VOLUME 24 ISSN 2456-9704

SINGLE-USE PLASTICS: A ROADMAP FOR SUSTAINABILITY?

By Garima Oberoi and Ankush Garg
From Vivekanana Institute of Professional Studies

ABSTRACT

People all over the world suffer today from an increasingly odd affliction, this increasingly common condition has a few incurable symptoms, although doctors are still working on the name but they are currently calling it "PLASTICITIS". One of its main symptoms is like a superpower, it is called the plastic goggles, as soon as a person walks into a room their eyes zero in on any plastic item present whether it's a wrapper from a snack or a water bottle or a disposable fork in a plastic takeaway. Now make a mental calculation multiplying all the people in the room and trying to estimate based on their habits just how much plastic has been consumed in the previous days and imagine where these pieces of plastic will be in five, twenty or even a hundred years time. People nowadays have become addicted to using plastics and other throw away items with fervor because of their added convenience. Single-Plastic has become an inseparable part of our lives and has continued its way deep into the fabric of our lives, just like a bad habit we started we couldn't live without it, actually we are loving it, aren't we saving trees with plastic bags? This research article analyzes the problems with the usage of single-use plastics, the need for change and suggestions as to how we can save our environment with respect to the Indian scenario.[1]

KEYWORDS: Single-use plastics, Environment, Styrofoam, Plastic bags, Thermoplastics, Thermo sets, Micro plastics.

INTRODUCTION

A document on the UNEA website articulates that they will address the damage to the cosystems caused by unsustainable use and disposal of plastic products, including by reducing single-use plastic products by 2030 and will work with private sector to find affordable and environment friendly alternatives.

Our messy leftovers are safely locked away in waterproof plastic to-go containers. But in no time we have gone from creating just two million tons of plastic globally per year to over 400 million tones of new plastic created every year. [2]If things stay the same that number will double in the next twenty years. Can you imagine a billion tones of plastic? The people who can are the manufacturers and suppliers of plastic items, they're doing everything they can to increase our reliance on plastics all the while, insisting that there's nothing wrong with their product because it can be recycled. We are told that if we can just get our plastic into the blue bin everything will be okay, but here's the tragic truth, when it comes to plastic the recycling triangle breaks down even with our best efforts and policies less than nine percent of all plastic made is recycled as much as 30 % of single use plastic goes straight into our environment and goes straight into our environment as litter and ocean debris and what about the small percent that is recycled, well it usually ends up down-cycled into items with lower recycling rates that will

[1] State of Environment Report, Chandigarh, 2008.

[2] *Id.* at 145.

likely end up as landfill or in our environment. Just because we put it in a truck and cart it out of our neighborhood and pile it up somewhere we and we can't see it, the landfill is still in our environment. So what exactly is Single-use plastic? Bags, to-go containers, packaging of all sorts, straws etc. No matter what form it takes, Single-use plastics average use period is less than six months, often less than six minutes. Think about that how long did you use your coffee stirrer this morning or that sampling spoon, less than six minutes, but it will persist in our environment for hundreds of years.[3] Single-use plastic is responsible for half of all plastic waste in the world and contributes to the more than eight million tons of new plastic and entering our oceans each year, with that the winds of change are stirring as that face of plastic pollution is showing itself in the alarming photos and videos we can't ignore; the images of decaying albatross carcasses burdened with plastic caps and cigarette lighters or who hasn't seen that video of a plastic straw being painfully extracted out from a sea turtles nostril or the images of plastic litters on beaches, these images and stories are heartbreaking and profoundly disturbing but the motivation and awareness they bring is exactly what is inspiring positive action and people are beginning to see clearly the side-effects of plastic pile-ups.[4] We are reconnecting with the waste we create and are realizing that it doesn't just magically disappear when we throw it in that blue bin, the fact is recycling is not the solution, we must reduce our demand for single use plastics. Small local organizations should unite to demand and support change. Responsible businesses are beginning to act ahead to reduce and eliminate single-use plastics from their manufacturing processes and bold municipalities are advancing change by banning single-use plastic items, plastic to go containers, plastic bags and of-course single-use plastic water bottles. Our journey out of this plastic fog of this convenient and cheap is well underway.[5]

