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Formerly Booz & Company

Plastic Packaging – the sustainable and smarter choice

Why banning plastic packaging in Indian FMCG is not a viable option

pwc

FICCI

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We are differentiated from our competitors in our ability to deliver implementable solutions to the client's problems, with clear benefits realization, while effectively leveraging our local and global expertise.

About FICCI

Established in 1927, FICCI is the largest and oldest apex business organisation in India. Its history is closely interwoven with India's struggle for independence, its industrialization, and its emergence as one of the most rapidly growing global economies.

A non-government, not-for-profit organization, FICCI is the voice of India's business and industry. From influencing policy to encouraging debate, engaging with policy makers and civil society, FICCI articulates the views and concerns of industry. It serves its members from the Indian private and public corporate sectors and multinational companies, drawing its strength from diverse regional chambers of commerce and industry across states, reaching out to over 2,50,000 companies.

FICCI provides a platform for networking and consensus building within and across sectors and is the first port of call for Indian industry, policy makers and the international business community.

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1. Purpose and Scope of this Study

This study was undertaken by Strategy& in collaboration with FICCI. The **purpose** of this study is to:

- Evaluate the broad-based impact (i.e. on consumers, economy and environment) of a ban on plastic packaging

- Share Strategy& perspective on the way forward to address the health and environmental concerns raised

The **scope** of this study is limited to the different types of plastic packaging used by the Indian FMCG industry. For the purposes of this study, all plastic packaging used by the FMCG sector in India is assumed to be under purview of the ban being considered due to the wide range of issues involved.

The study **does not address** the broader uses of plastic, such as in the pharmaceutical sector and/or for non-packaging use. It also does not cover any concerns associated with plastic use beyond a) plastic waste management in India and b) the specific health concerns associated with PET that are currently under discussion.

2. Executive Summary

The National Green Tribunal (NGT) is considering imposing a ban to restrict the use of plastics for packaging of all non-essential items. The ban is being considered as a response to address certain health concerns and environmental concerns raised by different public interest litigations.

Based on the study conducted, Strategy& believes that an outright ban on use of plastics for packaging is not a prudent solution to address the concerns raised.

Plastics are a ubiquitous packaging material of universal choice for FMCG products

Plastics are the material of choice in packaging FMCG products across categories globally. In India, an overwhelming majority of the FMCG products that households buy are packaged in plastic – so much so that some categories (e.g., biscuits, hair care) are almost exclusively packaged in plastic.

The unique properties of plastic enable it to deliver superior performance compared with alternative packaging materials (such as glass, paper and metals) along three critical dimensions: 1) Increased food safety, quality and shelf life, 2) Reduced environmental impact and 3) Innovative packaging options for consumer convenience.

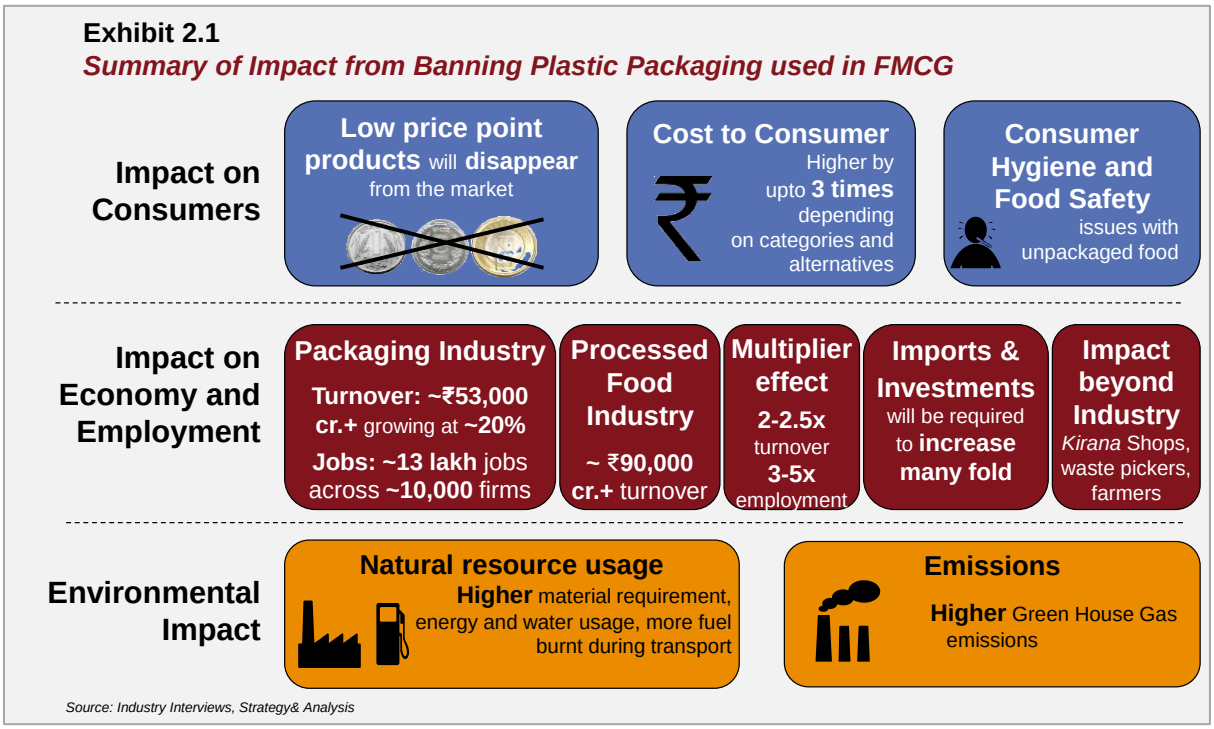
The impact of an outright ban on plastic packaging will be far-fetched

