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RESEARCH ARTICLE

TO WHAT EXTENT HAS THE MAHARASHTRA 2018 SINGLE-USE PLASTIC BAN AFFECTED THE ECONOMIC EFFICIENCY OF INDUSTRIES AND ENVIRONMENTAL SUSTAINABILITY IN MAHARASHTRA?

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Abstract

Introduction:-

The world's current population is 7.9 billion and the world produces about 381 million tonnes of plastic waste every year. India's population is equivalent to 17.7% of the total world population. Fig1 shows that in the financial year 2015-16, with over 469 thousand tonnes of per annum, Maharashtra generated the maximum amount of plastic waste in India. Since the population below poverty line of Maharashtra is 17.35% the underprivileged opt for the most affordable and available resource: plastic for essentials.

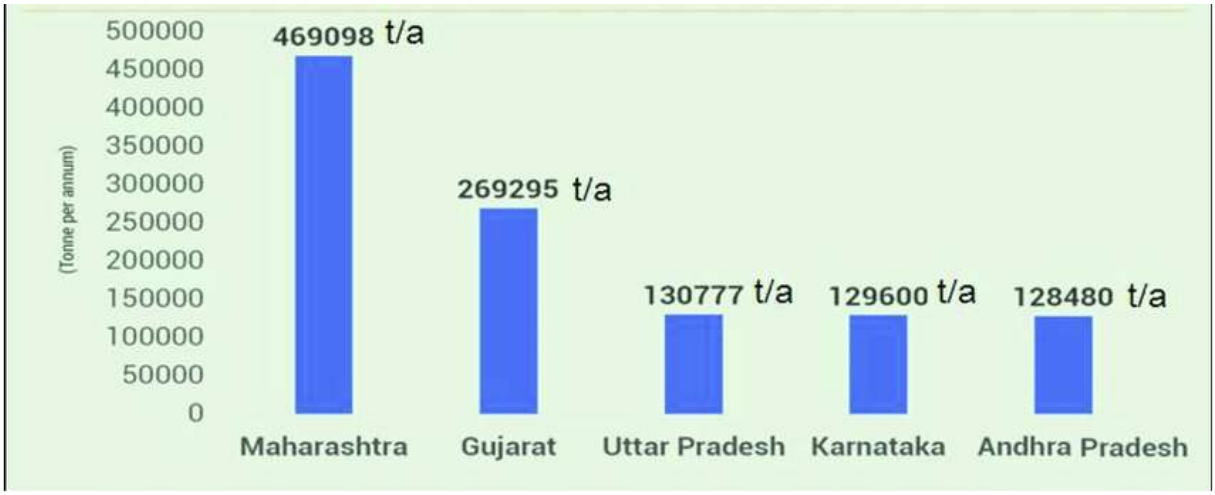

Fig1: Top Plastic Waste Generators in India 2015-2016

ResearchGate, 26 May 2019, www.researchgate.net/figure/Five-top-Plastic-Generating-States-in-India-Source-Centre-for-Science-and-Environment_fig2_333356328. Accessed 15 Aug. 2021.

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Plastic is a growing concern all over the world as it is taking a major toll on the environment due its non-biodegradable composition. The toxic chemicals that leach out of these plastic variables cause human health adversities too. Micro-plastic particles were found in the placenta of unborn babies (Bansal). The misuse of plastic causes negative externalities to form which gives rise to threat to sustainability.

As a solution, the Maharashtra government introduced a ban on manufacture, sale, and use of single-use plastic bags. They banned an array of plastic products including cutlery, straws, and containers. A violation of rules would result in a penalty between □5,000 and □25,000. Furthermore, Maharashtra Pollution Control Board has planned several measures for plastic management.

I have been a lover of the oceans since my childhood. I remember feeling sad and appalled to see the amount of plastic floating in the Arabian Ocean when I had gone sailing. The thought that by 2050 there will be more plastic than fish in the world's oceans (Kaplan) made me want to learn more about the Maharashtra plastic ban. According to me, alternatives-to-plastics and safe disposal of plastic waste should be encouraged throughout the world. My attachment with the beach and interest in environmental economics led me to explore the research question: To what extent has the Maharashtra 2018 single-use plastic ban affected the economic efficiency of industries and environmental sustainability in Maharashtra?

Hypothesis

Since it has been only 3-4 years since the ban, the impact on the environment would be small as the environment takes time to replenish. If the ban is implemented properly, there would be a small positive impact on the environment. The impact of the ban would be the greatest on producers as there would be economic losses like unemployment and GDP decline. Consumers would be at loss too since plastics are cost-effective, durable and convenient. Overall awareness of the people of Maharashtra may increase.

Methodology:-

The report consists of diverse, mixed methods of study which aim to explain, evaluate, and analyse the economic and environmental impact of the Maharashtra Plastic ban 2018.

1. Interview from two plastic related business owners provided an insight and helped understand the intensity of the impact on the plastic economy.
2. Interview with an environmental activist helped to understand the environmental impact and effect of the ban on sustainability.
3. Survey that was given to 100 people from age 18-60, who reside in Maharashtra, to understand the impact of the ban on consumers.
4. Interview with a Psychological Analyst to understand the psychology behind the consumers attitude towards the ban and sustainability.
5. Statements that were made by different stakeholders were collected from articles on the internet which helped me support my claims.
6. Data from reports and the Indian government websites was taken to provide numerical data and understand the implementation of the ban.

The primary data helped analyse the effect of the ban on plastic producers and consumers.Unique questionnaires which included open ended questions were given to different stakeholder. The interviews provide extensive qualitative data that enhances the quality of my report and allows me to analyse the perspectives of different stakeholders and the ban's impact on them. The names of certain people are kept anonymous for privacy and ethical reasons. The 2–3-minute survey included multiple-choice questions so that people wouldn't have to spend a lot of time and the data collected could be represented in graphical format for evaluation.