HYPOTHESIS

- ***The possible impact of a single-use plastic.***
- ***Recently, Prime Minister, Narendra Modi has made statements addressing the United Nations, in his Independence day speech and even in his weekly Mann ki Baat radio address it is pretty clear that a ban or a phasing out of at least of some single-use plastics from the 2nd of October 2019 is inevitable. What will it mean for the Indian Consumer and the Indian businesses.***
- ***The available alternatives instead of single-use plastics.[6]***
- ***How hard will it be to implement the policy of no usage of single-use plastics.***
- ***If there is no effective waste disposal system, how is the plastic disposed of.***

3 www.algomhoriah.net/newsweekarticle.php?sid=16524.html (May. 12, 20014, 10:04 AM).

4 4 VERGHESE JOLLANDS, et al, THE LITTERABILITY OF PLASTIC BAGS: KEY DESIGN CRITERIA. A REPORT PRESENTED ON 5th AUSTRALIAN CONFERENCE ON LIFE CYCLE ASSESSMENT: ACHIEVING BUSINESS BENEFITS FROM MANAGING LIFE CYCLE IMPACTS, MELBOURNE, 1-10, (2nd ed. 2018).

5 https://www.stuff.co.nz/business/98308042/how-the-supermarkets-plastic-bag-bans-will-work (Jun. 5, 2012, 11.00PM).

6 8 SWIFT GAYLENDS, NON-MEDICAL BIODEGRADABLE POLYMERS: ENVIRONMENTALLY DEGRADABLE POLYMERS.HANDBOOK OF BIODEGRADABLE POLYMER, 473-511 (3rd ed. 2000).

- ***Single-use plastics were once considered a boon, now we are saying that they are a menace. Our planet is in a situation of climate emergency.***

DISCUSSION

Plastic is a miracle material. The greek word "plastikos" mens mouldable. Plastic is a lightweight, imperviousness, hygienic and resistant material which can be molded into a variety of ways and utilized in a wide range of applications. Plastics are organic polymers mostly formed of carbon atoms. Thermoplastics and Thermo sets are the two main categories of plastics. [7]

- ❖ Thermoplastics are a family of plastics that can be melted when heated and hardened when cooled. These characteristics, which lend the material its name, are reversible. That is, it can be reheated, reshaped and frozen repeatedly. [8]The most common Thermoplastics are: Polyethylene Terephthalate (PET), Polypropylene (PE), Low Density Polyethylene (LDPE), High Density Polyethylene (HDPE), Polystyrene (PS), Expanded polystyrene (EPS), Polyvinyl-chloride (PVC), Polycarbonate Polypropylene (PP), Polylactic Acid (PLA) and Polyhydroxyalkanoates[9] (PHA).
- ❖ Thermosets are a family of plastics that undergo a chemical change when heated, Creating a three dimensional network. After they are heated and formed, these plastics cannot be re-melted and reformed. The most common thermo sets are: Polyurethane (PUR), Phenolic resins, Epoxy resins, Silicone, Vinyl ester, Acrylic resins, Urea formaldehyde (UF) resins.

Plastics became populare for a number of reasons, that is, they were light, inexpensive, had an ease of usability, it has substituted even metal, cloth, paper. Unlike metals plastics do not rust or corrode. Most plastics do not biodegrade, but instead photodegrade, meaning that they slowly break down into small fragments known as micro plastics. The fragmentation of large plastic items into micro plastics is common on land such as beaches because of high UV irradiation and abrasion by waves, while the degradation process is much slower in the ocean due to cooler temperatures and reduced UV exposure.[10]

Single-use plastics, often also referred to as disposable plastics are commonly used for plastic packaging and include items intended to be used only once before they are thrown away or recycled. They include- plastic bags, straws, water bottles and most food packaging. They are petroleum based and non-biodegradable.

All thanks to plastics, uncountable lives have been saved in the health sector, the growth of clean energy from wind turbines and solar panels has been greatly facilitated and safe food storage has been revolutionized. But what makes plastic so convenient in our day-to-day lives is that it is cheap also makes it ubiquitous, resulting in one of our planet's

[7] Plastic Waste Management (Amendment) Rules, 2018.

[8] Toolkit on Plastic Waste Management Rules, 2016.