The impact of a ban on plastic packaging is summarized in Exhibit 2.1. Three types of impact will need to be considered as an outright ban on plastic packaging is discussed:

1) Impact on consumers:
A ban on plastic packaging will compel the FMCG packaging industry to switch from plastics, and use alternatives as materials for packaging. Consequently, consumers will see three major impacts:

- **Increase in the price** of most FMCG products as manufacturers shift packaging to alternatives.
- **'Wipe-out' of various low price point products** (e.g., those that cost less than ₹5 – such as shampoo sachets, detergent pouches, biscuit packets etc.) as production at these price points becomes unviable. Such price points play a significant role in allowing first time consumers to experience categories at an affordable price, and play a key role in serving the rural market.
- **Adverse food safety and hygiene issues** - As low price points disappear and costs increase, consumer dependence on unpackaged materials

Exhibit 2.1
Summary of Impact from Banning Plastic Packaging used in FMCG



Source: Industry Interviews, Strategy& Analysis

for essentials such as milk, edible oils and food will increase - and food safety and hygiene issues will come to the forefront.

2) Impact on economy and employment: The economic impact will be multi-dimensional as well:

- **Direct impact**: A ban on plastic packaging will directly impact:
  - ~₹53,000 cr.+ segment of the plastic packaging industry, growing at a CAGR of 20%
  - ~13 lakh personnel across ~10,000 firms engaged in plastic packaging for FMCG will need to find alternative employment.
  - ~₹90,000 cr. revenue of the food processing industry (>70% of the total industry size!) that is dependent on lower price point and price sensitive products. This industry shrinkage will also have additional employment impact
- **Indirect impact:** The multiplier effect of the ban across the economy is estimated to be ~2 to 2.5x the direct impact on turnover and ~ 3-5x on employment.
- **Imports and Investment Requirements**: Industries that supply alternative packaging materials in India do not have sufficient excess capacity to replace plastic packaging. Thus, imposing the ban will lead to a higher dependence on imports, at least till alternative capacity catches up. For domestic production to catch up, significant additional investment will need to be pumped in by the alternatives industries.
- **Impact beyond industry**: The impact of the ban will have a spillover effect on small retailers/ *kiraana* shop owners (those who sell a large proportion of low priced FMCG products), waste pickers (~30% of whose livelihood is estimated to depend on sales of PET) and the agricultural sector (as demand for farm produce falls in line with the shrinkage of the food processing industry).

3) Impact on environment: Over their lifecycle, alternatives are, in general, less environmentally friendly vis-a-vis plastic packaging.

Alternatives, in general, have lower product to package ratio, resulting in the use of higher quantities of raw materials. They also require higher energy and water during manufacturing. In general, use of alternative packaging materials results in a need for more truck trips for product distribution, leading to more use of fuel, and more emissions.

Way forward - More prudent actions need to be considered rather than an outright ban

The problem of plastic waste management needs to be tackled more holistically and should be centred on improving collection and re-use of plastic waste. Currently, re-use rates are ~70% for PET-plastic, and lower for non-PET plastic. This low rate of re-use is despite the existence of several technologies that can productively and economically use all plastic waste. Ultimately, the problem of plastic waste is driven by the lack of usability of the waste disposed, and can be traced to two root causes: a) All waste is collected in one, non-segregated stream and b) Segregation and reuse is largely dependent on economic value of the waste to the informal sector, which channelizes its

Exhibit 2.2

A four-pronged approach to enhance the usability and utility of plastic waste via collaboration between government and the industry is suggested

Recommended Four-Pronged Approach to tackle the Problem of Plastic Waste



In partnership with NGOs and industry associations

efforts on higher demand, heavier weight waste materials. A ban on specific types of non-PET packaging would still not address our plastic waste problem since all lighter weight plastic waste – irrespective of whether single layer or multi-layer – holds low value to the informal sector, and consequently has low rates of segregation and re-use.

Thus, any solutions for the plastic waste management problem need to fundamentally address the question of how to make the waste generated usable. The solutions should be an outcome of a consultative and participatory process partaken by the government and the industry. We suggest a four-pronged approach to enhance the usability and utility of plastic waste via collaboration between government, industry and other stakeholders (e.g., NGOs, communities) etc. (Refer Exhibit 2.2). Below are a few effective means that the government can adopt:

1) **Segregate waste at source - make waste usable:** Municipal governments must be encouraged to undertake necessary action to move waste collection from one unusable waste stream to multiple segregated and usable streams. The central government can specify actions required by state governments to enhance compliance of municipal governments with its directives.

2) **Enhance the economic value of plastic waste through regulation:** The informal sector's participation in collection, segregation and recycling of non-PET plastic waste will increase if the market demand, and consequently the market value for this waste increases. Central and state governments can play a role in encouraging re-use in different ways:

    a) **Mandate usage thresholds** in industries that can reuse the plastic waste, such as road construction (making Polymer Blended Bitumen Roads) and cement manufacturing (for co-processing in cement kilns).
    b) **Provide governmental incentives for use of plastic waste** by these industries. Any incentives provided can be recovered via producer levies.
    c) **Encourage education** of these industries on how they can use plastic waste, associated benefits and regulations, via industry associations

The government's efforts must be complemented by the industry, which is better equipped to be at the forefront on two areas:

3) **Educate the masses to segregate at source:** The industry – specifically industries that produce and/or use plastic – can be asked to lead campaigns to generate mass awareness to educate and encourage consumers and other stakeholders (e.g., waste pickers) to segregate at source. The government can specify industry participation levels and/or investment levels expected in mass awareness programs.

