupting our bodily mechanisms. A recent study done by Ragusa A. et al. (2022) reported that inevitable exposure to plastic has shown the presence of microplastics in human breast milk. Microplastic passes the cell membrane and is translocated to different body sites, triggering specific cellular mechanisms. The scientist came up with the solution of reutilization of leftover residues of spirulina cultivation can be blended with PVA (Polyvinyl alcohol) to create a flexible material just like plastic. Other materials such as glycerol can be added to increase the flexibility and maleic anhydride for compatibilizer to strengthen the bond. PVA has gained more attention nowadays because of its high tensile strength, biodegradability, and being soluble in water. The main advantage of using Spirulina sp. is that it takes less time to cultivate and does not require a large area for cultivation as compared to terrestrial plants and also acts as a filler in a polymer matrix. Hence, using spirulina as a filler reduces cost and carbon footprint.

Introduction

India annually generates more than 3.5 million tonnes of plastic. In today's world, plastic disposal has become a major threat to the environment and is considered a major contaminant in environmental ecology because of its recalcitrant biodegradation, poor management, and risky disposal. The careless behaviour of humans has resulted in fatal damage to over 6000 organisms by entanglement or ingestion of plastic debris and also disturbs the dynamic equilibrium balance of the biosphere. There have been many studies going on to develop biodegradable bio-based plastics. Some studies try to propose sustainable, eco-friendly, and simple procedure solutions. They tried to convert hazardous high-salt microalgal residues into bioplastic film. The synthesis mechanism shows that the algal residues consisting of inorganic salts act as a filler for the sheets under alkali conditions or act as a cross-linker in acidic conditions. This practice enhances the practical feasibility as well as a sustainable solution for the eco-friendly waste reutilization process. Most of the bioplastics mainly developed from raw materials obtained from agricultural plant sources such as corn, potato, wheat, and soybean. The utilization of agricultural resources is good to some extent but it causes a potential threat to food security and agricultural land resources. Several research is going on various species of microalgae such as Chlorella sp., Nannochloropsis sp., Scenedesmus sp., Chlamydomonas sp., Spirulina sp., etc. Hence, Spirulina can be one of an ultimate solution and serve as a promising feedstock formation of bioplastic due to its fast growth rate and environmental tolerance as well as alleviating competition with food crops.

10 million tons of plastic is dumped in oceans annually which equals to more than a garbage truck load every minute

500kg of plastic is discharged into the oceans **every second**

50% of all plastic produced (380 million tons a year) is **Single use plastic**

The plastic garbage patch in the pacific ocean is larger than India.

PLASTIC POLLUTION FACT CHECK!

Less than 9% of all plastic gets recycled globally

Humans eat over **40 pounds** of plastic in their lifetime

1 million marine animals are killed by plastic pollution every year

Microplastics (PET) have been found in human blood

Spirulina – as solution!

Spirulina – a microscopic and filamentous cyanobacteria. Due to its 60% of average protein content, and antioxidant & antitumor properties, it is considered as a superfood. After extraction of Spirulina, the large number of inorganic salt residues such as calcium chloride and disodium hydrogen phosphate cause disposal problems so some studies reported that these leftover salts serve as fabrication of bioplastic. For example, presence of calcium enhances the tensile strength of the material. Dianursanti et al. (2019) focused on blending PVA with biopolymer. The high protein content of spirulina act as a compatible biopolymer for utilization.

TABLE I. The Composition of Spirulina Platensis

Component	(wt%)
Protein	60
Lipid	6
Fatty Acid	265 mg / 10 gr
Amino Acid	2410 mg / 10 gr
Vitamin A	23000 IU
Vitamin B1 - B3	2.3 mg / 10 gr
Vitamin B6 - B12	112 mcg
Vitamin E	4 IU
Phycocyanin	20%
Chlorophyll	1.5%
B-Carotenoids	0.15%
Pantothenic Acid	4 mg / 100 gr
Folic Acid	100 mcg / 100 g
Polysaccharide	0.4 g / 100 gr

Bioplastic – a miracle material production

Chaofan Zhang et al. (2020) An ultrapure water consisting of HCl and NaOH was adjusted to pH 3 to 5 and then introduced with 3gm of Spirulina residue. This solution is then treated ultrasonically at 1800 kW for 3hrs. After the first phase of treatment, the preheated polyvinyl alcohol (PVA) aqueous solution at 90°C was added to the suspension and mixed at different concentration ratios such as 91% of residue content in 0.3gm of PVA, 85% residue content in 0.5gm of PVA and so on. In the end, the homogenous solution was cast on a smooth polypropylene tray and leave it aside for drying for 3-4 days at 25°C to obtain the sheet.