[9] Polyhydroxyalkanoates or PHAs are thermoplastics produced by numerous microorganisms, including through bacterial fermentation of sugar or lipids. https://www.tandfonline.com/doi/abs/10.1080/1558372090304824 (Jan. 29, 2009, 10:04 AM).

[10] https://bestmediainfo.com/2017/04/tetra-pak-india-continues-go-green-initiative-encourages-recycling-of-cartons. Dec. 09, 2019, 10:54 PM)

greatest environmental challenges. Our oceans have been used as a dumping ground, choking marine life and transforming some marine areas into a plastic soup. In cities around the world, plastic waste clogs drains, causing floods and breeding disease. Consumed by livestock it makes its way into the human food chain.[11]

Plastic packaging accounts for nearly half of all plastic waste globally and much of it is thrown away within just a few minutes of its first use. Much plastic may be single-use, but that does not mean it is easily disposable. When discarded in Landfills or in the environment, plastic can take up to a thousand years to decompose.

A growing number of governments are taking actions on this issue and demonstrating that all nations, whether rich or poor, can become global environmental leaders. Rwanda, a pioneer in banning single-use plastic bags, is now one of the cleanest nations on earth. Kenya has followed suit, helping clear its iconic national parks and saving its comes from an unhealthy diet.

CASE STUDY 1
The plastic bags ban in Rwanda

In the year 2004, the Ministry of Environment of Rwanda, conducted a base-line study about the reprehensible disposal of bags made up of plastic, due to their improper burning and clogging of the drainage systems, conducted a study revealing that the litter caused due to bags of plastic litter threatened rural production, polluting the water resources and creating pollution.

In the year 2008 the government of Rwanda banned the development, sale and use of all types of plastic bags. Paper bags replaced plastic ones, and citizens also started using reusable bags made of cotton. Along with the new ban, tax incentives were provided to companies willing to invest in plastic recycling equipment or in the manufacturing of environmentally friendly bags. Critics claim that stakeholders were insufficiently consulted during the policy design and that the poorest fractions of the population were not considered.[12] Despite the good intentions, after the entry into force of the ban, investments in recycling technologies were lacking, as were good and cheap alternatives. As a result, people started smuggling plastic bags from neighboring countries and a lucrative black market emerged. What worked well With time, enforcement of the law became stricter, and if caught, offenders would face high fines and even jail. In the long run, citizens became used to the new regulation and, Kigali, the capital of Rwanda, was nominated by UN Habitat in 2008 as the cleanest city in Africa.

CASE STUDY 2:
BARBUDA AND ANTIGUA

In January 2016, Antigua and Barbuda prohibited the importing, manufacturing and trading of plastic shopping bags. In July of the same year, the distribution of such bags at points of sale was banned, leaving enough time for retailers to finish their stocks. Since plastic bags sold in large retailers accounted for 90% of the plastic litter in the environment, the ban was first implemented in major supermarkets, and later extended to

[11] *Id*. At 567.
[12] Michael Golfdmann, *Waste: An Overview*, THE GEOGRAPHICAL, January, 17, 2005, at A3.

smaller shops.What worked wellKey elements of policy's success include four rounds of stakeholder consultations to ensure engagement and acceptance of the policy. Stakeholders engaged include major retailers, the National Solid Waste Management Authority, the Ministry of Trade and the Department of Environment. After approval by the Cabinet, it was decided that the ban would be incorporated in the existing legislation, as this was more expedient than instituting a new law. An awareness-raising campaign titled "I'm making a difference one bag at a time" included frequent television short clips by the Minister of Health and the Environment providing information on the progress of the ban and feedback from stakeholders. A jingle was produced to promote the use of durable bags for a cleaner and healthier environment. Moreover, shoppers were provided with reusable bags outside supermarkets, and seamstresses and tailors were taught how to manufacture such bags so as to meet increasing demand. Major supermarkets were also required to offer paper bags from recycled material, in addition to reusable ones. To encourage the manufacturing and use of alternatives to plastic bags, the legislation includes a list of materials that will remain tax free, such as sugar cane, bamboo, paper, and potato starch. Impact In the first year, the ban contributed to a 15.1% decrease in the amount of plastic discarded in landfills in Antigua and Barbuda, and paved the way for additional policies targeting the reduction of plastics. For instance, the importation of plastic food service containers and cups was prohibited in July 2017. As of January 2018, single-use plastic utensils were banned, as well as food trays and egg cartons. At a later stage, Styrofoam coolers are also expected to be outlawed.[13]

THE AGE OF PLASTICS - WHY WE NEED TO CHANGE?