4) **Invest in and pilot re-use technologies:** Different industries can carry out tests for proof of concept, conduct pilot projects and invest in recycling plants to enhance use of plastic waste.

In addition to the four pronged approach specified above, the government can consult the industry to evaluate the best ways to **enhance producer responsibility via CSR initiatives** in post-consumer use stages (e.g., by working with NGOs to incentivize the informal sector to collect all types of plastic packaging). Germany has successfully implemented an industry-led solution for the management of plastic waste that can be studied further for applicable learnings on this front.

With respect to the health concerns raised, there is sufficient international literature that states that PET is a safe material for food packaging. Further study is recommended to evaluate the concerns raised in the Indian context before decisions are made to address this concern.

3. The Context

The National Green Tribunal (NGT) is considering imposing a ban to restrict the use of plastics for packaging of all non-essential items in FMCG sector. The ban is being considered as a response to address the following two concerns raised:

1) Environmental Concerns:

Plastics are non-biodegradable and unless collected and reused effectively, it leads to littering, dumping in landfills and damage to ecosystems (e.g., rivers, oceans). Municipal plastic waste management has been a challenge due to plastic disposal along with municipal solid waste – posing problems in collection, segregation, re-use and recycling.

In the order released on Mar 3, 2015, NGT had noted that "*It (plastic packaging) is in fact one of the largest sources of plastic municipal solid waste… Prima facie, we are of the view that there has to be restriction placed upon such packaging and generation of municipal plastic waste*".

2) Health Concerns:

Health concerns have been raised specific to use of PET bottles for packaging of food and food products. Concerns state that 'leaching' (penetration of chemicals from the packaging to the liquid/food product) of toxic chemicals used in the PET bottles occurs under varying storage temperatures, and also when the packaging becomes old. The arguments raised are:

- PET bottles are tested for permissible levels of harmful chemicals at storage temperatures of ~20^{o}C, leaching may increase at higher temperatures
- Consignments could be left stranded in sub-optimal storage conditions and temperatures since logistics is largely an unorganized sector in India

There are concerns that 'leaching' can lead to several diseases.

4. Plastic Packaging – the Smarter Choice

Plastics are a ubiquitous packaging material and are used across the globe. Predominantly 7 types of plastic – PET, HDPE, PVC, LDPE, PP, PS or other types - are used in packaging of FMCG products. A wide variety of products - from beauty and personal care products (e.g. shampoos, toothpastes, creams, deodorants) to packaged food and beverage products (e.g. soft drinks, juices, bottled water, cereals, confectionary) to home care products (e.g. laundry detergents, dishwashers, sanitizers) are packaged in these plastics.

The unique properties of plastic provides advantages vis-à-vis the alternative packaging materials like glass, metal, paper, etc. and have made it the **material of choice** for packaging FMCG products across categories **globally**. Exhibit 4.1 compares plastics in the packaging mix across select developed and developing countries. From hair care to food packaging, plastic packaging plays an instrumental role in delivering products of different kinds to the consumers. Of the total consumer packaged units sold globally in 2014[1], more than two-thirds of the units sold used some form of plastic packaging.

Similarly, in India, an overwhelming majority of the FMCG products that households consume are packaged in plastic – so much so that some categories are only packaged in plastic (refer Exhibit 4.2). In 2014, >97% of the total number of biscuits, dried processed food items and hair care products; and >90% of dairy products, laundry products and baked goods sold in India were packaged in plastic.

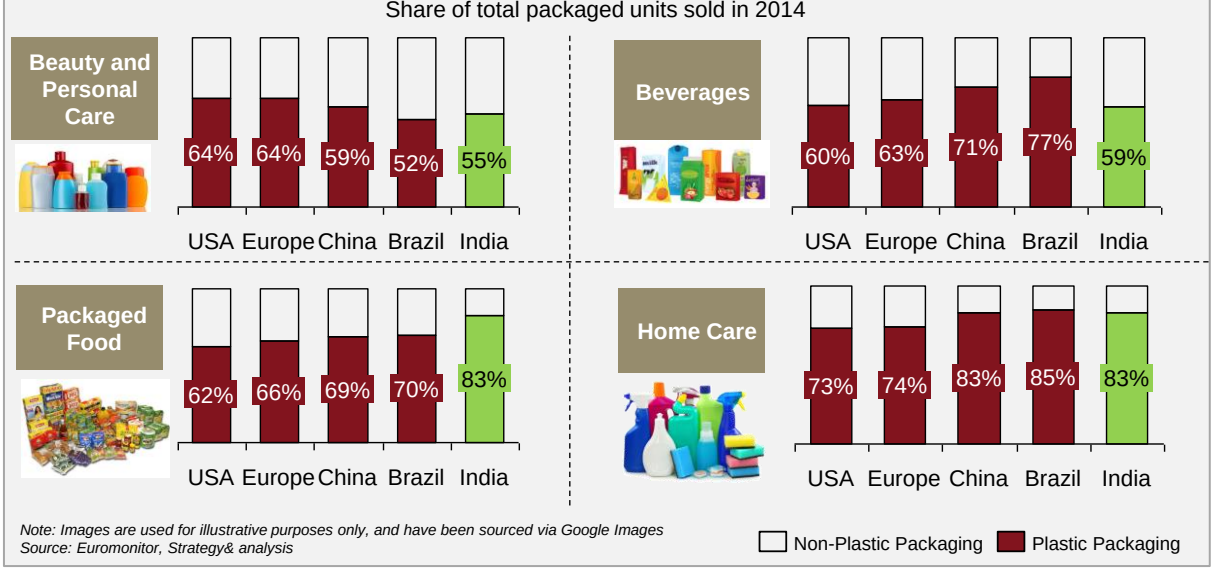
Plastic has been the preferred choice of packaging globally and in India due to three crucial benefits:

1) **Increased food safety, quality and shelf life:** Plastics are inert and create an inherent barrier against moisture and oxygen transmission; ensuring freshness and hygiene of the contents, and protecting the content for a longer time.