Secondary research that included data from published reports, articles from authentic sourcesand the MPCB website made this report credible.Quantitative data is presented in graphical formats to help make the evaluation easier and effective.

Economic Theory

Plastic delivers many direct economic benefits and can contribute to resource efficiency. It reduces food waste by increasing shelf life, and its relative light weight reduces fuel consumption for transporting goods. However, single-use plastic's cause direct harm to the wildlife, increases the Pacific trash vortex and release greenhouse gases.

Opportunity cost

A ban on Single-Use plastics implements an opportunity cost. An opportunity cost is 'the value of the next best alternative that must be sacrificed in order to obtain something else.' (Tragakes 2020) Opportunity costs can be either implicit or explicit in nature.

Implicit cost refers to the loss of an intangible non-cash sacrifice. The implicit cost of single-use plastic ban in Maharashtra led to unemployment. According to Mr. Neemit Punamiya, general secretary, Plastic Bag Manufacturers' Association of India, which represents about 1,400 manufacturers in Maharashtra., about 700-800 carry bag manufacturing units have been shut down in the State, leading to job losses of 20-30 workers per unit (Sharad Vyas & Tanvi Deshpande).

Moreover, there are explicit costs which result in a monetary sacrifice. The explicit cost leads to a decline in economic growth as the GDP per capita falls. The All-India Plastic Manufacturers Association (AIPMA) was one of the petitioners against the Stategovernment's ban in the Bombay High Court. According to AIPMA's petition, the domestic industry of plastic in India is valued at about $42 billion (Sharad & Tanvi).

Market Failure and Allocative Efficiency

Market failure is the failure of the market to efficiently allocate resources, resulting in allocative inefficiency where too little or too much of goods or services are consumed and produced relatively to what is socially most desirable shown in figure 2. When a competitive industry is in a long-run equilibrium, quantity supplied and demanded are equal thus the Marginal Social Benefit (MSB) is equal to the Marginal Private Benefit (MPB) which establishes allocative efficiency.

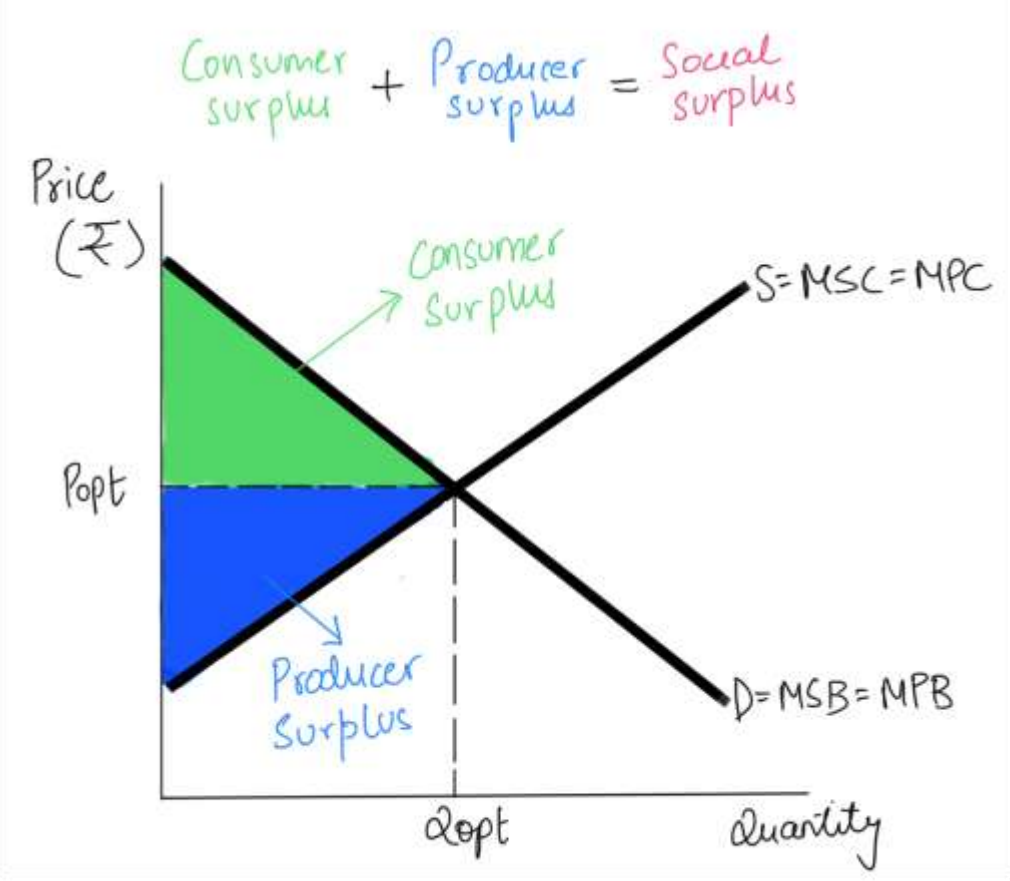

Fig2: Basic social benefits and costs diagram

Plastic acts as a demerit good; a good or service that is undesirable for consumers but are over-provided by the market and cause negative externalities (Tragakes 2020). These goods require government intervention in the form of policy/policies to correct the market failure.

Negative Externality of Production

A negative externality is when the actions of producers or consumers give rise to negative side-effects on other people who are not part of these actions. (Ellie Tragakes 2020)

Plastics are pollutants throughout their infinite life. When plastic bags are produced cancerous chemicals like benzene and vinyl hydrochloride are used, these contribute to air, water and soil pollution. Furthermore, overuse of land for disposal of non-biodegradable single-use plastic causes land pollution and spread of diseases. Plastic directly enters nallahs[1] by the general public and slums areas and discharge of untreated domestic waste accounts for 93% of the source of pollution for these water bodies (Koyande).

