Environmental Illusion

THE NON-WOVEN BAG

Toxics Link
for a toxics-free world

About Toxics Link

Toxics Link is an Indian environmental research and advocacy organization set up in 1996, engaged in disseminating information to help strengthen the campaign against toxics pollution, provide cleaner alternatives and bring together groups and people affected by this problem. Toxics Link's Mission Statement - "Working together for environmental justice and freedom from toxics. We have taken upon ourselves to collect and share both information about the sources and the dangers of poisons in our environment and bodies, and information about clean and sustainable alternatives for India and the rest of the world." Toxics Link has a unique expertise in areas of hazardous, medical and municipal wastes, international waste trade, and the emerging issues of pesticides, Persistent Organic Pollutants (POPs), hazardous heavy metal contamination etc. from the environment and public health point of view. We have successfully implemented various best practices and have brought in policy changes in the aforementioned areas apart from creating awareness among several stakeholder groups.

Acknowledgement

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1 Background

1.1 Introduction

Plastic is considered as one of most significant creations of human beings, a material which made life easier and simpler. It was in 1907 that the first modern plastic, bakelite, was invented- which led the way for the invention of a whole family of synthetic polymers. In the late 1950s and early 1960s, improvements in manufacturing processes brought down the cost of plastic production paving the way for cheap mass production and in the real sense of the term, led to the beginning of an era which can be aptly coined as 'Plastic Age'. Qualities of plastic like being lightweight, tough, transparent, malleable and waterproof made it a wonder material, resulting in a phenomenal rise in its usage and this flexible material put many traditional materials like wood, cloth, metal etc. out of business in many usages.

But only almost a century after its invention, plastic has gone from being hailed as a scientific wonder to being looked down upon as an environmental concern. The very quality of plastic for which it was celebrated- its property to last long, its attribute of durability and non-degradability by natural factors- is now considered as its biggest drawback. These properties made plastic useful for storing and transporting items, thereby increasing a product's shelf life. But now these very qualities make plastic stay in our environment forever. Plastic does not decay for hundreds of years. The plastic which was produced in 1907, probably still exists somewhere in the globe in some form or the other and so does all the 9 billion tonnes of plastic produced over the last 6 decades!

1.2 Plastic – An environmental burden

The mass production of plastic started way back in the 1950s, but since the quantum produced was limited, the waste generated was also limited. However by the 1990s, plastic production had tripled and hence the amount of plastic waste became huge, causing governments and institutions to take note of it and initiate action. But the worst was still to come as in the early 2000s, our output of plastic waste rose more in a single decade than it had in the previous 40 years. And one big reason behind this was the proliferation of single-use plastic. Today, we produce about 300 million tonnes of plastic waste every year. That's nearly equivalent to the weight of the entire human population[1]!

Humans have produced approximately 9 billion tons of plastic since large-scale manufacturing of plastics took off in the 1950s. As per researchers[2], out of this 9 billion tonnes of plastic that has ever been produced, as of 2015, about 7 billion tons has been disposed of as waste, with only 9 percent of it being recycled, 12 percent incinerated, and a whopping 79 percent finding its way into landfills. Many of this, of course, finally ends up in our oceans.

About 7 billion tons have been disposed of as waste, with only

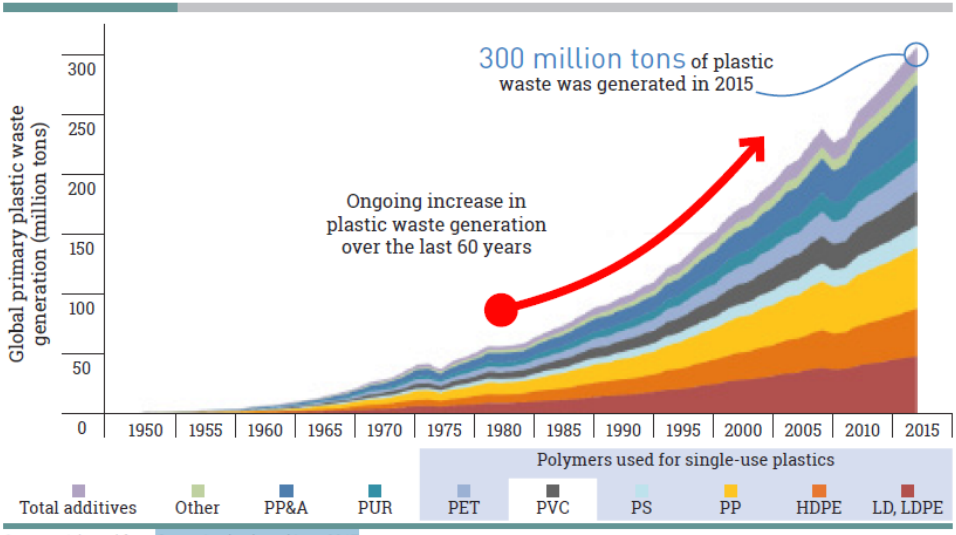
9%

of it being recycled

1 https://www.unenvironment.org/interactive/beat-plastic-pollution/

2 Production, use, and fate of all plastics ever made, Roland Geyer, Jenna R. Jambeck and Kara Lavender Law

Figure 1: Global primary plastic waste generation (Source: UNEP (2018). SINGLE-USE PLASTICS: A Roadmap for Sustainability)



Source: Adapted from Geyer, Jambeck, and Law, 2017

Marine plastic is one of the biggest environmental concerns globally, with at least 8 million tons of non-biodegradable material ending up in our oceans every year. The main sources of marine plastic are land-based, from urban and storm runoff, sewer overflows, littering by beach visitors, inadequate waste disposal and management, industrial activities, construction and illegal dumping. Under the influence of solar UV radiation, wind, currents and other natural factors, plastic fragments into small particles, and are termed as microplastics (particles smaller than 5 mm) or nanoplastics (particles smaller than 100 nm).