Since the 1950s, the production of plastic has outpaced that of almost every other material. Much of the plastic we produce is designed to be thrown away after being used only once. As a result, plastic packaging accounts for about half of the plastic waste in the world. Most of this waste is generated in Asia, while America, Japan and the European Union are the world's largest producers of plastic packaging waste per capita.

Our ability to cope up with plastic is already overwhelming. Only nine percent of the nine billion plastic the world has ever produced has been recycled. Most ends up in landfills, dumps or in the environment. If current consumption patterns and waste management practices continue, then by 2050 there will be around 12 billion tones of plastic litter in landfills and the environment. By this time, if the growth in plastic production continues at its current rate, then the plastics industry may account for 20 percent of the world's oil consumption.

Most plastics do not bio-degrade. Instead they slowly break down into smaller fragments known as micro plastics. Studies suggest that plastic bags and containers made of expanded polystyrene foam (commonly referred to as "Styrofoam[14]") can take up to

[13] Spokas Keith Adrewson, *Plastics: still young, but having a mature impact on Waste Management*., 28 ASTER LJ, 473, 473-474 (2007).

[14] "Styrofoam" is a Dow Chemical Company trademarked name for closed-cell extruded (not expanded) polystyrene foam used primarily in construction as insulation and water barrier for roofs,

thousands of years to decompose, contaminating soil and water.

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

Plastic waste causes a plethora of problems when it leaks into the environment. Plastic bags can block waterways and exacerbate natural disasters. By clogging sewers and providing breeding grounds for mosquitoes and pests, plastic bags can increase the transmission of vector-borne diseases like malaria. High concentration of plastic materials, particularly plastic bags, has been found blocking the airways and stomachs of hundreds of species. Plastic bags are often ingested by turtles and dolphins who mistake them for food. There is evidence that the toxic chemical added during the manufacture of plastic transfer to animal tissue, eventually entering the human food chain. Styrofoam products which contain carcinogenic chemicals like styrene and benzene, are highly toxic if ingested, damaging the nervous systems, lungs and reproductive organs. The toxins in Styrofoam can leach into food and drinks. In poor countries, plastic waste is often burned for heat and cooking, exposing people to toxic emissions.[15]Disposing of plastic waste by burning it in open air pits releases harmful gases like furan and dioxin.

The economic damage caused by plastic waste is vast. Plastic litter in Asia-Pacific region alone costs its tourism, fishing and shipping industries 1.3 billion dollars per year. In Europe, cleaning plastic waste from coasts and beaches costs about 630 million dollars per year. Studies suggest that the total economic damage to the world's marine ecosystem caused by plastic amounts to at least 13 billion dollars every year. The economic, health and environmental reasons to act are clearly in front of us.

The remarkable number of national and local governments that over the last decades have developed and implemented policies and economic measures to reduce plastic bags and Styrofoam products keeps growing. The number of policies regulating plastic bags and Styrofoam products at the national level increased steeply after 2015. This is partially due to EU Directive 2015/720, which encourages member states to set reduction targets or adopt economic instruments to achieve a sustained reduction of "lightweight" carrier bags. EU member states are for instance invited, among other options, to reduce the amount of lightweight plastic bag consumption to a maximum of 90 per person a year by the end of 2019, and to a

walls, and foundations. In contrast, coffee cups, food trays, box packaging, and other daily life items commonly referred to as "Styrofoam" are actually expanded polystyrene (EPS) foam, which has been moulded into blocks from expanded resin. This means that none of these daily life products are in fact made from "Styrofoam." Despite the inaccuracy of using "Styrofoam" to refer to foamed single-use products, this paper makes use of the term to refer to such daily-life items because of the high degree of penetration of this colloquial expression among the general public, while more accurate terms such as "EPS foam products" or "single-use polystyrene foam products" are often unrecognizable to non-specialists.