These effects are suffered by non-plastic users as well. The most predominant effect of the overuse and disposal of single-use plastic is drinking water contamination as these plastics can release harmful chemicals into the surrounding soil, which can then seep into groundwater further causing water borne diseases.

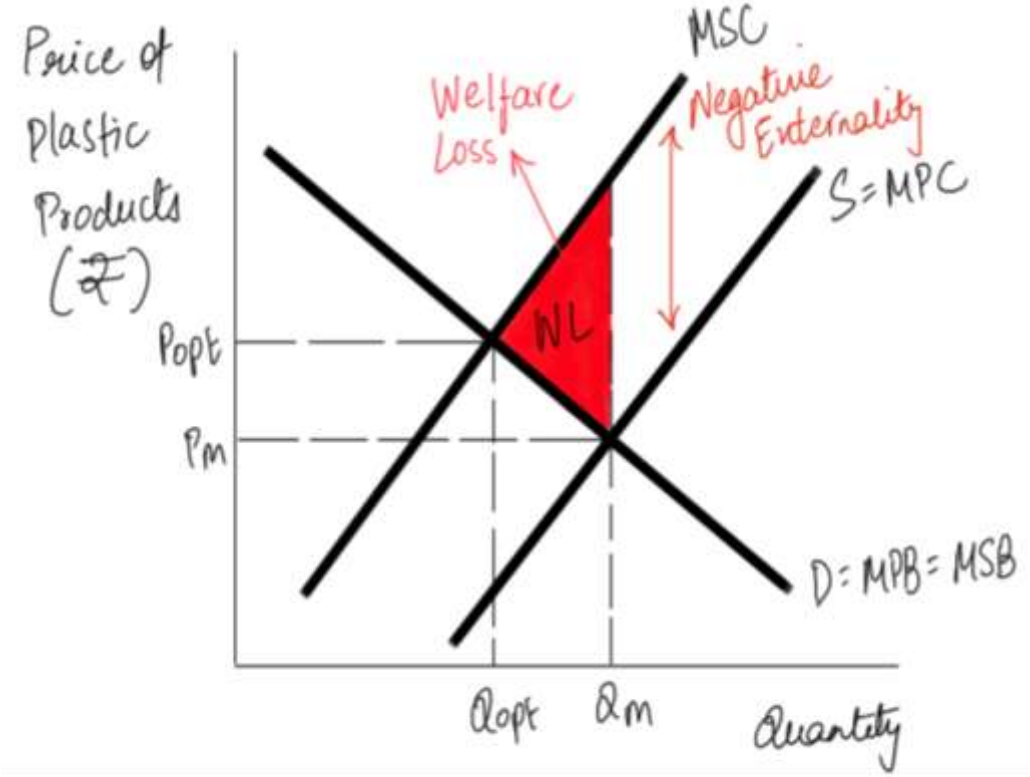

Fig3: Negative externality of Production of plastic products

MPC is below the MSC as there is an external cost to the to the society. There is a misallocation of the resources as the firm produces the plastic products at very low prices to sell more quantity of the good (Qm) rather than at the optimum quantity (Qopt). This results in Welfare loss as at Output Qm, MSC> MSB. Overallocation causes market failure because external costs are not considered in production in a free market.

Maharashtra government implemented the following policies to reduce the production of single-use plastic and thus reduce the negative externality

1. Ban on sale and use of single-use plastic like polythene bags, cutlery, straws, and containers
2. Heavy penalty (□5,000-□25,000) on consumers and producers
3. Awareness programmes

[1]A small stream (Brook)

Negative externalities of Consumption

While overproduction plays an important role in market failure, overconsumption is a crucial aspect too. Since plastic has a very cheap price the demand for it is extremely high, this causes overconsumption. Durability and availability also aid in overconsumption. Overconsumption of single-use plastic products has caused environmental degradation and allocative inefficiency which leads to market failure.