It was observed that without the addition of PVA, the residues could not form integrated films under all pH conditions. The elemental distribution of inorganic salt was composed of Ca, P and O, and salts may be formed from sedimentation of CaCO₃, Ca(OH)₂, or Ca₃(PO₄)₂ under alkali conditions. The sediments were shaped into nanosheets and served as the filler for composite bioplastic films due to the pre-treatment of ultrasonic.

In acidic conditions, the residue was found to be compact and homogenous. While the sediments were also not obtained but in the place of sediment cube-shaped inorganic salts were identified which were deposited NaCl due to evaporation. Hence, this suggests that calcium act as a cross-linker in composite bioplastic films. The series of trials with several concentrations of PVA showed that the compact film was formed when PVA content reached 35%. The higher concentration of PVA makes the film moisture-resistant as well as smoother. On the basis of the efficient extraction of phycobiliproteins, the high salt concentration forms a uniform structure. Other cations such as sodium and potassium are also capable of working as a cross-linker between the Spirulina sp. residues, and PVA. The flexibility was found to be enhanced on the increment of PVA concentration from 9% to 35%. The probability of collision and transference of force was improved in acidic conditions and it resulted due to the elimination of electrostatic repulsion by cation cross-linker. This led to a denser matrix with enhanced flexibility and resistance to viscosity. The flexibility of the material was tested with the addition of varying concentrations of glycerine. Dianursanti et al. (2019) PVA is a brittle plasticizer, so to overcome this problem glycerol was used to increase the flexibility. The degree of elongation was increased due to hydrogen bonds being found to be formed under acidic conditions.

Conclusion

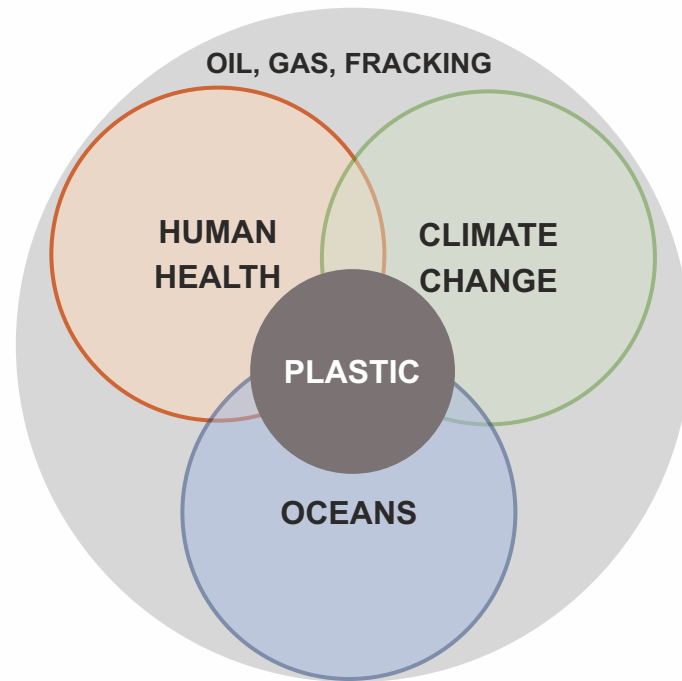
Plastic has become an unavoidable part of our life, it is found floating at the surface of the sea, found along the coastlines, on roadsides, and even 7 miles beneath the soil surface. Even the tiny organisms named zooplankton are the base of the food chain and are found to ingest plastic which threatens the life of each and every organism enrolled in food chain. It is undeniable that we are eating and drinking plastic. Hence, further improvement in findings will help in enhancing bioplastic production from spirulina as well as from other algal cultivation and will aid the elucidation of the corresponding mechanism. This biodegradable tool can help us to avoid at least single-use plastic material & replace plastic packaging but the waste which we had dumped till now is need to be eradicated. So, let's rethink and work in a positive attitude and create a green life like spirulina!



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PLASTIC POLLUTION- AN OVERVIEW

Plastic pollution is one of the greatest challenges of the 21st century. Developed in the early 20th century, the versatility, lightweight and flexible properties of plastic have given us convenience for packaging, ease of shipping and many important products, like electronics or medical devices. However, the non-stop convenience and production of plastic has turned this material into an environmental and public health nightmare. Half of all plastic is designed to be used once and then thrown away. There are many reasons to work towards a plastic-free environment:

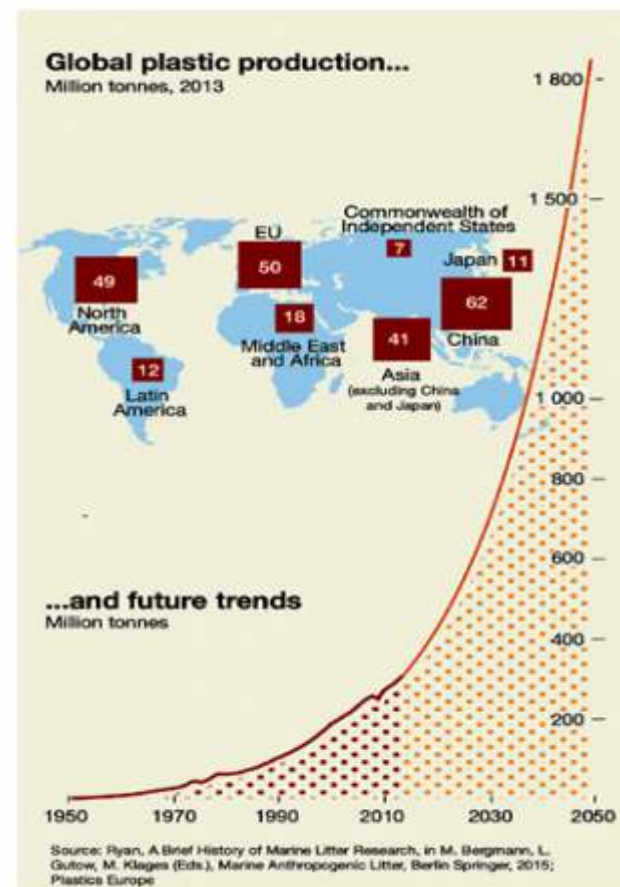


- Plastic contributes to greenhouses gases that lead to CLIMATE CHANGE
- Some chemicals in plastics are known carcinogens or endocrine disruptors that affect HUMAN HEALTH
- Plastics are the major source of pollution in the OCEANS
- Plastics are derived from COAL, OIL & GAS extracted by DRILLING & FRACKING

Of the 300 million tons of plastic produced every year, more than half are classified as “single-use plastic” (SUP) items, designed to be used once and then discarded. Mismanaged plastic waste, a result of inadequate waste management coordination and infrastructure, makes its way into the environment. The impacts are most visible in the ocean, with approximately 8 million tons of plastic waste leaking into the ocean each year, equivalent to a truck full of plastic every minute.

Statistics on plastics and plastic related pollution

- 15 million tons in the 1960s to 311 million tons in 2014 and is expected to triple by 2050, when it would account for 20 percent of global annual oil consumption
- The ocean is expected to contain 1 ton of plastic for every 3 tons of fish by 2025 and, by 2050, more plastics than fish (by weight).
- That is over 150 million tons of plastic waste in the ocean today. Without significant action, there may be more plastic than fish in the ocean, by weight, by 2050.
- Studies suggest that the total economic damage to the world's marine ecosystem caused by plastic amounts to at least \$13 billion every year.
- Each year, at least 8 million tons of plastics leak into the ocean – which is equivalent to dumping the contents of one garbage truck into the ocean every minute. If no action is taken, this is expected to increase to two per minute by 2030 and four per minute by 2050.
- Plastic packaging generates significant negative effects, conservatively valued by UNEP at \$40 billion.



- Packaging represents 26 percent of the total volume of plastics used
- In 2017, the global production of plastics reached 348 million metric tons (up from 335 in 2016), with 64 million metric tons produced in Europe alone.
- In a business-as-usual scenario of unchecked plastic-waste leakage, the global quantity of plastic in the ocean would nearly double to 250 million metric tons by 2025.
- Researchers estimate that more than 8.3 billion tons of plastic has been produced since the early 1950. About 60 percent of that plastic has ended up in either a landfill or the natural environment.



Plastics and Consumption

Many plastics contain chemicals and additives that can migrate back out of plastics into our food, our water, and ultimately our bodies. For example, Phthalates and bisphenols are added to plastics to make them soft, hard, or flexible - these chemicals mimic our hormones and are called endocrine disruptors. These can have serious health effects through microdosing - particularly for young people, is found in many types of plastic commonly used for food storage.