2) **Reduced environmental impact:** Plastics are light-weight. This allows plastics to have a high product to package ratio, resulting in a lighter weighed end product. For example, a plastic flexible stand up pouch has a product to package ratio that is 35 times that of glass bottles. The impact and scratch resistance of plastics results in lower breakage levels. This leads to less wastage. Plastics are also recyclable and have lower energy requirements for production. For instance, plastics use ~25% less energy in production with respect to other alternatives.
Environmental friendliness of plastics vis-à-vis alternatives is elaborated in

Exhibit 4.1

Plastic is THE material of choice in packaging FMCG products globally

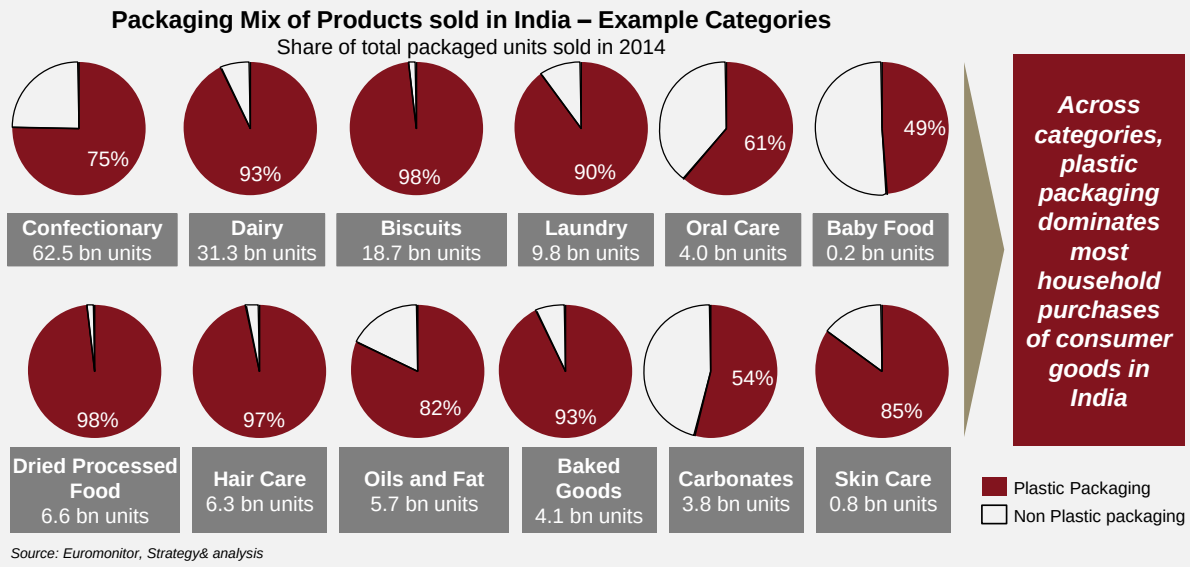


Note: Images are used for illustrative purposes only, and have been sourced via Google Images
Source: Euromonitor, Strategy& analysis

[1] Excludes tobacco, alcohol, hot drinks and pet food

Exhibit 4.2

An overwhelming majority of the products that Indian households buy are packaged in plastic



Source: Euromonitor, Strategy& analysis

further detail in Section 5.3 (Impact on Environment).

3) **Innovative packaging options for consumer convenience:** Plastics are highly versatile – they can be flexible or rigid, and can be molded into desirable shapes. Their use has resulted in packaging innovation and creation of consumer friendly packaging and cap designs. They can be made re-sealable and reusable, and are easy to carry, store and clean.

5. Banning Plastic Packaging – Impact on Consumers, Economy, and Environment

An outright ban on plastic packaging will have a significant impact on three keys areas as discussed below:

1) Impact on consumers
2) Impact on economy and employment, and
3) Impact on the environment

5.1. Impact on Consumers

As discussed earlier (Refer: Section 4, Exhibit 4.2), a large fraction of FMCG products consumed by Indian households is packaged in plastic. A ban on this packaging will necessitate manufacturers to move towards alternative materials such as glass, metals, bio-degradable materials (e.g., jute, bamboo), paper or bio-plastics to package their products.

If FMCG companies were to start using one of these alternative materials in packaging their products, consumers will see three major impacts:

1) **Increase in the price** of most FMCG products as manufacturers shift packaging to alternatives.
2) **'Wipe-out' of various low price point products** (e.g., those that cost less than ₹5 – such as shampoo sachets, detergent pouches, biscuit packets, etc.) as production at these price points becomes unviable.
3) **Adverse food safety and hygiene issues:** As low price points disappear and costs increase, consumer dependence on unpackaged materials for essentials such as milk, edible oils and food will increase - and food safety and hygiene issues will come to the forefront.