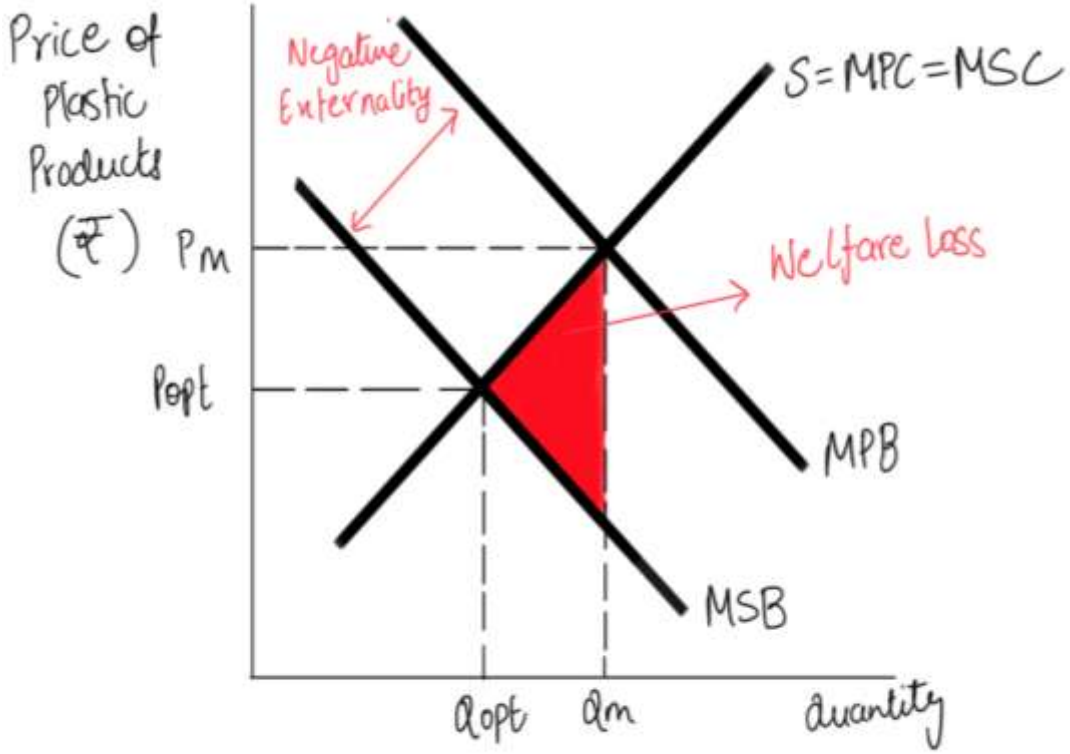

Fig4 : Negative externality of consumption of plastic products

Overconsumption takes place as in a free market, consumers will maximise their private utility and consume at MSC=MPB. Overconsumption takes place as the (market quantity) Qm >Qopt (socially optimum quantity). Since MSC > MSB there is a presence of welfare loss (red shaded area)and market failure occurs.

Unemployment and GDP

Implementing a ban on single use plastic will result in unemployment which will further lead to declined economic growth due to a lower GDP per capita of Maharashtra because of overall decline in the plastic industry. The manufacturing industry claims the ban has hit industry hard, with a loss of □15,000 crore and rendering almost 3 lakh people jobless (Sharad & Tanvi).

However, a statement by Ramdas Kadam[2] states that the level of unemployment wouldn't lead to a major crisis. He said, "Almost 80 per cent of this plastic is imported from other states and only 20 per cent is produced in the state. The loss of employment will be small, but we will try to resolve their issues as well" (Waghmode).

Impact on other industries

Due to the ban and fine on plastic bags, consumers will purchase larger quantitates of substitutes like paper bags which will push their demand to the right and cause the demand curve to shift to the right. Fig5 shows that D1 will shift to the right to form D2 to present the increase in demand. Industries that produce substitutes of plastic bags: paper, cloth, woollen bags will grow which could balance the loss of the plastic industry.

[2]Politician; Member of Legislative Assembly (Khed Vidhan Sabha, Shiv Sena, Maharashtra)

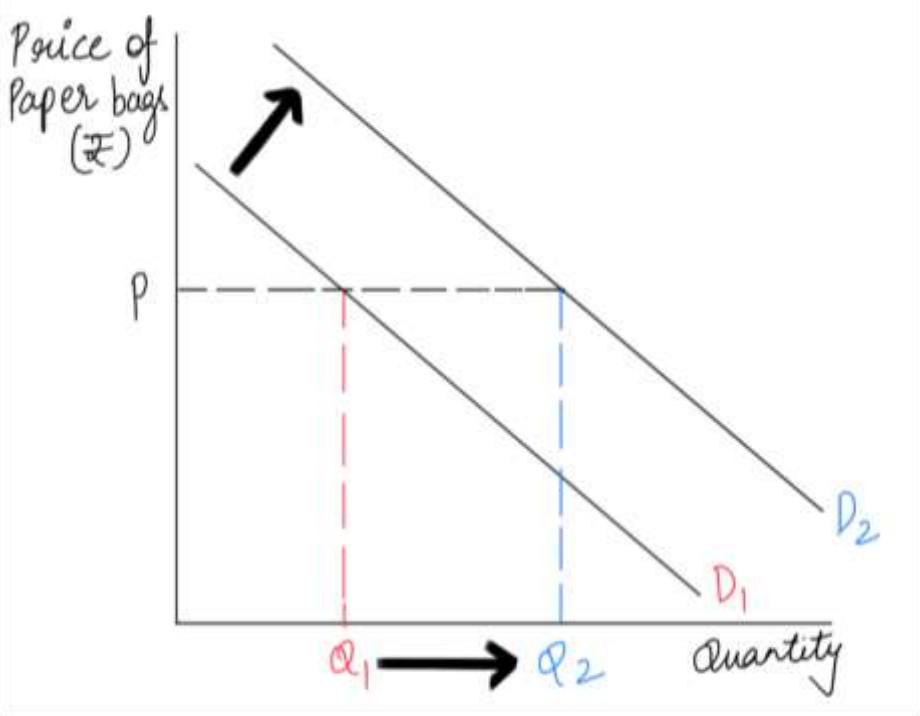

Fig5: Rightward shift of demand curve as demand of paper bags increase

After the ban, several Indian companies which specialised in alternativestoplastic were founded. Everwards India, SuckIN and EnviGreen produce biodegradable products[3] that are durable and environmentally friendly.

Sustainability and Economic Development

The environment, energy and climate change are indictors for measurement of economic development. Since plastic is non-biodegradable, remains on the earth for millions of years, and contributes to climate change due to the release of greenhouse gases, it is unsustainable. Thus, the ban on unsustainable products like single-use plastics in Maharashtra is a step towards sustainability and economic development. Economic development includes policies and programmes that seek to improve the economic well-being and quality of life for a community.

According to Dr Iyer, the ban should result in reduction of the carbon footprint of citizens of Maharashtra, decrease in non-biodegradable waste and litter, cleaner water bodies and beaches, and more awareness[4]. However, these results will be seen in the long-run and are subject to the extent of implementation and supervision of the ban. If these changes are brought, economic development would take place.