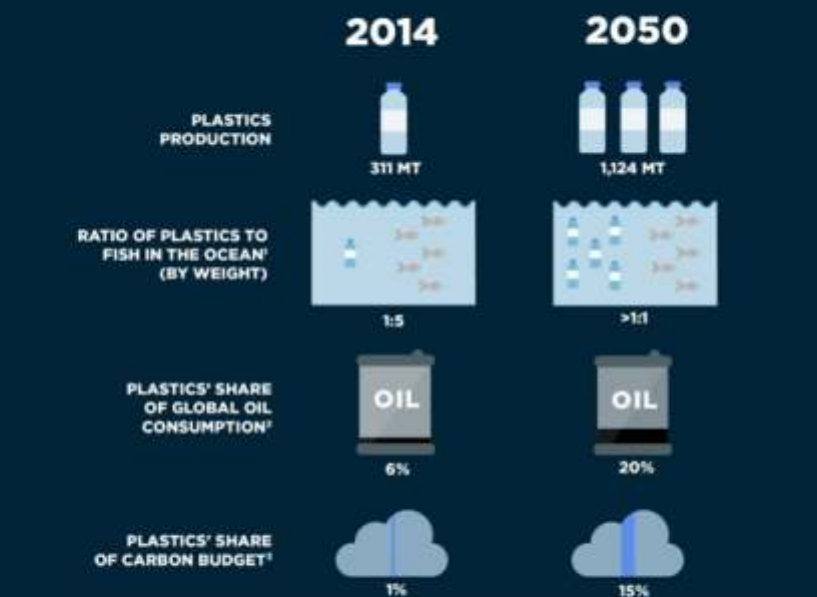
EXTRACTION

90% of plastics produced are from virgin fossil feedstocks. Plastics are made from petrochemicals, which originate from oil, fracking and drilling of natural gas or coal. These are transported to refineries to be distilled in different fractions, including naphtha. Then, naphtha is cracked into monomers which, after chemical process, constitute virgin plastic polymers.

MANUFACTURE

Polymers are mixed with additives to improve plastic characteristics. Then, packaging producers manufacture items.

WITH AN EXPECTED SURGE IN CONSUMPTION, NEGATIVE EXTERNALITIES RELATED TO PLASTICS WILL MULTIPLY



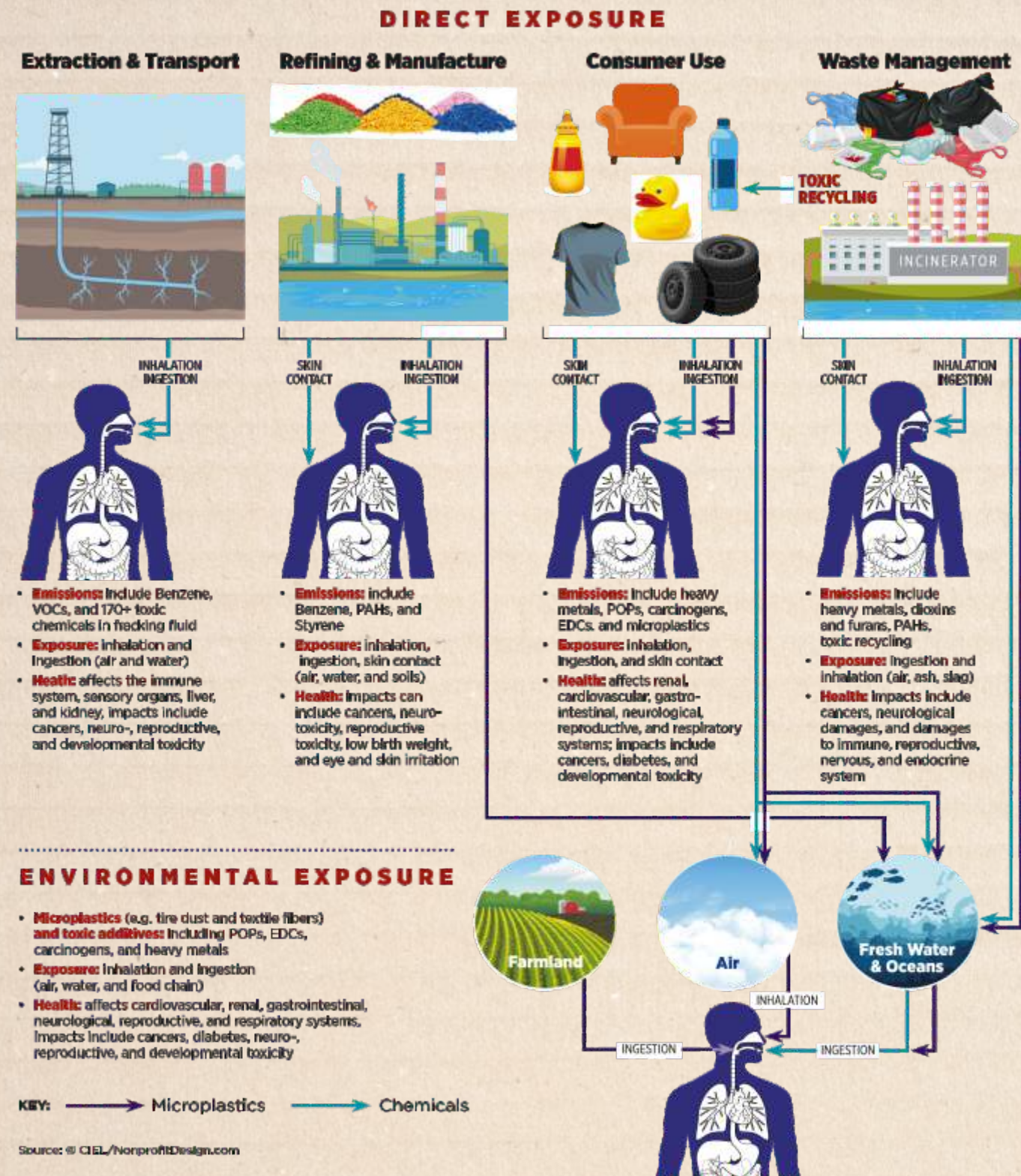
ELLEN MACARTHUR FOUNDATION
WORLD ECONOMIC FORUM, ELLEN MACARTHUR FOUNDATION, MCKINSEY & COMPANY, A NEW PLASTIC ECONOMY: REIMAGINING THE FUTURE OF PLASTICS (2016)
ELLENMACARTHURFOUNDATION.COM/ENR/Publications