The most alarming impacts of marine plastics, including macro, micro and nano particles are the ingestion, suffocation and entanglement of hundreds of marine species. Marine wildlife such as seabirds, whales, fishes and turtles, mistake plastic waste for prey or food, and most die of starvation as their stomachs are filled with plastic debris. Floating plastics also contribute to the spread of invasive marine organisms and bacteria, which disrupt ecosystems.

Microplastics have now been detected in all oceans, including the Arctic- suggesting that probably there are no corners in the globe left untouched from this plastic form. Its detection in tap water, salt and even human faeces is clearly indicative that the plastic waste that we have created for the last seven decades is coming right back to us. Plastics can also function as carriers of invasive species or alien species thereby altering the ecology of a place.

Significantly large volumes of plastic waste and the economic non-viability of recycling of many factions leads to its disposal in large bodies of water or simply burning them. On burning such waste, emissions that are released include heavy metals, dioxins and furans and PAHs (Polycyclic aromatic hydrocarbons). The effect of plastic pollution can be increased manifold, if combined with natural and man-made disasters such as tsunami, oil spills, etc.

1.3 Plastic- A cocktail of chemicals

With eight million metric tons of plastic entering the world's oceans every year, there is growing concern about the proliferation of plastics in the environment. But, surprisingly there has been very little focus on its impact on human health.

Plastic has many additives, used for making it flexible, malleable and other properties required for different products. Some of the harmful chemicals used in plastic are Bisphenol A, phthalates, and flame retardants. These are proven Endocrine Chemical Disruptors (EDCs)[3] and many have been linked to cancer and reproductive problems. The chemicals added to plastics easily spread into the surrounding environment as the plastic breaks down, posing an ever-increasing risk to water, soil or body tissue where plastic is present.

Plastic degrading in the ocean or on land builds up in the food chain as it is ingested by larger animals. The plastic both leaches the chemicals it already contained into

3 http://toxicslink.org/docs/Paper%200n%20EDC%20-%20for_web.pdf

the environment and accumulates other toxic chemicals present in the environment as it works its way up the food chain. Contaminants that can be attracted to plastic surfaces include Persistent Organic Pollutants (POPs)[4] like PCBs and DDT at high concentrations. Since different chemicals are present in the marine environment, such as in the sediments, water column, plastics and biota, in different concentrations, their interactions and possible synergic effects have to be taken into account when assessing the impacts to marine life. When fish and other marine animals ingest plastic debris, they are also ingesting these toxins.

1.4 Plastic Bags- Is it only a Visual Polluter?

Though plastic waste is recognised to be a problem as a whole, there is one kind of plastic waste that has caught the attention of almost everybody and that is single-use plastic bags. They are one of the most littered plastic products, causing many environmental concerns.

The adverse impacts of plastic bags are undeniable: When they're not piling up in landfills, they're blocking storm drains, littering streets, getting stuck in trees, and contaminating oceans, where fish, seabirds, and other marine animals eat them or get tangled up in them.

Build-ups of huge quantities of plastic bags are well-known to block local drainage systems, especially in developing countries. For example, the floods in Bangladesh 20 years ago were partially attributed to blockages in drainage systems from plastic shopping bags. Plastic shopping bags also pose health risks to human populations over the years as they leach toxins into water supplies.

Plastic bags are also problematic to recycle. Bags of less than 50 microns are not commonly picked up for recycling- the reasons being economic as well as the conditions in which these are dumped. Most of these bags actually end up in landfills and sit there for hundreds of years. Litter from plastic bags is not just on land. Plastic shopping bags have heavily contributed to a huge amount of plastic debris found in the oceans. Floating plastic shopping bags can be mistaken to be jellyfish by marine animals who consume them. Plastic bags cause over 100,000 sea turtle and other marine animal deaths every year. An autopsy of the stomach of a beached whale found 20 square feet of plastic shopping bags that took up its whole stomach. Similar cases have been observed over the past few decades.

Various animal species like cows are also known to ingest plastic bags that are littered as part of municipal waste, and get entangled in them even causing toxicological impacts that has led to death of the animal in multiple cases.

Considering the serious impacts of plastic bag waste, environmentalists are increasingly pushing for laws to regulate its usage.

4 https://ec.europa.eu/environment/integration/research/newsalert/pdf/IR1_en.pdf

1.5 The Indian scenario: Regulations on Plastic bag usage

Plastic bags are one of the most commonly regulated plastic products across the globe. Several countries, spread over different continents, have placed restrictions or banned the usage of these disposable bags. In India, there have been regulations at both central and state levels to regulate plastic bags and also to deal with plastic waste. At the national level, Plastic Waste Management Rules, 2016 have been enacted, wherein the minimum thickness of the bags which can be used is 50 microns. There have been also stricter regulations at the state level with some states banning the plastic bags entirely and some restricting their usage in ecologically sensitive areas[5].