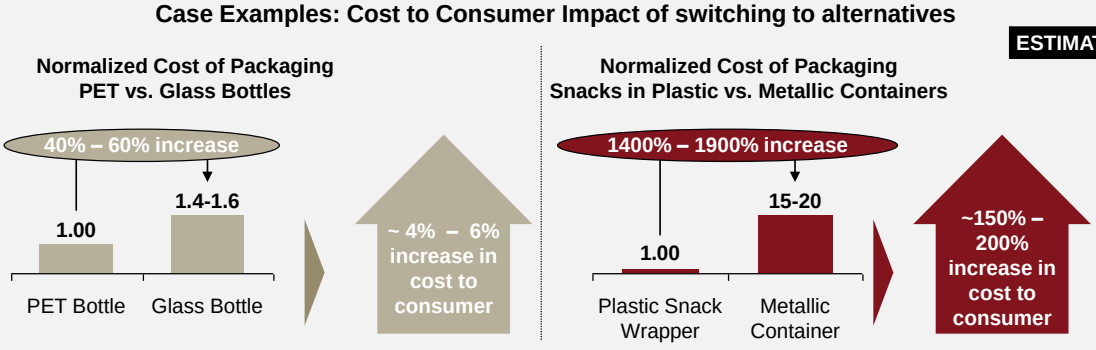
Exhibit 5.1 illustrates a case example for the cost increase that consumers are likely to face from a switch to alternative packaging. Innovations in plastic packaging over the years have been able to reduce packaging weights for products, allowing introduction of lower cost products as well as efficient logistics and distribution. Switching to alternatives will increase costs of the packaging material used due to higher costs associated with lower product to package ratio, higher costs of manufacturing and distribution.

For example, each unit of PET will need to be replaced with 8-10 units of glass in weight. Higher energy consumption cost is required in manufacturing of glass vs. PET. Distribution costs to stockists and retailers will also be higher because of lower packing density and higher breakage rates (fewer bottles per truck and more trips). Industry interviews indicated that these factors would result in an average of 40-50% higher cost per bottle of glass vs. PET. The packaging cost can increase to as high as 20 times the current cost, depending on the type of plastic packaging currently used and alternatives usable for that product category. Typically, packaging costs constitute ~3-11% of the total costs, resulting in a cost increase for the consumer by as much as 200%.

Low price point products – specifically in categories such as biscuits, snacks, spices, chocolates and confectionaries, salt, juices and fruit drinks, noodles, hair care, detergents, etc. - are critical in Indian FMCG (refer Exhibit 5.2), and have been innovatively used by Indian FMCG companies to allow first time consumers to experience the category at an affordable price, serve the rural market and to allow

Exhibit 5.1

Cost to consumer could increase by up to 3x depending on category



Source: (1) Sustainability Outlook Report on Indian FMCG Market; Centre for Development ACP-EU, Industry Interviews, Secondary Research, Strategy& Analysis

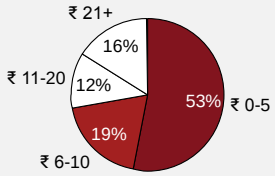
Exhibit 5.2

Low price points are likely to disappear

Low price points are critical in Indian FMCG



Example: Snacking Sales in India by price point



Note: Images are used for illustrative purposes only, and have been sourced via Google Images
Source: Nielsen, Secondary Research, Industry interviews, Strategy& analysis

consumers to control portion sizes. Low price points are made possible in part through the use of low cost, light weight packaging materials. It is estimated that FMCG companies currently take a hit on margins at very low price points (e.g., ₹5 and lower), and have little flexibility to pass on the raw material hikes due to massive volume declines even with small changes in price. A ban on plastic packaging would make these price points unviable resulting in withdrawal of low price point products from the market. Depending on the category, entire product categories might disappear from the market. The economic impact on the food processing industry is further discussed under section 5.2.1.

As low price point products disappear from the market and costs to consumer increase, consumer dependence on unpackaged foods will increase. For instance, increased quantities of essentials like edible oils, biscuits and other snacks will be transported in bulk to outlets, and would need to be sold unpackaged/ loose over the counter. Use of unpackaged food increases the chances of product contamination and compromises food safety due to exposure to the environment and/or to non-conducive conditions and pollutants– such as moisture pick-up (or loss), heat and light exposure, permeation of gases, and exposure to insects, dust, etc. This can lead to changes in flavors, cause rancidity and/or development of strong odors. Unpackaged food also has higher likelihood of human touch/ handling during transportation and sale. Consequently, food safety and hygiene concerns are likely to increase.

In summary, a ban on plastic packaging will adversely impact consumers resulting in:

- Access to fewer categories, especially for price sensitive and rural consumers
- Higher prices of most FMCG items
- Adverse food safety and lower access to hygienic eating options
- Fewer choices in terms of product variety

5.2. *Impact on Economy and Employment*

The impact of the ban as a whole will be a manifestation of the impact on the following four facets of the economy:

1) **Direct impact** – i.e., scale of plastic packaging industry turnover and number of jobs that are directly dependent on FMCG sector
2) **Indirect impact** – i.e., scale of industry turnover and number of jobs that will be affected in the 'backward linked' industries
3) **Imports and Investment Requirements** – i.e., any imports, and investment requirements to scale up production of alternative forms of packaging
4) **Impact beyond industry** – i.e., additional stakeholders whose livelihood may be affected indirectly