¹ Plastic waste is expected to be collected for incineration and recycling.
² Total oil consumption expected to grow above 10.5% p.a. from plastics production (1.9% until 2030 then 3.2% to 2050).
³ Carbon footprint includes energy used in production and carbon released through incineration and/or energy recovery after use. The latter is based on 100% incineration and/or energy recovery in 2014 and 2016 to 2050. Carbon budget based on 2-degree scenario.

Source: Plastics Europe, Oil Supply and Demand, IEA, World Energy Outlook (WEO) Global GDP (2010-2014) and Global New Plastic, Analysis of Demand Projection (2014-2016), both assumed to continue to 2050; Design, Consumption and Packaging Center for Business and Environment, Estimating the Total Litter Based on Design for a Plastic-Free World (2016); J. R. Jennings et al., Plastic waste leaks into the ocean, 19 February 2015; J. Jennings et al., Plastic Recycling: Challenges and Opportunities (Philosophical Transactions of the Royal Society B, 2016); B.A. 2012 emissions from fuel combustion (2014); IEA, World Energy Outlook, Special Report Energy and Climate Change (2015); Carbon Tracker Initiative, Unburnable Carbon (2014).

FIGURE 2
Plastic & Health: The Hidden Costs of a Plastic Planet

Humans are exposed to a large variety of toxic chemicals and microplastics through inhalation, ingestion, and direct skin contact, all along the plastic lifecycle.



Disposal

Plastic stays around for hundreds of years or more. Unfortunately, only 9% of the plastic every produced gets recycled; the majority ends up in landfills or in the environment. In fact, 8 million tons of plastic enter our waterways each year. All that plastic is starting to show up in unexpected (and unwelcome) places, from our tap water to our food. The “smog” of microplastics in our ocean is smothering the small organisms that make up the base of the food chain and could have serious implications for our food systems.

CONSUMER USE

Humans are affected through multi-pronged exposure to chemicals in plastic, with differing impacts according to the toxicity (hazard) and the levels of exposure.

During production, additives are mixed with virgin plastic polymer to improve performance, including features such as malleability, durability or colouring but Majority of these additives have not been tested, but two that are most studied are phthalates (pronounced “thalates”) and Bisphenol A, i.e. BPA.

Some of the additives used in plastic are shown to be endocrine disruptors, meaning they affect the delicate balance of glands and organs that produce, store and secrete hormones.

There are also many human health impacts associated with plastic, both through the chemicals contained in plastic which we encounter daily, and the impacts on the environment, which affect us. Many of the key chemicals in plastic, such as Bisphenol A (BPA or BPS), plasticisers or phthalates (used to make plastics flexible), and flame retardants have been shown to disrupt the hormonal system, impair brain function and cause reproductive abnormalities.

PLASTIC WASTE MANAGEMENT

The impact of the disposal depends on the after-use pathway.

When plastic makes it way to the ocean, it can end up back on our dinner plates through fish, shellfish, salt, water and we are then at risk of ingesting not only the plastic but all of the associated absorbed chemicals (e.g. persistent organic pollutants in the ocean).

As plastic has entered human food chain, it impacts human health through:

- Food security: Decrease of food availability for humans. Experiments conducted in laboratories shown that microplastics exposure to organisms has impacts such as: mortality, reduce feeding rate, body mass and metabolic rate.
- Food safety: After ingestion, additives and pollutant contained in plastic can be transferred to animals and cause trouble in the key vital functions. Organism may be physically damaged and cellular functions altered due to plastic particle absorption. Plastic waste can contaminate organisms and contribute to the increased risk of human and animal disease.