Figure 2: State-wise Plastic Bans

(Source: CPCB, 2018-19)

Even after full and partial bans and phase-out orders at the state and centre level, plastic bags continue to be in use. Though plastic bags are still freely available in the market; on a positive note, owing to consumer awareness and restrictions, there is a small shift to alternatives. These include cloth, jute, paper bags, bio-plastics and oxo-biodegradable plastics etc. The advantages provided by these alternatives is that they are reusable options and can thus help reduce the "trash it" culture that is prevalent due to the availability of light-weight, cheap and single use plastics and they can obviously reduce the plastic burden. Amongst these above-mentioned options, one of the most popular has been that of **Non-Woven Bags.**

1.6 Non- Woven Bags

Reusable bags have been promoted as an alternative to plastic bags in an effort to reduce the plastic waste concerns. Among the variety of reusable grocery bags out in the market, non-woven bags seem to be a prominent one. Non-woven bags, as the name suggests, are bags which are not 'woven' and are manufactured using any material that is not woven. Like woven cloth, non-woven fabric is made from fibres. However, the fibres are entangled together through whatever process is applied to them, as opposed to being woven together. The product can be produced mechanically, chemically or thermally.

There are various types of non-woven materials. Each type of non-woven material can be made from different types of fibres. The type of fibre determines whether a non-woven bag is biodegradable or not. In most cases, non-woven bags are made up of spun bond polypropylene.

5 https://cpcb.nic.in/uploads/plasticwaste/Annual_Report_2018-19_PWM.pdf

Polypropylene (PP), a thermoplastic resin material, is produced by the polymerisation of propylene. It can be turned into a fibre form as well. There are two types of polypropylene bags —woven and non-woven. Woven PP is made by pressing long strings of polypropylene molecules (called polymers) together to make a thread-like strip and then weaving these fabrics as you would any other fabric. Woven PP has been used to make sacks for a number of industrial uses like sand bags as well as for packaging bulk coffee, rice and other dry foods. It is clean, strong and easy to sew. Woven PP is usually laminated to the strands together as they are slippery and can separate easily.

Non-woven PP (NWPP) is made by taking polypropylene polymers and spinning them using heat and air into long fluffy threads, like cotton candy, then pressing the threads together between hot rollers to get a flexible but solid fabric with a weave-like texture similar to canvas. Non-woven bags are made from non-woven polypropylene fabric. This fabric is made with spun and bond polypropylene fibre, which is soft, smooth and air-permeable. In a spun-laid non-woven material the fibres are directly taken onto a moving web which arranges them randomly. The unprocessed web looks somewhat similar to cotton. The fibres on this web are then bound together thermally or mechanically.

Need for this study

There has been a push in the recent years to eliminate plastic bags and replace them with alternative more eco-friendly carry bags. One type of bag stands out among the rest of the 'non-woven bags'. Non-woven bags have in recent times flooded the market and are being used in small confectionery or grocery shops to large brands and retailers.

Since the reason to replace plastic bags was based on its environmental consequences, it is important to understand if its alternatives are safer for the environment. This study assesses if non-woven bags are one of the most popular choices for vendors/establishments who are looking at replacing plastic bags. The study more importantly also attempts to understand if the non-woven bags, commonly provided by vendors/shops, are eco-friendly and the right replacement.

2 Study Framework

2.1 Objectives

The overall objective of our work on plastic is to reduce plastic pollution and hence arrest the damage inflicted on the planet.

The specific objectives of the study are:

a. To assess popularity of non-woven bags as an alternate to plastic carry bags

b. Identifying and determining the chemical constituent of non-woven bags

c. Analyzing if non-woven bags are a suitable substitute for plastic bags

2.2 Methodology

The study involved primary as well as secondary components.

A. Primary Study

a. Retailer's survey: A study in the form of a survey was carried out amongst different retailers/vendors in Delhi to assess the usage of plastic bags and its alternatives. Attempt was made to include different categories of retailers to understand sector wise usage and the switch to non- woven bags, if any. The total number of responses for this survey was 90 and was based on random selection. Please see the table below for the details of the respondents included in the survey.

Table 1: Respondents in the retailer survey

Categories	No.
Chemist/Pharmacy	10
Clothes / Readymade Garments	16
Grocery	10
Restaurant / Dhaba	12
Shoes	14
Sweets	14
Vegetables/ Fruits (mainly cooperatives like Safal)	13
Any other (ice-cream vendor)	1
Total	90

The type of shops included in the survey was based on common users (providers) of plastic carry bags. Attempt was made to include big merchandise brands as well as smaller ones- national or international as well as local ones. A questionnaire was developed and field tested before being commissioned. The tool used to carry out the survey was KOBO humanitarian tool (please refer to the annexure for the survey questionnaire).

b. Testing: Samples of non-woven bags were collected from different types of retailers and sent in for testing to an accredited lab in New Delhi. This was done to identify the chemical component of these bags and determine whether it truly is an environment-friendly alternate to plastic. The sample size was 5 and was collected from

1. Pharmacies
2. Restaurants
3. Vegetable and fruit shops
4. Grocery shops
5. Directly from carry bag vendors

The samples were then labelled and photographed. These were then sent for testing.

Figure 3: Screenshot of KOBO form

Type of shop:
- ○ Grocery
- ○ Vegetable/ Fruits
- ○ Restaurant/ Dhaba
- ○ Sweets
- ○ Chemist/ Pharmacy
- ○ Clothes/ Readymade Garments
- ○ Shoes
- ○ Any Other

Have you replaced plastic bags?
- ◉ Yes, providing alternative
- ○ No, still using plastic
- ○ Not providing anything

What kind of bag are you using as an alternative
- ○ Jute bag

Figure 4: Non- woven bag samples

B. Secondary Research: Various sources such as research papers, reports, national/international legislations, policy briefs, news and magazine articles were referred to gather data on the non-woven bags which were analysed to understand the scenario surrounding non-woven bags

2.3 Limitations of the Study

There has been very little work on non-woven bags and its suitability in replacing plastic bags. And, hence we had to rely mainly on primary research and some newspaper articles etc.

Due to financial and time constraints, the primary survey of retailers was limited to Delhi. But the secondary research hinted that the scenario is not very different in other urban spaces in India.