5.2.1. Direct Impact

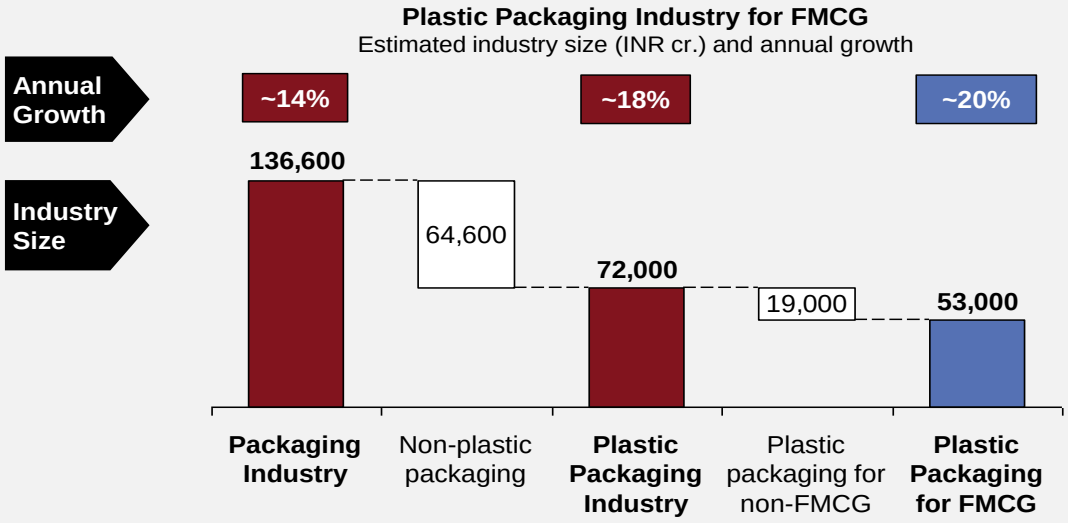
The Indian packaging industry is one of the fastest growing industries in the country. Its market size is estimated to be about ₹ 136,600 crores, growing at a CAGR of 14%. Plastic packaging comprises ~53% of Indian packaging industry, and the FMCG sector contributes ~70-75% of total plastic packaging industry's revenue. Thus, the 'addressable market' of FMCG plastic packaging is ~ **₹53,000 crores**, **growing at a CAGR ~20%** (Refer Exhibit 5.3a). In other words, the proposed ban would result in a loss of revenues of ~ ₹53,000 crores.

As a result, ~ **13 lakh people** directly involved in plastic packaging and processing for FMCG will need to seek alternative employment opportunities. This impacts **~10,000 companies**, a majority (~80-85%) of which is small and medium scale enterprises (SMEs).

Additionally, the ban on plastic packaging will also significantly impact the turnover of the processed food industry in India. The industry estimates that this ban would cripple turnover of over ₹90,000 crores per annum across multiple categories. This amounts to about 72%

Exhibit 5.3a

A ban will directly eliminate a ~ ₹53,000 cr. segment of the packaging industry growing at ~20%



Source: FICCI – A report on Plastic Industry, IBEF, Indian Institute of Packaging, Secondary Research, Industry Interviews, Strategy& analysis

of the total processed food industry in India today – effectively shrinking the industry to a quarter of its size today! (Refer Exhibit 5.3b).

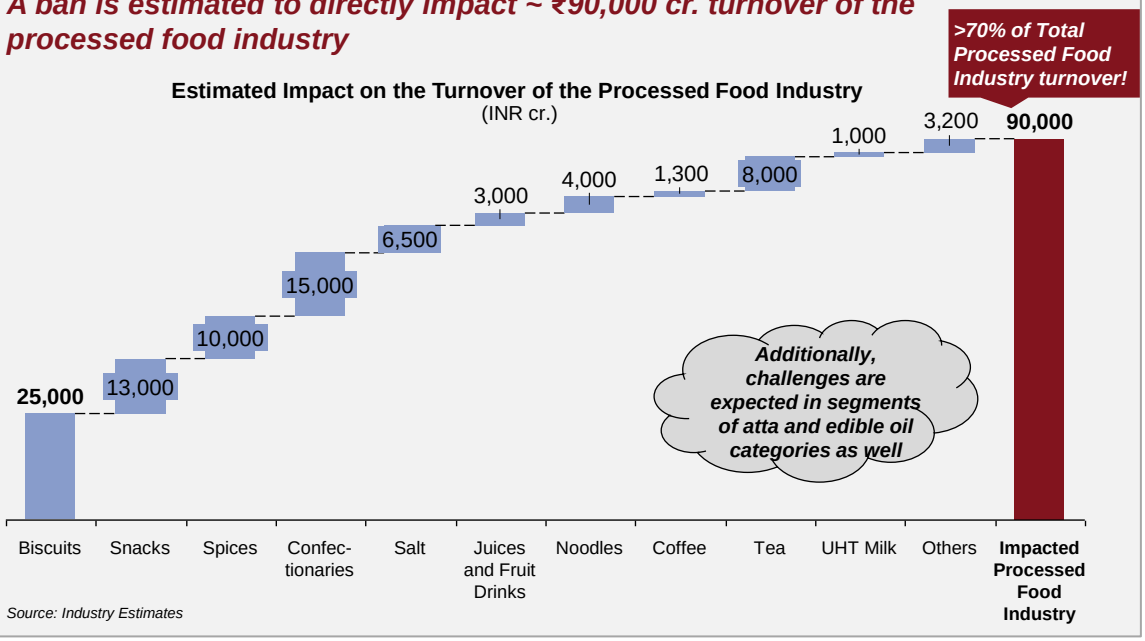
5.2.2. Indirect Impact

Manufacturing industries are inherently interlinked. A decline in the demand for plastic packaging will lead to a decline in the requirement for its inputs as well. The entire 'backward linked' value chain (tier-2 suppliers and beyond) will get affected by this reduction in demand. The backward linkage here includes (but is not limited to) petroleum intermediate producers, resin producers (raw material to plastic polymer), naphtha producers (raw material to plastic polymer), pre-packaging manufacturers, plant & machinery producers, mould producers, additive producers among many more. For simplicity, the indirect impact of the changes anticipated in the processed food industry is not considered here. (Refer Exhibit 5.4a)