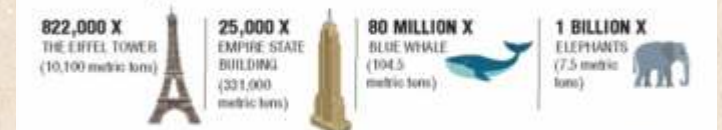


STOP PLASTIC POLLUTION

A clearer picture of plastics

Humans have created about 8.3 billion metric tons of plastics to date, outgrowing all man-made materials other than steel and cement.

How heavy is 8.3 billion metric tons?



The rapid rise of plastics

A world without plastics seems unimaginable today, yet their large-scale production and use only dates back to around 1950.

GLOBAL PLASTIC PRODUCTION ESTIMATES



More than 99 percent of plastics are produced from chemicals derived from oil, natural gas and coal — all of which are non-renewable resources. If current trends continue, by 2050 the plastic industry could account for 20 percent of the world's total oil consumption.

Only 9 percent of all plastic waste ever produced has been recycled. About 12 percent has been incinerated, while the rest — 79 percent — has accumulated in landfills, dumps or the natural environment.

According to Valuing Plastic, the annual damage of plastics to marine ecosystems is at least \$13 billion per year. Asia-Pacific Economic Cooperation estimates that the cost of ocean plastics to the tourism, fishing and shipping industries was \$1.3 billion in that region alone.

- Landfill – additives used in plastics can migrate from the plastics to the leachate (the liquid that drains or 'leaches' from a landfill), contaminating groundwater.
- Low-income population often burn plastic waste for heating or cooking purposes.
- Incineration of plastic waste releases toxic chemicals into the air and directly release carbon which was captured in plastic products.

WHAT CAN WE DO?

It is essential to stem or stop the flow of the plastic tap at the source with two ingredients: ATTITUDE AND ACTION

Attitude

Right now, everyone is talking about plastics. Many people are doing something. But there is so much more to do.

It is important to understand that Plastic-free, is more likely to be plastic-reduced. It also means there will be obstacles along the way as you try to implement plastic-free behaviour and actions.

This is why it is important to persuade as many parties as you can of the need to go plastic free. It is also important to not feel discouraged if you do not get everything you ask for. Each step forward, is a step in the right direction.

Right now, there are thousands of initiatives taking place – inventions, new laws, new systems. Some of these may prove to be bad ideas after a while. Don't give up. Just re-adapt or reject and start again. This is how real life works and the art of negotiation and persuasion is probably the biggest challenge you will face.



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[2] World Bank (2010) 'The State of the Environment Report 2010: The Environment in the World', *World Bank Publications*, Washington, DC: World Bank

[3] Haines, R. J. et al. (2017) 'Endocrine-disrupting chemicals: a global public health challenge', *Environmental Health Perspectives*, Vol. 125, No. 1, pp. 1-11

[4] Haines, R. J. et al. (2017) 'Endocrine-disrupting chemicals: a global public health challenge', *Environmental Health Perspectives*, Vol. 125, No. 1, pp. 1-11

[5] Haines, R. J. et al. (2017) 'Endocrine-disrupting chemicals: a global public health challenge', *Environmental Health Perspectives*, Vol. 125, No. 1, pp. 1-11