[15] UNIDO Report- Recycling of Plastics in Indian perspective by Dr. Smita Mohan, 2009.

maximum of 40 by the end of 2025. Another reason behind the recent growth in the number of plastic nag policies enacted at the national level is the visibility gained by governments that introduce bans on the importation, production and use of single-use plastics.[16]

CONCLUSION

Recently, The United Nations Convention To Combat Desertification, COP 14, took place in New Delhi. The prime Minister of India, Narendra Modi announced that India will take steps to prevent plastic caused pollution and by 2030 about 26 million hectares of land will be recovered. The government is leading efforts to scap single-use plastics by 2022. The ban will be comprehensive and will cover- manufacturing, usage and import of such items. There are many challenges that will be faced by the Indian government : (i) The first is, since they are practically non-biodegradable, they end up on the roadsides, in landfills, lakes and oceans, thus making their way into the food chain. It is felt accurately in India because the towns and villages do not have adequate waste disposal systems. (ii) The second problem is their ecological footprint – in terms of the environmental cost vis-a vis their transport, production and use.

The paradox of the plastic bag is that its total environmental footprint is actually much lower than that of its alternatives. According to a study conducted by the Danish government in 2018, you need to use a paper bag 43 times to achieve the same cumulative environmental impact as a plastic bag. To achieve the same environmental impact as a plastic bag, a cotton bag would have to be used 7,100 times. If India's proposed ban on single-use plastics is successful, the benefit is that we will reduce plastic pollution, but at the cost of worsening the cumulative environmental impact.

The negative impact is that a large part of existing investments, machinery, business processes and jobs in the plastics industry may be in trouble. Only the big companies might be able to afford additional costs to replace old machinery. The burden of a plastic ban will disproportionately affect the poor because of the price of plastic bags. The representatives of the plastic packaged drinking water when questioned about the effect of the ban averred that ban on plastic bottles will have severe repercussions as it engages over seven crore people directly and indirectly. They have further requested the government that the PET bottles used by them should not be classified as single use plastic. It will have adverse impact on the Rs. 30,000 crore industries since no alternative was immediately possible.

The positive impact on the other hand is that economic benefits will mainly arise from new investments and innovations in the packaging industry. Also a good number of jobs will be created through it. According to estimates made by a recent survey, the US is the highest user and consumer of plastics and India's plastic consumption is a tenth of US's.

Plastic bags, if properly planned and enforced can effectively counter one of the causes of

[16] EU Directive 2015/720.

plastic overuse[17]. Nevertheless, to tackle the roots of the problem, Governments need to improve waste management practices and introduce financial incentives to change the habits of consumers, retailers and manufacturers, enacting strong policies that push for a more circular model of design and production of plastics. They must finance more research and development of alternative materials, raise awareness among consumers, fund innovation, ensures plastic products are properly labeled and carefully weigh possible solutions to the current crisis. Governments must engage a broad range of stakeholders in the decision making process as they seek to tackle the crisis. To meet the rising tide of plastics, we urgently need strong government leadership and interventions.

Governments around the world are increasingly becoming awake to the scale of plastic pollution. More than 60 countries have introduced bans and levies to curb single use plastic waste. Plastic bags and, to a certain extent, foamed plastic products like Styrofoam have been the main focus of government action so far. These plastic products are often the most visible forms of plastic pollution. It is estimated that 5 trillion plastic bags are consumed worldwide each year. Five trillion is almost 10 million plastic bags per minute. If tied together, all these plastic bags could be wrapped around the world seventy times every hour.[18]

It is too early to draw a robust conclusion on the environmental impact that bans and levies have had. In 50 percent of the cases, information about their impact is lacking, partly because some countries have adopted them only recently and partly because the monitoring process is inadequate. In countries that do have data, about 30 percent have registered plastic drops in the consumption of plastic bags within the first year. The remaining 20 per cent of countries have reported little or no change. Of the countries that have reported little to no impact, the main problems appear to be : (i) a lack of enforcement and (ii) a lack of affordable alternatives. The latter has led to cases of smuggling and the rise of black markets for plastic bags or to the use of thicker plastic bags that are not covered by the bans. This has increased environmental problems in some cases.[19]

Public private partnerships and voluntary agreements can be good alternatives to bans. Voluntary reduction strategies allow citizens time to change their consumption patterns and provide an opportunity to affordable and eco-friendly alternatives to hit the market. The promotion and adoption of reusable bags is an example of a reduction strategy where the choice lies with the consumer. This strategy has changed consumer behavior and reduced the use of conventional plastic bags in many regions.[20]

---

[17] Jambeck Geyer, & Wilcox Siegler, *Plastic waste inputs from land into the ocean*, 347 THE SCIENCE JOURNAL, 768–771 (2015).