For assessing the material composition, the sample size considered is small. This was mainly due to resource constraints.

The responses recorded are subject to personal bias.

This is one of the few reports on this subject and further widespread investigation is necessary for a better overview of the topic.

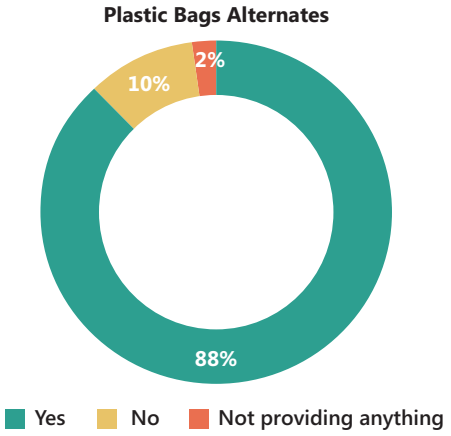
3 Findings and Discussion

Plastic bags are cheap to produce, sturdy, easy to carry and store, and hence have captured a huge market in a consumeristic society which places convenience and cost as top priorities. Disposable plastic bags are convenient, but they are a major source of waste and pollution. Plastic bags have clogged drains, filled landfills, reached oceans, filled sea turtle and cow bellies! Recognition of its disastrous impacts has led to bans and restrictions on these non- biodegradable bags in many countries across the globe. India has also, at the national as well as state level, taken action to restrict this pollutant.

3.1 Ground Reality

Plastic bag restriction at the state and national level has resulted in some change on ground. Since the national framework bans the use of plastic bags below 50 microns, legally the country is mandated to not use them. But in many states across the country the ban on plastic bags is complete, irrespective of thickness (not applicable in the survey state of Delhi). But apart from the mandate, there have been also voluntary actions by shops/companies etc. wherein they have replaced the plastic bags with alternatives.

Figure 5: Have plastics been replaced?

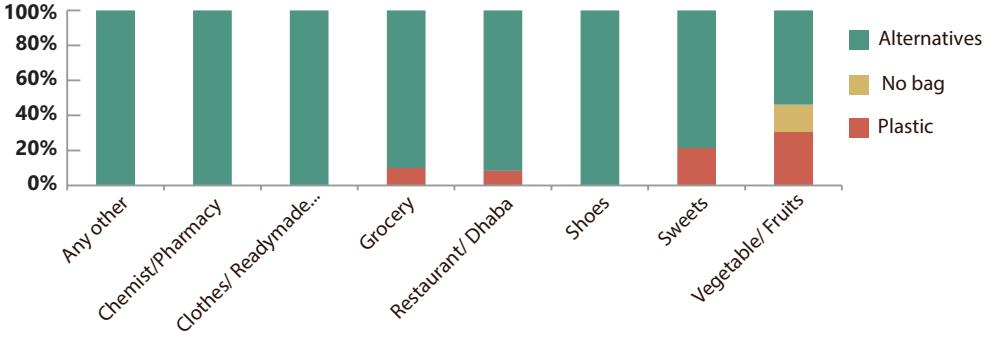


Plastic bag: Replaced?

Our survey looked at different types of establishments to understand if plastic bags are still widely used or the alternatives have become popular. In the responses received, an overwhelming 88% of the respondents said that they have replaced plastic bags with alternatives. Only 10% of the respondents were still using plastic among the surveyed establishments. A very small percentage had done away with bags completely, irrespective of the material.

Among the different kinds of establishments, cent percent of the surveyed pharmacies, clothes and shoe shops had made the switch to plastic bag alternatives. The least change was seen among the vegetable and fruit vendors, where a sizeable percentage is still using plastic. The percentages of plastic bag usage might be higher, as most respondents are aware of plastic bag concerns and hence may not be giving accurate responses.

Figure 6: Bags usage by establishments



Popular Replacement

Since a large percentage of respondents had shifted to alternatives, the next likely question was regarding the choice of alternatives. Paper, cloth, jute are popular choices but non-woven bags is the most popular option. 45% of the respondents have replaced plastic bags with non-woven bags, and 40% are replacing it with paper. Jute and cloth bags were not so popular choices, mainly because of the cost factor. Some respondents also said that they were using aluminium foil boxes, biodegradable plastic and net bags, cardboard, old and used newspapers as alternatives.

The choice of replacement varied with the type of establishment. Paper bags were more preferred in a pharmacy and garment shops, whereas a larger majority of shoe shops and restaurants were using non-woven bags. Though few restaurants and grocery shops did claim to use cloth bags, it was likely that they were calling non-woven as cloth. The sweet shops were divided in their choice between non-woven and paper bags, but the vegetables and fruit cooperatives were completely using non-woven bags as an alternative.

Figure 7: Alternates provided (%)