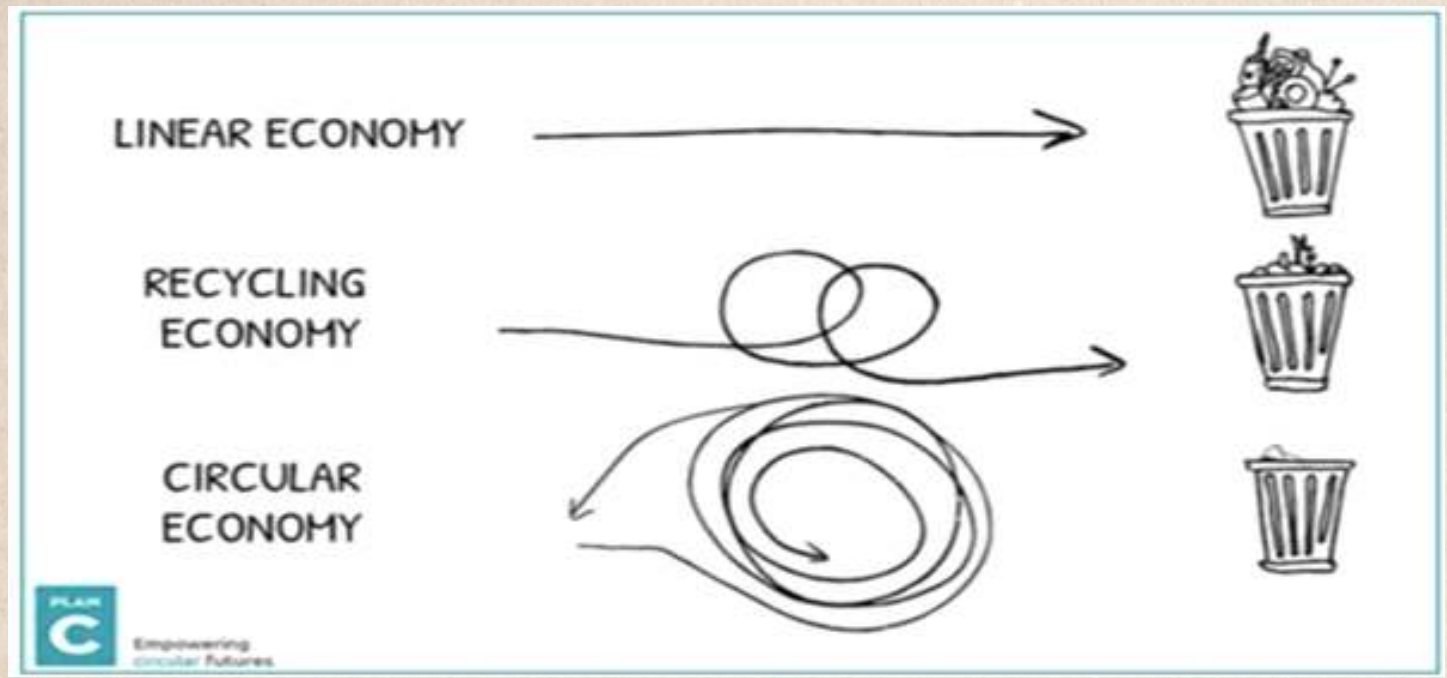
[6] Haines, R. J. et al. (2017) 'Endocrine-disrupting chemicals: a global public health challenge', *Environmental Health Perspectives*, Vol. 125, No. 1, pp. 1-11

[7] Haines, R. J. et al. (2017) 'Endocrine-disrupting chemicals: a global public health challenge', *Environmental Health Perspectives*, Vol. 125, No. 1, pp. 1-11

[8] Haines, R. J. et al. (2017) 'Endocrine-disrupting chemicals: a global public health challenge', *Environmental Health Perspectives*, Vol. 125, No. 1, pp. 1-11

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Action

- Educating the public on the importance of reducing single-use plastics (SUP),
- Working with manufacturers to change product design or delivery to consider a closed-loop cycle of resources/Improving waste management capacity,
- Drastically reducing the demand for plastic.

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AFTERMATH OF WORST CATASTROPE, EARTH COVERED IN PLASTICS.

Today I am going to discuss a very scary, but almost likely situation that is staring at us right now. I am going to discuss the possibility of the entire planet being covered in the growing pile of plastic and how it's going to affect us all.

Let me first ask, are you someone who thinks it's another doomsday scenario everybody talks about all the time but is never going to happen? Then, my dear friend, I suggest you check a few scientific and environmental journals to get your facts corrected. Yes, this is not any scary future predictions, but hard science, based on evidence and experimental findings.



So, let's first check what will most likely happen. As human activities will keep creating more and more plastic waste, without any real solution for its removal or reuse strategies, this plastic waste will keep piling on our land and oceans. In absence of any real solution for the complete breakdown or degradation of plastic, slowly the plastic will start creating a film on the land. This will cover agricultural fields, forests, and wetlands, preventing plant life by blocking the root system to hold onto land. This will also block water uptake by plants.



At the same time, in oceans, floating plastic waste will create havoc for marine life. Already there are so many videos circulated online in which marine creatures are seen wrapped in plastic waste, struggling to breathe or swim.

Now that we are clear about what might be facing us, let's see how this will directly affect us, humans. The first and foremost effect will be the loss of pasture and agricultural land. This will result in reduced food production, which may ultimately lead to great famines. However, scientists have already predicted this situation, and many studies are being done to develop landless agricultural techniques. Let's hope the science will be able to come to our rescue and save us from this grim situation.

The next and ultimate effect will be on the ecological balance, and once this fine balance will be affected, we may enter into a situation of real chaos. Nobody can exactly predict how this is going to play out, what will be its outcome and whether we will be able to interfere in this and restore natural balance.