These industries that are linked with the plastic packaging industry will be indirectly impacted by the ban. Thus, the total impact inclusive of

Exhibit 5.3b

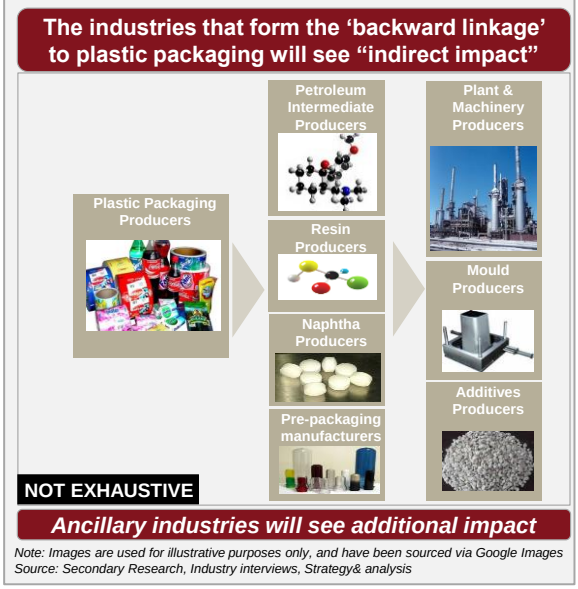
A ban is estimated to directly impact ~ ₹90,000 cr. turnover of the processed food industry



Source: Industry Estimates

Exhibit 5.4a

The ban will have indirect impact



Note: Images are used for illustrative purposes only, and have been sourced via Google Images
Source: Secondary Research, Industry interviews, Strategy& analysis

the indirect impact will have a multiplier effect of **~2-2.5x on revenue** and **~ 3-5x on employment.** These multipliers have been estimated based on comparisons with international plastic industry and other Indian manufacturing industries.

Therefore, a total of **₹~106,000-132,000 crores** worth of revenues and **~40-65 lakh jobs** in the industry run the risk of being gravely impacted by the ban. (Refer Exhibit 5.4b)

5.2.3. Imports and Investment Requirements

Alternatives industries in India do not have sufficient excess capacity to replace plastic packaging. Thus, imposing the ban will lead to higher dependence on imports, at least till alternative capacity catches up.

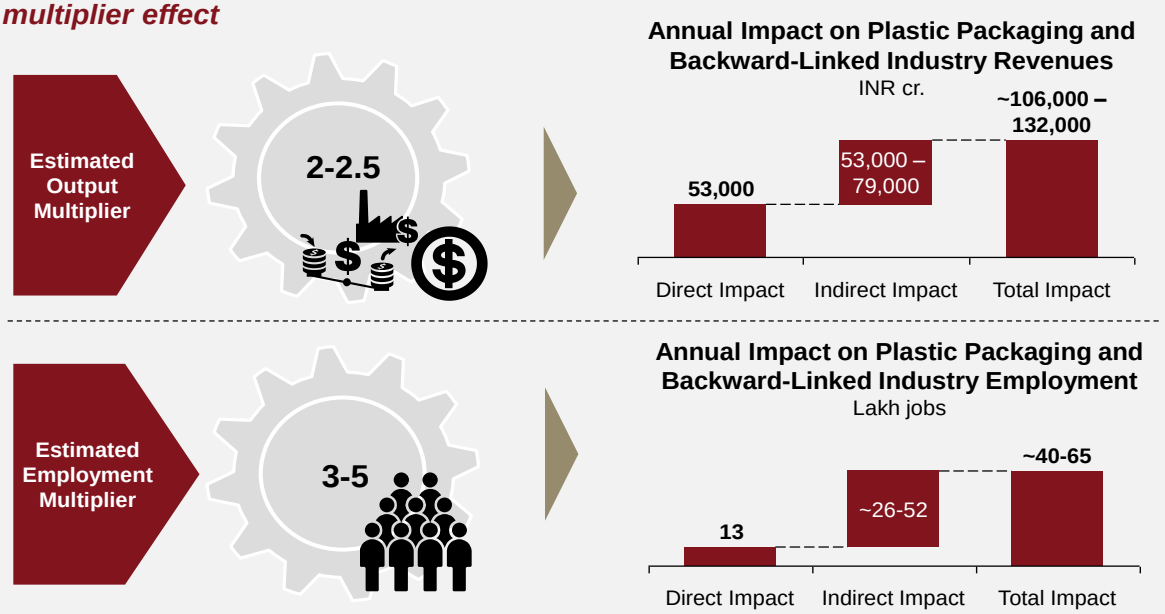
This is illustrated in Exhibit 5.5 using a case scenario of replacing the existing PET packaging in India with the glass packaging. The current usage of PET by the FMCG industry is estimated to be~4.2 lakh tons per annum. To carry the same quantity of beverage, the industry estimates that ~8-10 times the weight of PET is needed if glass packaging is used. Thus, to fully replace the current PET demand in FMCG, glass container capacity of ~34-42 lakh tons of would be required. This is higher than the current total container glass production in India! The current container glass production in India is ~27 lakh tons per annum and the industry is estimated to be at ~70-75% capacity. This capacity would have to more than double just to replace PET – one of the many types of plastic packaging that would need to be replaced with alternatives.