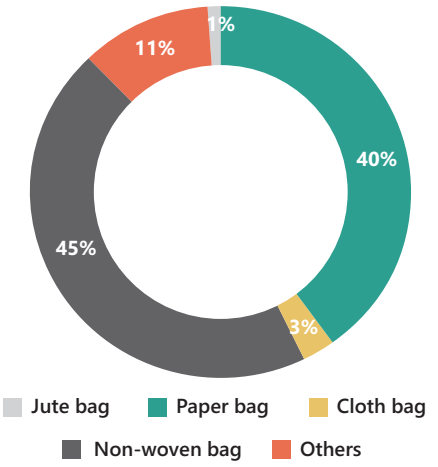
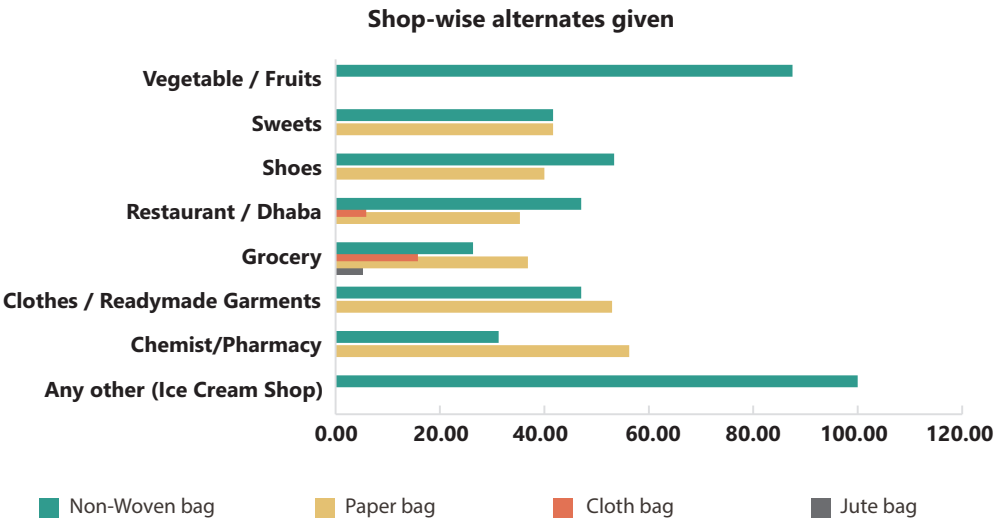


Figure 8: Shop-wise plastic alternates provided



Non-woven bag as an alternative

Among the respondents who were providing non-woven bags, more than 70% said that these are better options than plastic bags. A sizeable percentage, though, still favoured plastic bags. **One of the reasons for preference for non-woven bags could be the notion that these bags are bio-degradable. 46% of the respondents were of the opinion that non-woven bags will bio-degrade, but a large percentage (44%) were unsure. Only 10% of them said that these replacements were non-biodegradable.**

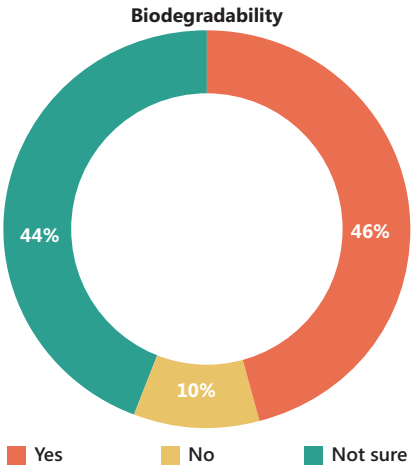
Table 2: Non-woven bags a better alternative than plastic bag?

Choice	Percentage
Yes	73.08
No	21.15
Not sure	5.77

The lower cost of non-woven bags, compared to most other alternatives, was another big reason that the establishments preferred to hand out these. Though these are more expensive than plastic, the range of 200-250/kg, depending on the size, made these bags still affordable for most of them. There are approximately 200-300 bags per kg, depending again on the size. So the cost per bag comes to around 0.80 to 1.50 Rupees.

Though most vendors don't charge the consumers for the bags and dole them out for free, there were few who charged 5 or 6 rupees per bag to the consumers.

Figure 9: Are non-woven bags biodegradable?



3.2 Are NON-WOVEN bags the RIGHT CHOICE?

It is clear from the earlier section that non-woven bags are the most popular alternatives chosen by the respondents. The majority feel this is better than plastic bags. Hence, the next step in this study was to assess if they were really the best option and whether these bags are solving the concerns of plastic bags. For this, material analysis of the non-woven bags was done.

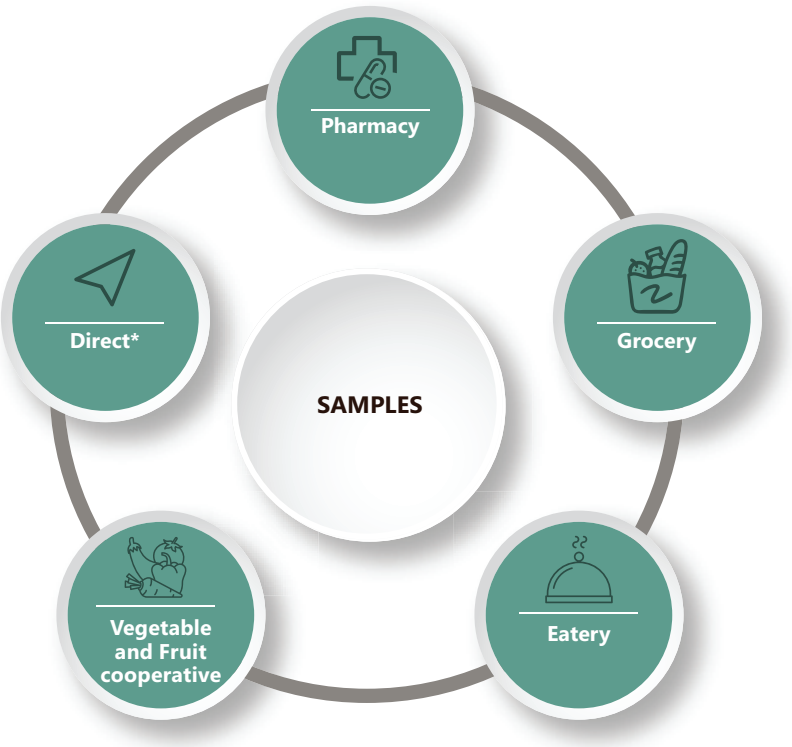
Sampling

The purpose of the testing was to understand the material composition of the non-woven bags, commonly provided in the market. Hence, samples were taken from different types of establishments. Due to resource limitations, sample collection was limited to Delhi.