The growth of alternative-to-plastics like wood, bamboo and paper industries would enable change in social awareness which would aid to sustainability. These alternatives are biodegradable, organic, and easily available in Maharashtra.

Analysis and Interpretation of data

The main stakeholders involved in or affected by this ban are producers, consumers, environmental activists,and other industries.

[3] Appendix 1.4
[4]Appendix 1.2 answer 2

Results of interview from plastic producing companies

To analyse the effects of the ban on the plastic industry, the interviews from the plastic company representatives[5] help determine the changes that companies faced due to the ban. Despite the ban, both the company's growth hasn't been affected which shows that despite being affected companies can make changes and continue growing. Both the companies made changes while Company 1 substituted materials with biodegradable ones, Company 2 raised awareness on plastic management and recycling. Both the companies faced an increase in cost of production due to the ban, which shows that in order to have growth in the future companies must make bear costs. While Company 1 claims that customers became more aware and that their demand changed, Company 2 said that there were no changes — this establishes that consumers patterns differ according to the product. Lastly, Company 1's employment reduced and was later recovered but Company 2's employment remained constant.

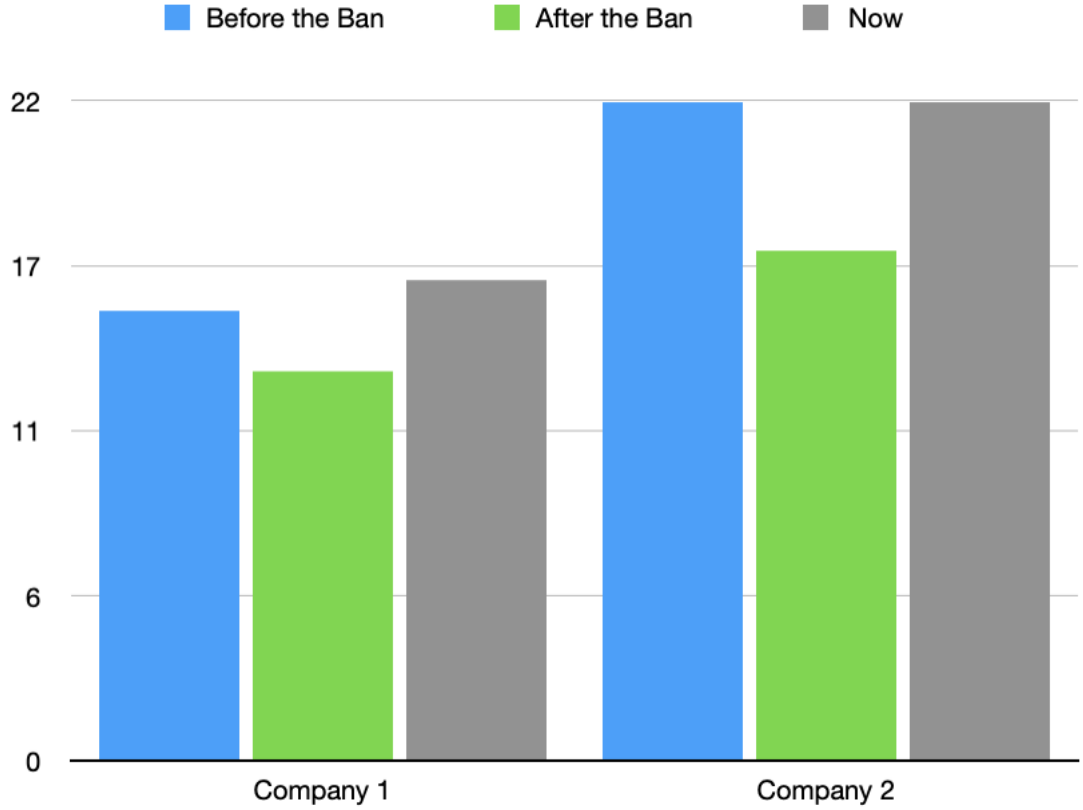

Fig 6: Net Profit Percentage Change of both the companies

The Net Profit Percentage (NPP) is an indication of the direct impact of the ban on producers. Figure 6 shows that both the companies NPP had decreased after the ban due to the increase in cost of production and operation[6]. However, over 4 years the companies have successfully recovered the NPP. It is noticeable that Company 1's NPP increased after recovery. These figures establish that even though the ban reduced the producer's NPP, in the long run NPP can be retained and even be increased in some companies.

Impact on other industries

It is important to conclude that the ban caused a negative impact on other industries too. Viren Shah, told the Mumbai Mirror that 300,000 small businesses in the city have seen their sales drop by about 50 percent since the ban. Furthermore, Lalit Gandhi, said, "many units are on the verge of closure in the absence of basic packaging material - plastic bags and we fear that nearly 3,00,000 people employed may become jobless" (Doshi).

[5]Appendix 1.1
[6]Appendix 1.1

The fishing industry has faced loses in the sale of fishes as paper and other materials are messy and inconvenient, Naina Patil claimed a loss of 80% in business after the ban was implemented (Chacko).

Renowned retailers like D-Mart have suffered losses too as they need to charge customers □15-20 for cloth bags as an alternative to plastic. These along with the losses in the plastic industry will account for decline in GDP. 'The plastic industry contributes to at least 10% of the State's GDP. The State has lost around □800 crore in GST alone,' says Haren Sanghavi, member of AIPMA (Sharad & Tanvi).

A city-based survey across 525 shops including malls, mid-range shops and street vendors, found that 43% of all shopkeepers did not know about the ban (Badri Chatterjee). This shows that the awareness of the ban in the city was very low.