[18] European Commission, Directive of the European Parliament and of the Council on the Reduction of the Impact of Certain Plastic Products on the Environment, THE NEW YORK TIMES, http://ec.europa.eu/environment/circular-economy/pdf/single-use_plastics_proposal.pdf (Nov. 15, 2018, 2.09AM).

[19] Plastic Waste Management Rules, 2016.

[20] Markus Geylers, *It's Not My Bag, Baby, On Earth: Environmental Politics People*, 25 WILLIAMSON LJ 32, 32-34 (2005).

Given the broad range of possible actions to curb single-use plastics and their mixed impact, UN Environment has drawn up a 10 step roadmap for governments that are looking to adopt similar measures or improve current ones. The steps are based on the experiences of 60 countries around the globe:

1. Target the most problematic single-use plastics: By conducting a baseline assessment to identify the most problematic single-use plastics, as well as the current causes, extent and impacts of their mismanagement.

2. Consider the best actions to tackle the problem: For example, through regulatory, economic awareness, voluntary actions, etc., given the country's socio-economic standing and considering their appropriateness in addressing the specific problems identified.[21]

3. Assess the potential socio-economic and environmental impacts: Positive and negative impacts both are to be assessed of the preferred short-listed instruments or actions. How will the poor be affected? What impact will the preferred course of action have on different sectors and industries?

4. Identify and engage key stakeholder groups: Retailers, consumers, industry representatives, local government, manufacturers, civil society, environmental groups, tourism associations – to ensure broad buy in. Evidence based studies are also necessary to defeat opposition from the plastics industry.

5. Raise public awareness: About the harm caused by single-use plastics and explain the decision and any punitive measures that will follow.[22]

6. Promote alternatives: Before the ban or levy on single-use plastics comes into force, asses the availability of alternatives. Ensure that the pre-condition for their uptake in the markets are in place. [23]Provide economic incentives to encourage the uptake of eco-friendly and fit for purpose alternatives that do not cause more harm to the environment.[24]Support can include tax rebates, research and development funds, technology incubation, public-private partnerships, and support to projects that recycle single-use items and turn waste into a resource that can be used again. Reduce or abolish taxes on the import of materials used to make alternatives.

7. Provide incentives to industry: By introduction of tax rebates or other conditions to support its transition. Governments will face resistance from the plastics industry, including importers and distributors of plastic packaging. Time should be given to them to adapt.

8. Use of revenues: [25]collected from taxes to or levies on single-use plastics to maximize the public good. Support environmental

[21] Anthony Angerstler, *Plastics and the environment* 3 NEW JERSEY *LJ*, 379, 379-397 (2003).

[22] www.wecf.eu/cms/download/2004-2005/homeburning_plastics.pdf.

[23] www.weforum.org/docs/WEF_The_New_Plastics_Economy.pdf.

[24] Stevens Eagleton, *Green Plastics: An introduction to the new science of biodegradable plastics* 5 PRINCETON NJ, 15, 15-30 (2016).

[25] Zoljargal Mueller, *Less paper, more plastic*, THE UB POST, (Apr. 5, 2003, 1.48PM), http://ubpost.mongolnews.mn/?p=3657.

plastic projects or boost local recycling with the funds. Create jobs in the plastic recycling sector with seed funding.

9. Enforcement: of chosen measures in an effective manner by making sure that there is clear allocation of roles and responsibilities.