The field survey identified some key types of establishments/shops using non-woven bags; namely, pharmacies, grocery shops, eateries, and fresh produce shops, and hence these were chosen as our sample collection establishments. Samples of non-woven bags were collected from each type of establishment (chosen randomly), where it was being provided to consumers for carrying medicines, grocery and vegetables etc. One sample was also collected from a bag wholesaler (termed as direct).

200 grams of each sample of bags were sourced, as required for testing. For four of those samples, various products were purchased so that they were handed over in the carry bags, wherein the wholesale bag shop, the bag was purchased directly. The non-woven bag samples were then packed separately, marked as Sample number 1-5, and then sent to an accredited laboratory for testing.

Figure 10: Samples from different establishments (sourced from the non-woven bag seller)



Testing and Results

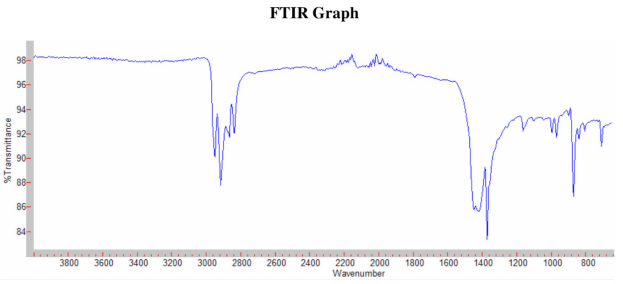
Five samples of non-woven bags were sent to an accredited laboratory based in New Delhi, where it was subjected to FTIR-Spectrometer (Fourier-transform infrared)/CIPET Method to identify the material.

The results of FTIR analysis of the samples are detailed below.

Sample No. 1

The sample was sourced from a pharmacy.

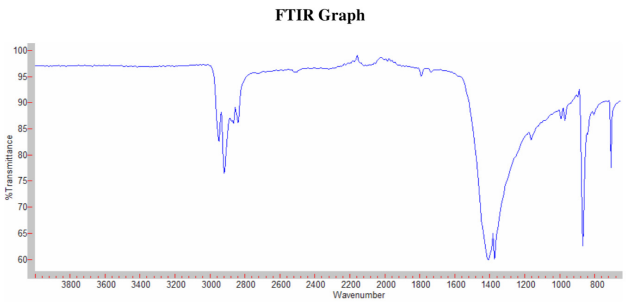
Figure 11: FTIR Analysis of Sample no 1- Material is identified as Polypropylene (PP)



Sample no. 2

The sample was sourced from a grocery shop.

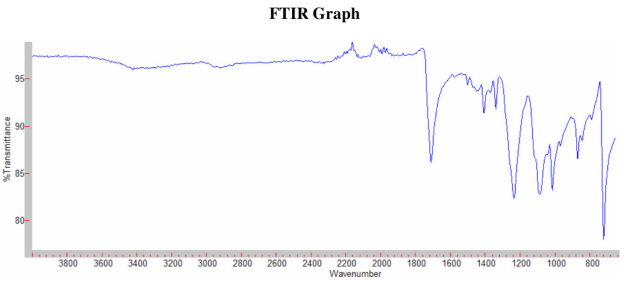
Figure 12: FTIR Analysis of Sample no 2- Material is identified as Polypropylene (PP)



Sample no. 3

The sample was sourced from a vegetable and fruit cooperative.

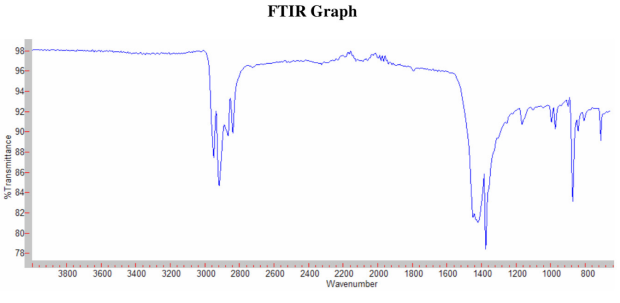
Figure 13: FTIR Analysis of Sample no 3- Material is identified as Polyester

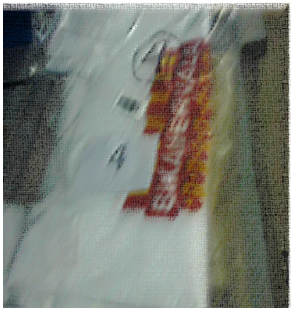


Sample no 4

The sample was sourced from a popular eatery.

Figure 14: FTIR Analysis of Sample no 4- Material is identified as Polypropylene (PP)

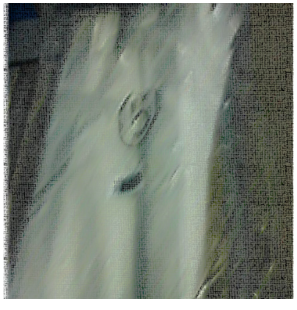


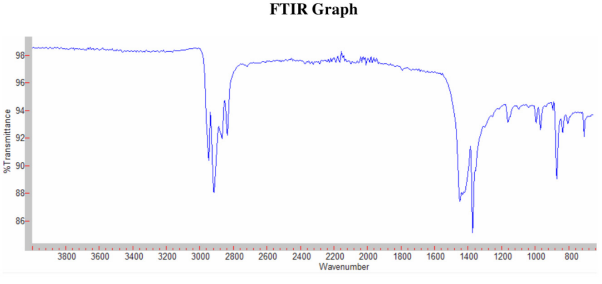


Sample no 5

The sample was sourced from a bag wholesaler.