Results of Survey from consumers

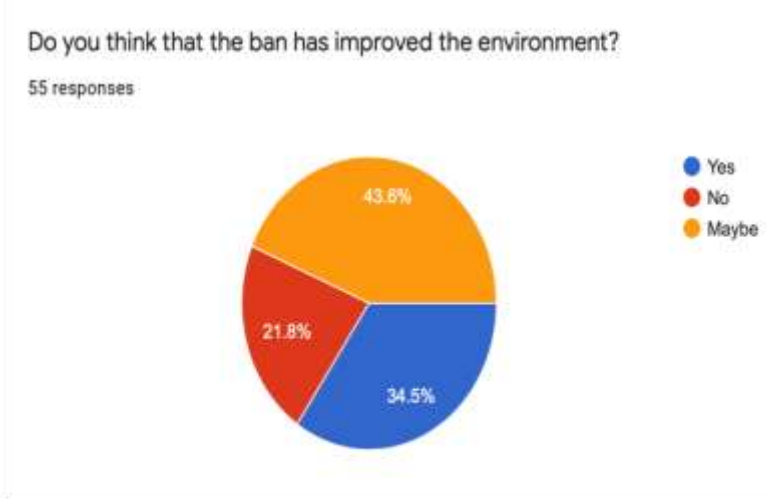

Fig 7: Has the ban improved the environment

Therefore, by referring to Figure 7 it can be generalised that 43.6 + 34.5 = 78.1% of the general population (consumers) believes that the ban has positively affected the environment [7].

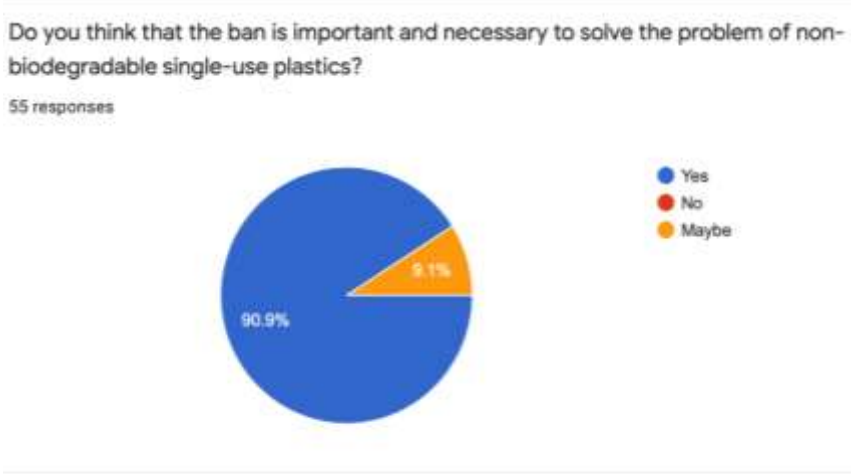

Fig 8: Is the ban important to solve the problem of plastics

Figure 8 establishes that 90.9% consumers believe that the ban is important to solve the problem of biodegradable single-use plastics[8].

[7]Appendix 1.5 Question 3

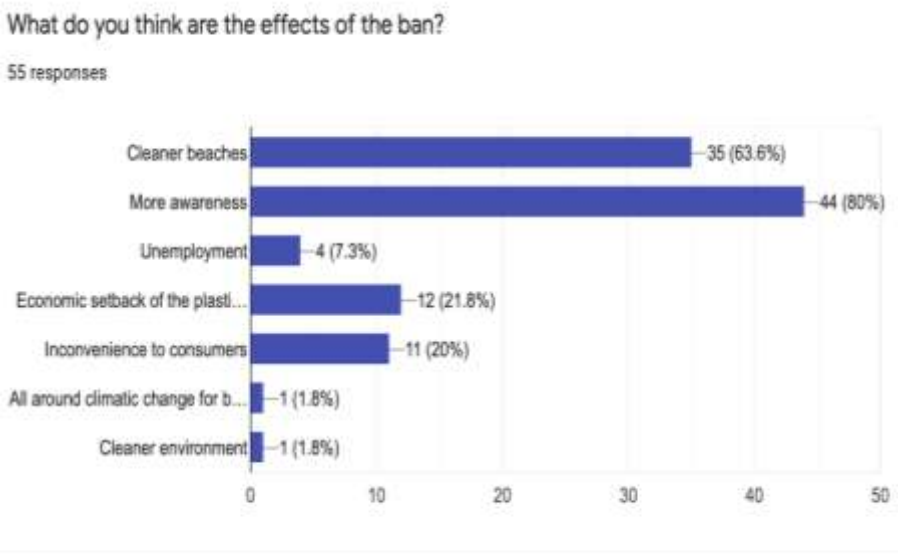

Fig 9: Effect of ban according to consumers

Figure 9 shows the effect of the ban according to the consumers. 80% of the 55 people think that more awareness was created due to the ban. 63.6% believe that the beaches are cleaner after the ban while 21.8 + 7.3 = 29.1% believe that there is a negative impact on the economy. Alas, it can be concluded that according to the consumers the ban was important and has environmentally sustainable benefits to the society[9].