So, friends, the idea of this article is to wake you up to the grim future we are facing, and motivate one and all to act now!!! The only way we can reduce or alter this predicament is by becoming part of the circular economy, ditching plastic for other more sustainable and environmentally friendly alternatives, and finally respecting the fine balance of our environment.

I will be happy to share with you all a few steps I have taken and changes I have made in my life to keep this planet, our only true home, safe for future generations. I hope my experiences will positively motivate you for the same. Here are a few steps you all can take to minimize our use of plastic:

- Always carry your own cloth bag/tote bag, just in case you need to buy or carry something
- Learn to refuse – many times we accept articles in plastic bags/covers, even when we can do just fine without it. We must learn to refuse to accept things in plastic bags, and insist on using our own bags
- Be mindful – reduce bringing in more plastic in your home, and be proactive in finding alternate material/objects
- Try to reuse any plastic articles you have with you in a meaningful way
- Recycle plastic objects - Instead of throwing PET bottles and other hard recyclable plastic in the waste bin, segregate it and give for recycling to Kabadiwala



**12) Virajsinh Dodiya:
B.Sc. Biotechnology
(I Sem)-22SC02054**

“PLASTIC AND HOW THEY HARMFUL TO ENVIRONMENT”

Plastic has been a staple in our society for decades, used in everything from water bottles and grocery bags to medical equipment and construction materials. It's cheap, versatile, and durable, making it the go-to material for a wide range of products. However, as convenient as it may be, plastic is also a major contributor to environmental pollution and poses a serious threat to the health of both humans and wildlife.

One of the biggest problems with plastic is that it takes hundreds of years to decompose. According to the United States Environmental Protection Agency, plastic takes anywhere from 450 to 1000 years to break down in landfills. This means that every piece of plastic ever produced is still out there somewhere, whether it's floating in the ocean or buried in a landfill. As plastic breaks down, it releases harmful chemicals into the environment, contaminating soil and water and posing a threat to wildlife and human health. In addition to its slow decomposition rate, plastic also poses a threat to wildlife. Animals can mistake plastic debris for food and ingest it, leading to injury or death. For example, sea turtles often mistake plastic bags for jellyfish, their primary food source, and can become entangled in plastic six-pack rings or other debris. Fish and other marine life can also ingest plastic particles, which can then make their way up the food chain and into the human food supply. The Great Pacific Garbage Patch, a floating mass of plastic and other debris in the Pacific Ocean, is a prime example of the impact plastic has on the environment. The patch, which is twice the size of Texas, is made up of an estimated 80% plastic and is home to an estimated 1.8 trillion pieces of plastic. This plastic pollution not only harms marine life, but also has serious economic consequences. The patch, which is primarily made up of abandoned fishing nets and other gear, costs the fishing industry an estimated \$13 billion per year in lost revenue. Plastic pollution isn't limited to the oceans, however. It can also be found in rivers, lakes, and on land. For example, microplastics, which are small pieces of plastic that are 5mm or smaller in size, can be found in the soil and water of even the most remote areas of the world. These microplastics, which are often the result of larger plastic items breaking down, can be ingested by wildlife and enter the human food supply through the consumption of seafood. The impact of plastic on the environment isn't just limited to wildlife, however. It can also have serious consequences for human health. Many plastics contain harmful chemicals, such as phthalates and bisphenol A (BPA), which have been linked to a range of health issues, including cancer, hormone disruption, and reproductive problems.

These chemicals can leach out of plastic products and into the environment, contaminating soil and water and posing a threat to human health



Despite the numerous dangers of plastic, it continues to be a major part of our society. In 2018, the world produced an estimated 348 million tons of plastic, with the United States being the largest producer. While efforts to reduce plastic consumption and increase recycling have been made, the amount of plastic being produced and discarded continues to rise.

There are steps that individuals and governments can take to reduce the impact of plastic on the environment. For example, individuals can use reusable shopping bags, water bottles, and containers instead of disposable plastic options. Governments can also implement policies to reduce plastic consumption and increase recycling rates, such as banning single-use plastic bags or implementing a plastic bottle deposit program.

In conclusion, plastic is a major contributor to environmental pollution and poses a serious threat to the health of both humans and wildlife. It's slow decomposition is the main issue it generates. In addition to this, there are many gen z ways by which we can stop wasting plastic and reuse it. Many start-ups collect plastic from us and then make many new cool things including decorations, toys, and many more we can always connect to them and make new cool gifts for our friends and there are many more such creative ideas we can execute, the only thing we have to do is search DIY plastic on YouTube. Many start-ups collect scrap from your house and pay you for it one of the emerging start-ups that have entered this field is scrap uncle and when I connected to them, I was more than satisfied with their services.