Figure 15: FTIR Analysis of Sample no 5- Material is identified as Polypropylene (PP)





As evident from the FTIR analysis results, four of the samples sent for testing contained Polypropylene. One sample contained Polyester.

Table 3: Lab Test results

Sample	Material Identified
Sample No. 1	Polypropylene (PP)
Sample No. 2	Polypropylene (PP)
Sample No. 3	Polyester
Sample No. 4	Polypropylene (PP)
Sample No. 5	Polypropylene (PP)

The results have been shocking. There are various types of non-woven materials and each type of non-woven material can be made from different types of fibres. But this study found that most non-woven bags being used in the Delhi market are made of plastic, primarily of polypropylene. All the bags sent as samples contain Polypropylene (PP) or Polyester in large percentage, clearly making these bags non-biodegradable. **Thus it can be inferred that these bags, that are being identified as alternates to plastic bags, are nothing but plastic itself.**

Non-woven bags look different from the conventional plastic bags in appearance and hence many have assumed that these are not plastic and are environmentally friendly – our survey findings also indicate that. This is far from the truth, as is evident from the test results. Since the materials used to make the non-woven bags are also plastics, these bags also pose equal threat to the environment. This really means that the states where there are restrictions on plastic bags use, non-woven bags containing PP or any other plastic would be also covered and hence banned.

In an earlier study done in Nasik city to check biodegradability of the non-woven bag, it was found that non-woven bags, containing plastic resin, remain non-degraded.[6]

3.3 Non-woven bags- Regulatory framework?

Complete plastic bag ban or restriction, as mentioned in the earlier sections, are in place in many states, apart from the 50 micron restriction at the national level. Most of these do not identify or clearly mention non-woven bags as plastic bags and that is probably the reason why their popularity has soared as an alternative. But some states have mentioned non-woven bags. Maharashtra, Chandigarh and Karnataka have specified banning of non-woven bags in the overall plastic ban regulation(please refer to the table given below[7]). The Madras High Court had been moved seeking to quash a Government Order (GO) in Tamil Nadu, banning use and manufacture of plastic bags which include non-woven polypropylene carry bags.

6 Dr. Pratima Pandit Wagh et al (2019) 'A case study on biodegradability of Nonwoven bags distributed in the Nasik City as an Alternate to Plastic Bags', International Journal of Current Advanced Research, 08(05), pp. 18597-18600.

7 https://cpcb.nic.in/uploads/plasticwaste/Annual_Report_2018-19_PWM.pdf

Table 4: Specific bans on Non-woven bags

State	Ban
Maharashtra	**Complete ban on certain plastic products like:** i) **Plastic bags with or without handle irrespective of size and thickness** ii) **Single-use disposable items like cups, plates, straws, spoons etc.** iii) **Non-woven polypropylene bags** **vide Maharashtra Plastic and Thermocol Products Notification, 2018 dated: 23.03.2018 and amendment dated 11.04.2018, 30.06.2018 & 14.06.2019.**
Chandigarh	**Complete Ban on plastic carry bags vide Notification No. ED/2008/684 Dt. 30.07.2008 Compostable carry bags are allowed. Further, there is prohibition on use of plastic/non-woven plastic carry bags, plastic plates, glasses & other allied items**
Karnataka	**In 2019, banned items included plastic banners, buntings and flex, non-woven polypropylene bags, plastic cling films, disposable spoons, cups, plates, sheets spread on dining tables, items made of thermocol.**
Tamil Nadu	**The Government of Tamil Nadu, in an order in 2018, notified ban on manufacture, store, supply, transport, sale or distribution of used and throwaway plastics, plastic sheets used for food wrapping, spreading on dining table etc., plastic plates, plastic coated tea cups and plastic tumbler, water pouches and packets, plastic straw, plastic carry bag and plastic flags irrespective of thickness. The ban came into effect from 01.01.2019 and included non-woven PP bags.**

States like Karnataka, Tamil Nadu and Maharashtra have also run campaigns against the use of non-woven bags, as these were emerging as the most common alternatives after blanket ban on plastic bags were implemented in the states[8].

8 https://www.freepressjournal.in/cmcm/mumbai-non-woven-bags-are-no-alternative-to-plastic-says-experts

Figure 16: Banned Non-woven bags in a) Maharashtra and b) Karnataka

Figure 17: Part of the handbook on Single use plastic ban, by Tamil Nadu Pollution Control Board

Nagaland has also included NWPP bags as part of the banned plastic bag notification. In a press interaction, the Deputy Commissioner of Mokokchung, Nagaland also clarified that polypropylene was banned and said that polypropylene bags were in fact more harmful than polythene bags in that not much research has been done on the former and that its potential threats remained unknown, except for the fact that it is made of thermally heated plastic polymer and therefore non-biodegradable[9].

But non-woven bags continued to be used in large volumes as replacement for plastic bags and are freely available.

9 https://www.morungexpress.com/clearing-confusion-polypropylene-carry-bags-are-hazardous-single-use-plastic

4 Conclusions

Single-use plastic bags, commonly made from low-density polyethylene, were given for free to customers by stores/vendors when purchasing goods and have long been considered as a convenient, cheap, and hygienic way of transporting items. But in the last couple of decades, plastic bags have been identified as one of the most common types of litter on land. Build-ups of huge quantities of used plastic bags are well-known to create huge environmental concerns, especially in developing countries like in India where the quantum used is humungous and waste management systems are poor. Most plastic bags end up in landfills and sit there for hundreds of years, get into soil and slowly release toxic chemicals. When they're not piling up in landfills, they are blocking storm drains, getting stuck in trees, and contaminating oceans, where fish, seabirds, and other marine animals eat them or get tangled up in them and probably break down to microplastic, one of the most globally talked about environmental concerns today. The concerns pertaining to plastic bags have been well-recognised globally and as of January 1, 2020, bans have been introduced in 74 countries, with varying degrees of enforcement, and 37 countries have made these bags chargeable. As a result of these restrictions, the shops/vendors have looked for viable alternatives.