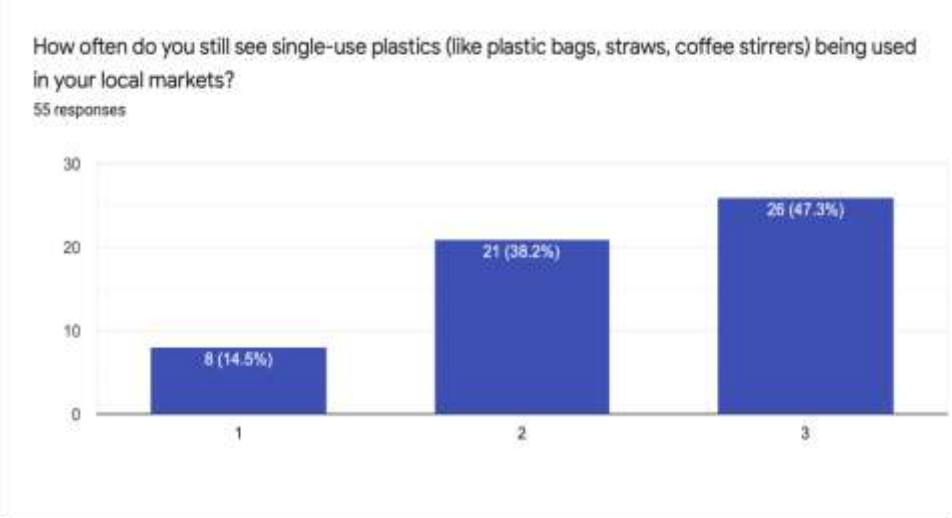

Fig 10: How often are single-use banned products still being seen in local markets

Figure 10 shows that the ban was not regulated and monitored well as 47.3+38.2= 85.5% of the people of Maharashtra see banned single-use plastic products in their local markets[10].

Results of interview with environmental activist

According to Mr Iyer, the safe disposal of plastic is the problem. Needless products like plastic straws, lids, stirrers, and cutlery should be banned and others should be avoided by spreading awareness and implementing stricter laws

[8]Appendix 1.5 Question 7
[9]Appendix 1.5 Question 5
[10]Appendix 1.5 Question 2

on producers of plastics rather than banning a large chunk of plastics that are cost-effective and durable. He believes that the ban has raised awareness and has made people more socially responsible.

He mentioned that plastic garbage liners were banned, and compostable liners were not available for consumers, so they continued using plastic liners out of inaccessibility[11]. This shows that the ban was not well planned, sudden and lacked awareness campaigns.

Furthermore, he added that it is difficult to measure the impact of the ban of the environment as the Maharashtra plastic ban was ineffective and unsuccessful as plastic straws and bags are still used in the markets.

Results from Psychological Analyst

Dr Rohini suggested that money is a universally valued and scalable punishment that incurs a loss for the consumers which is the reason why people must have followed the ban in the beginning. However, due to the failure of implementation in the long-run people find it convenient to use plastic products as they are very cheap and durable. Furthermore, she said that people have become more socially and environmentally active after the ban as they have been forced to become aware of the ill-effects of plastic due to the ban. However, she believes that campaigns and other policies would be more effective in raising awareness as those would form long-term environmentally responsible habits that would be sustained.[12]

Existing data on the internet

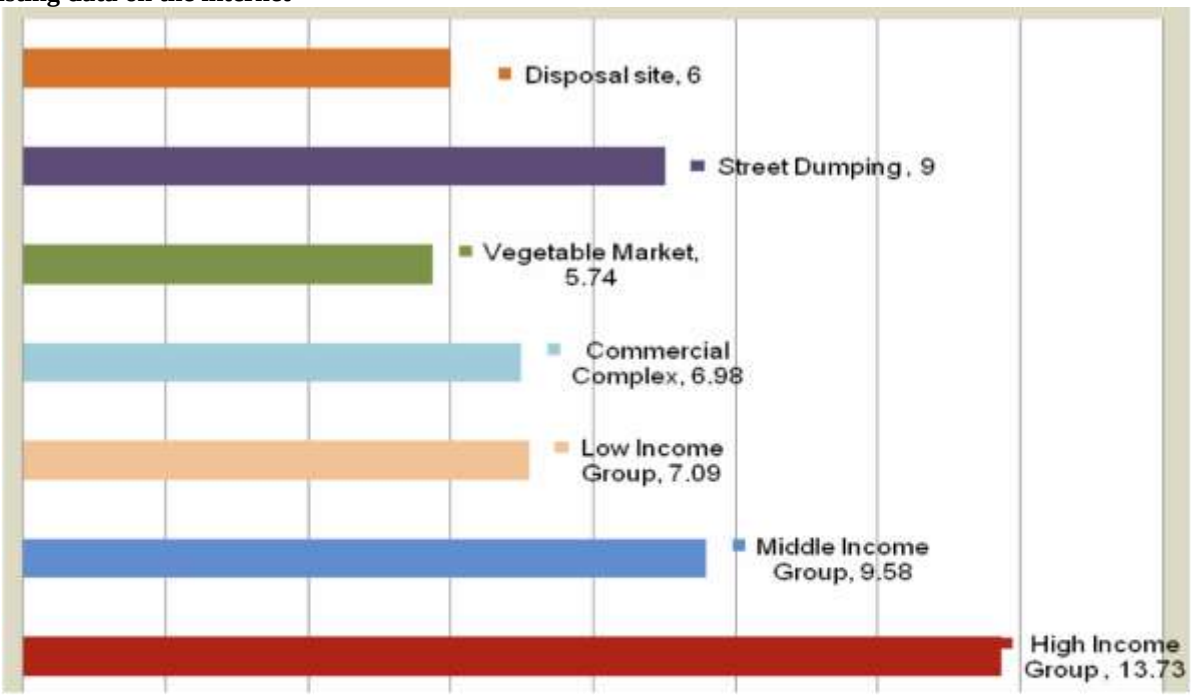

Fig11: Plastic waste percentage in different locations

Source:cpmaindia

Figure 11 shows that highest plastic percentage was found in high-income households and lowest in vegetable markets. On comparing all the types of plastics waste items, ratio of carry bags was found to be the highest 60-30% (CPMA India). This shows that alternatives-to-plastic[13] that are more expensive than single-use plastic products would be affordable by the highest plastic consuming category of high-income households.