10. Monitoring and adjustment of the chosen measures if necessary.[26]

REFERENCES

1. Erica Nelson, *Stages and implementation of Styrofoam ban,* ANTIGUA NICE, (Sep. 27, 2017, 12.05PM), http://www.antiguanice.com/v2/client.php?id=806&news=10298.
2. Prachi Bari, *Plastic ban has worked in Sikkim but not in Delhi, finds Pune-based NGO*, HINDUSTANTIMES, (Mar. 25, 2018, 8.09PM), https://www.hindustantimes.com/pune-news/plastic-ban-has-worked-in-sikkim-but-not-in-delhi-finds-pune-based-ngo/story-EGV9D4hl1yhUFFLGt9vcTK.html.
3. Bernadette Carreon, *Palau bans use of plastic bags*. MARIANAS BUSINESS JOURNAL, November 27, 2017, https://mbjguam.com/2017/11/27/palau-bans-use-of-plastic-bags.
4. Beldev Chauhan, *Indian state outlaws plastic bags,* BBC News, 7 August, 2003 http://news.bbc.co.uk/2/hi/south_asia/3132387.stm.
5. Lorraine Chow, *Chile Bans Plastic Bags in 100+ Areas,* ECOWATCH, 26 October, 2017. https://www.ecowatch.com/chile-plastic-ban-2501794220.htm
6. Luke Cooper, *Victoria jus announced it will ban single-use plastic bags,* HUFFPOST AUSTRALIA, 18 October, 2017. http://www.huffingtonpost.com.au/2017/10/17/victoria-just-announced-it-will-ban-single-use-plastic-bags_a_23245619/.
7. Deepika Kapoor, *Plastic 'garbage bags' are available in plenty online,* THE HINDU, 24 July, 2017, http://www.thehindu.com/news/national/karnataka/plastic-garbage-bags-are-available-in-plenty-online/article19338420.ece.
8. FEDERATION OF INDIAN CHAMBERS OF COMMERCE & INDUSTRY 2ND NATIONAL CONFERENCE: PLASTIC PACKAGING – THE SUSTAINABLE CHOICE. JOINT STUDY BY FICCI AND TATA STRATEGIC MANAGEMENT GROUP. Report on the Plastic Industry, 15th January 2016. http://ficci.in/spdocument/20690/Plastic-packaging-report.pdf.
9. David Fickling, *Tasmania carries the eco-fight by banning plastic bags carries hopes of environment,* THE GUARDIAN, 29 April, 2003, https://www.theguardian.com/world/2003/apr/29/australia.davidfickling.
10. Johny Hazem, *Red Sea Governorate bans plastic bags*. EGYPT INDEPENDENT, 14 November, 2009, http://www.egyptindependent.com/red-sea-governorate-bans-plastic-bags.
11. 146 BARNEY STALON & PECKER MILNER, DRIFTING PLASTIC AND ITS CONSEQUENCES FOR SESSILE ORGANISM DISPERSAL IN THE ATLANTIC OCEAN, MARINE BIOLOGY, 815-825, (3rd ed. 2015).
12. 8 BARNES THOMPSON, ACCUMULATION AND FRAGMENTATION OF PLASTIC DEBRIS IN GLOBAL ENVIRONMENTS.

[26] https://www.motherearthliving.com/health-and-wellness/harmful-effects-of-plastic-ze0z1205zsc.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY, 1985-1998, (4th ed, 2009).

13. 7 FRIAS MARTINS & SOBRAL PIERS, RESEARCH IN PLASTIC MARINE DEBRIS IN MAINLAND PORTUGAL, JOURNAL OF INTEGRATED COASTAL ZONE MANAGEMENT,145-148 (4th ed. 2017).
14. 4 FRY FEFER, & SILEO LAYMERS, INGESTION OF PLASTIC DEBRIS BY LAYSAN ALBATROSSES AND WEDGE-TAILED SHEARWATERS IN THE HAWAIIAN ISLANDS, 339-343(1st ed, 1987).
15. *Plastics Europe, Plastics the Facts* 2010. AN ANALYSIS OF EUROPEAN PLASTICS PRODUCTION, DEMAND AND RECOVERY FOR 2009. PLASTICSEUROPE, EUROPEAN PLASTICS CONVERTERS, EUROPEAN ASSOCIATION OF PLASTICS RECYCLING AND RECOVERY ORGANISATIONS & EUROPEAN PLASTICS RECYCLERS.
16. Loomis Remington. *Plague of plastic chokes the seas*, LOS ANGELES TIMES, August 2, 2006 at A6.
17. Tudor Dervers & Williams Atkinson, *Investigation of litter problems in the Severn estuary/Bristol channel area*, R&D TECHNICAL SUMMARY, E1-082/TS. BRISTOL: ENVIRONMENT AGENCY, 2001.

*****