Our study findings clearly establish that non-woven bags are seen as an alternative to plastic bags and have replaced them in many establishments. These bags are many a times assumed to be cloth bags and hence recognised as an eco-friendly option. As evident from the study, non-woven bags are being widely distributed by various types of vendors, to deal with the plastic bag ban. These bags, although, costlier than plastic bags, are one of the cheapest alternatives and hence popular.

Though the study was conducted in Delhi, newspaper reports and articles suggest that non-woven bags are used widely all over the country. These bags are the most popular alternatives being used in almost all states across India, mainly due to a perception that these bags are bio-degradable and eco-friendly.

Non-woven bags are also plastic bags!!

The look and feel of the non-woven bags have made people believe that they are made of cloth and therefore environment-friendly. This is far from the truth. The lab findings, which were a part of this study, clearly show the plastic content in the popularly distributed non-woven bags- thus breaking the myth that these bags pose no harm to the-environment. Lab results found polypropylene and polyester (both are plastic resins) in the samples tested, thereby proving that these bags are also plastic bags and not alternates. In simple terms, it means that if you discard the PP bags in the open, thinking that they will decompose you cannot be more mistaken. On the contrary they will be there just like single-use plastic bags. But unfortunately, lack of correct information or misleading information is leading most vendors to use plastic (non-woven PP) as replacement for normal plastic- and ironically paying more for it.

The industry though continues to assert that NWPP bags are the best alternative to polythene or regular plastic bags, citing their durability and also claiming that they are environment- friendly. Manufacturers have also petitioned against the ban in Tamil Nadu, claiming that such bags are 100% recyclable and reusable. Some industry players also claim that NWPP bags are bio-degradable!

Though some local and regional government agencies have explicitly admitted that NWPP bags are not the right choice, there is still lack of clarity on the issue. The Deputy Municipal Commissioner (special), Brihanmumbai Municipal Corporation (BMC), Nidhi Chaudhary had stated in a press interaction in 2019[10], "A non-woven polypropylene bag is not an eco-friendly alternative, it's more harmful than the plastic bags." Through laboratory tests, the Delhi government had confirmed in 2009 that non-woven bags are actually made of plastic mixed with few additives (fabric etc.) to give it the look and feel of cloth. "As much as 98.3 per cent of the material used in non-woven bags is plastic. Makers were trying to mislead the public into believing that this material was cloth or something similar," said J.K. Dadoo, the then Environment Secretary, Delhi[11].

Need for action

The study points out towards the need for more clarity and emphasises the role of regulatory agencies to include non-woven bags containing plastic resins, in the list of banned or restricted plastic bags, as done by few states already. But even beyond this, there is a huge need to educate the establishments, who at times have voluntarily shifted to non-woven bags as a measure to be environmentally-friendly. For example, Delhi, the survey area of this study, does not have a complete ban on plastic bags and even then many shops/ vendors have replaced plastic bags with non-woven ones. These establishments have taken a voluntary initiative, hardly realising that they have chosen plastic to replace plastic! Consumer awareness and behaviour change programmes still remain

10 https://www.freepressjournal.in/cmcm/mumbai-non-woven-bags-are-no-alternative-to-plastic-says-experts

11 https://www.hindustantimes.com/delhi/non-woven-bags-to-go/story-OWBK7iMhVkBqBITh4uqBiL.html

key elements and various agencies have to work towards informing and educating the consumers regarding the reality of non-woven bags.

Key Recommendations

- State-level plastic bag bans should explicitly mention non-woven PP bags and the bans should be extended to NWPP bags as well.
- Notices should be sent to shops/establishments/ vendors using NWPP bags. The vendors should be made aware that these bags are plastic bags and not alternatives.
- Strict enforcement on ground is needed to ensure reduction on use of NWPP bags.
- Shutting down industries engaged in manufacturing of non-woven PP bags is required .
- Support to other alternatives ought to be extended, to bring down cost and increase their production
- Widespread public awareness can be done to educate the general masses and clarify that NWPP bags are not cloth bags and hence their use needs to be discouraged

Annexure:
Field Survey Questionnaire

1. Date
2. Location
3. Shop/Shopkeeper Name
4. Name of the surveyor
5. Type of shop

   a. Grocery
   b. Vegetable/Fruit
   c. Restaurant/Dhaba
   d. Sweets
   e. Chemist/Pharmacy
   f. Clothes/Readymade garments
   g. Shoes
   h. Other

6. Have you replaced plastic bags

   a. Yes, providing alternative
   b. No, still using plastic
   c. Not providing anything

7. What kind of bag are you using as an alternative

   a. Jute bag
   b. Paper bag
   c. Cloth bag
   d. Non-woven bag
   e. Others

8. If giving non-woven bags, do you think non-woven bags are better than plastic bags?

   a. Yes
   b. No
   c. Not sure

9. How many woven bags do you give away to customers in a day (average)?
10. Do you charge for the bag?

    a. Yes
    b. No

11. If yes then how much per piece?
12. Are woven bags bio-degradable?

    a. Yes
    b. No
    c. Not Sure

13. Source of non-woven bag
14. What is the price of woven bags per kg

    a. 1kg
    b. 2 kg
    c. 5 kg

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