[11]Appendix 1.2 Answer 4
[12]Appendix 1.3
[13]Appendix 1.4

BMC had formed a blue squad to regulate the ban in 2018 which collected over 52340kgs of plastic bags and □2.76 crore from offenders. However, a member of the quad stated that despite heavy penalties, people continue using plastics as alternatives are not cost-effective and are inaccessible (Thevar).

Numerical Data from MPCB Website

Table 1: Data from Urban Local Bodies' Annual Reports for 2018-2019

	Tonnes Per Annum
Total quantity of Plastic waste generated	409641.653
Total Quantity of Plastic waste collected	279691.712
Total Quantity of Plastic waste channelised for use	172054.551

Source: mpcb.gov.in

Table 1 shows that:

$$\frac{279691.712}{409641.653} \times 100 = 68.28\%$$

68.28% of total plastic generated was collected by the government in 2018-19

$$\frac{172054.551}{409641.653} \times 100 = 42\%$$

42% of the total plastic generated was channelled for recycling in 2018-19

From the following data it can be concluded that in 2018 Maharashtra government was able to collect more than half of the total plastic waste generated which is a positive action of the ban. Furthermore, 42% of the plastics were channelised for recycling which gives an insight on the possible growth of the plastic recycling industry in Maharashtra.

In Urban Local Bodies' Annual reports for 2019-20(MPCB).

$\frac{271}{375} \times 100 = 72.27\%$ ofurban body councils had not prepared or implemented an action plan for management of Plastic Waste. This is due to inaccessibility of technology, expense of machinery, lack of awareness and manpower. This data shows that despite MPCB's attempt to encourage correct plastic management, producers and councils have several ground-level problems.

In the Plastic Waste Management report MPCB 2020-21, the following has been disclosed(MPCB):

- since October 2018 till 31st March 2021, closure directions have been issued to 405 plastic and thermocol manufacturing industries.
- Fine of Rs. 3.91 Cr collected from stops and establishments independently in Financial Year (FY) 2020-21.
- 1425 tonnes of banned plastic items have been collected in FY 2020-21.

Evaluation and Conclusion:-

While the ban was implemented to eliminate single-use plastics to benefit the environment, Figure 11, and Dr Iyer's answers are proof that the ban is unsuccessful. The interview with Dr Iyer establishes that it is extremely difficult to

measure the impact of the ban on the environment and since the ban is not implemented effectively, the long-run effects will not be visible. The data from the survey and the interviews show that the public has become more socially aware but until single-use plastics are manufactured they will rotate in the markets or end up in the oceans and landfills.

In evaluation, the short-run impact of the ban on the plastic industries' efficiency is measurable and is higher than the desirable effect of the ban on the environment. While there is no data to prove that the environment has benefited due to the plastic ban, there is numerous data to evince that there was unemployment, loss of machinery and equipment, misallocation of resources and a loss of □15,000 crore investments. These losses account for inefficiency in the Plastic industry of Maharashtra. It's important to realise that due to the ban on plastics the demand for paper bags has increased which can boost the economy since paper is cost effective. However, due to a sudden increase in demand of paper bags, efficiency of the paper bag industry can be affected negatively due to the lack of equipment to avoid wastage and losses of energy. Even though single-use plastic products are seen in markets, MPCB's website shows that single-use plastic is still being collected which discerns that the ban is still active. Inthe long run, if the ban is implemented and monitored effectively then environmental benefits will be seen.The alternatives-to-plastic and plastic recycling industries have large scope in the future which can boost the economy and absorb the effects of the ban on the plastic industry.It is important to acknowledge that unlike several other states of India and countries of the world, Maharashtra has at least taken action to address the problem of single-use plastics.

The following are the additional drawbacks of a ban on single-use plastics
1. Slow process that involves breaking habits
2. Extensive implementation and monitoring required
3. Potential formation of black-markets or loopholes

My research question was: To what extent has the Maharashtra 2018 single-use plastic ban affected the economic efficiency of industries and environmental sustainability in Maharashtra?The data reveals that the ban has the following impacts:
1. Almost zero measurable or direct impact on the environment
2. Social awareness and activeness to some extent
3. Large measurable impact on industries' efficiency

The government can implement the following policies to solve the problem of single-use plastics. A tax on plastic manufacturers will result in decreased production. The money collected by the government by a tax can then be used as a subsidy for emerging alternativetoplastics[14] and plastic recycling companies. The government must parallelly run awareness campaigns while forming alliances with NGO's and waste management companies. Formulatingmonitoring teams for different areas within cities would help to being effectiveness. Lastly, ground-level problems should be solved by policies to make machinery and technology available and more affordable for producers to efficiently manage plastic waste.

A fall out question can be: To what extent will it be effective to tax plastic producers in Maharashtra and use the collected money to subsidise alternative-to-plastics companies to solve the problem of single-use plastics?

Constraints of the research:
1. Primary data which include interviews and survey are subject to biases which could have influenced my research. The interviews are limited to people's perspectives which can limit the reliability of my data.
2. A sampling error could have occurred in the survey. If more people from one city of Maharashtra answered the questions, the data reflected would be inaccurate since the study is about the impact on the entire state of Maharashtra.
3. The extent of reliability and independence of the data collected from the internet could impact my report.
4. Out of 100 people only 55 people completely answered the survey which could impact the quality of my report.
5. Due to Covid-19 safety protocols only 2 plastic companies could be interviewed, so the results of my report could be limited.

[14]Appendix 1.4

I could have enhanced my research by interviewing and gathering numerical data from more plastic company owners. This would help me analyse the effect of the ban better as the sample size would be larger and the accuracy of my research would increase. An interview with a government official would help me determine the problems faced by government and understand the reason for the poor implementation of the ban.

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