Consequently, import dependence of the country will necessarily need to increase till the domestic production catches up with the demand of the industry.

For domestic production to catch up, large amounts of additional investment will need to be pumped in by the alternatives industries.

Exhibit 5.4b

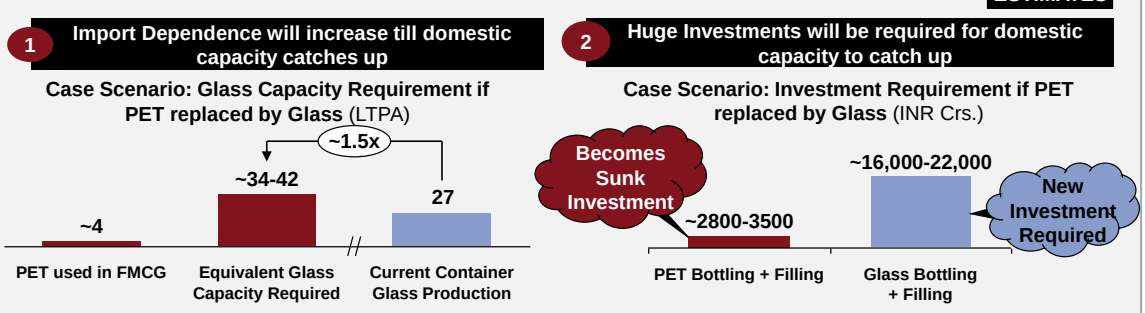
The revenue and employment losses due to the indirect impact will lead to a multiplier effect



Note:1) Output multiplier has been estimated based on comparables in international plastics industry as well as Indian manufacturing industries
2) Employment multiplier has been estimated based on comparables in international plastics industry as well as multiple Indian industries
Source: Secondary Research, NCAER computation, PlasticsEurope, Govt. of SA reports, IBEF, Indian Ministry of Mines reports, Strategy& analysis

Exhibit 5.5

Indian industry is not geared to replace plastic packaging, attempting to do so would require huge imports and investments



Sources: AIGMF Reports, Secondary Research, Industry Interviews, Strategy & Analysis

The plastic packaging industry on the other hand will be faced with humungous sunk investments as the production facilities shut down/ fall into disuse.

This is illustrated in Exhibit 5.5, which also shows a case scenario on the investment front. Our interviews with plastic packaging manufacturers indicated that the investment requirement for 1 manufacturing line for PET bottling is to the tune of ~₹ 40-50 cr. Based on the production rates and the current demand for PET from the FMCG industry, we estimate that the PET bottling industry has a total investment of ~₹2800-3500 cr., to serve the FMCG sector. To invest in ~34-42 lakh tons of capacity to replace PET bottling in FMCG, the glass bottling industry is estimated to need ~₹16,000-22,000 cr. of additional investment[2].

5.2.4. Impact beyond industry

There are many other sectors which are dependent on the FMCG industry for their livelihood either as a supplier or as a distributor of the products produced by the industry. Some of the other sectors which are dependent on FMCG products are:

Roadside Vendors/ *kirana* shops:

There are approximately 4.3 million workers engaged in retail trade on streets in urban and rural areas, and more broadly, ~8 million retail establishments in India overall. As discussed earlier (In Section 5.1 on Impact on Consumers), ban on plastic packaging is likely to eliminate lower price point categories, and lead to a general price rise – this will possibly impact the sales and livelihood of several lakh small vendors, many of whom sell large



Note: Images are used for illustrative purposes only, and have been sourced via Google Images

proportion of small ticket plastic packaged FMCG products.

Farmers – Agricultural Sector:



Note: Images are used for illustrative purposes only, and have been sourced via Google Images

Consumption in India is increasingly moving towards packaged and ready-to-eat foods. Farmers provide raw materials to the FMCG sector - processed food industry amounts to ₹125,000 crores growing at a CAGR of 8.4%. Agriculture sector will see impact as the processed food industry shrinks (as discussed in Section 5.2.1 – Direct Impact). For example, institutional buy contributes more than 25% of the open market sale of wheat and sugar.

[2] This requirement has been estimated based on balance sheet analyses of major glass manufacturing players and analyses of glass industry investment/ capacity announcements, and assuming similar asset to investments ratios for the industry.

Waste Collectors:



Note: Images are used for illustrative purposes only, and have been sourced via Google Images

Based on the estimates by All India Plastic Manufacturers' Association, more than 1.6 million waste collectors depend directly on plastic (primarily PET) waste, which constitutes 30% of their income. Our industry interviews with PET recyclers indicate that PET is the second most valuable waste material for collectors, fetching ~₹ 30-45/kg after metals that are valued at ~₹ 80/kg.

5.3. Impact on Environment

The use of plastic packaging does raise some environmental concerns – especially with respect to post-consumer management and use. However, a ban on its use will not be without its own share of adverse environmental impacts driven largely by issues associated with the use of alternatives. Thus, environmental impact of the ban needs to be considered in the light of the relative impact of plastic vs. alternatives.

Over their lifecycle, alternatives are, in general, less environmentally friendly vis-a-vis plastic packaging. This is driven by multiple aspects across the various lifecycle stages:

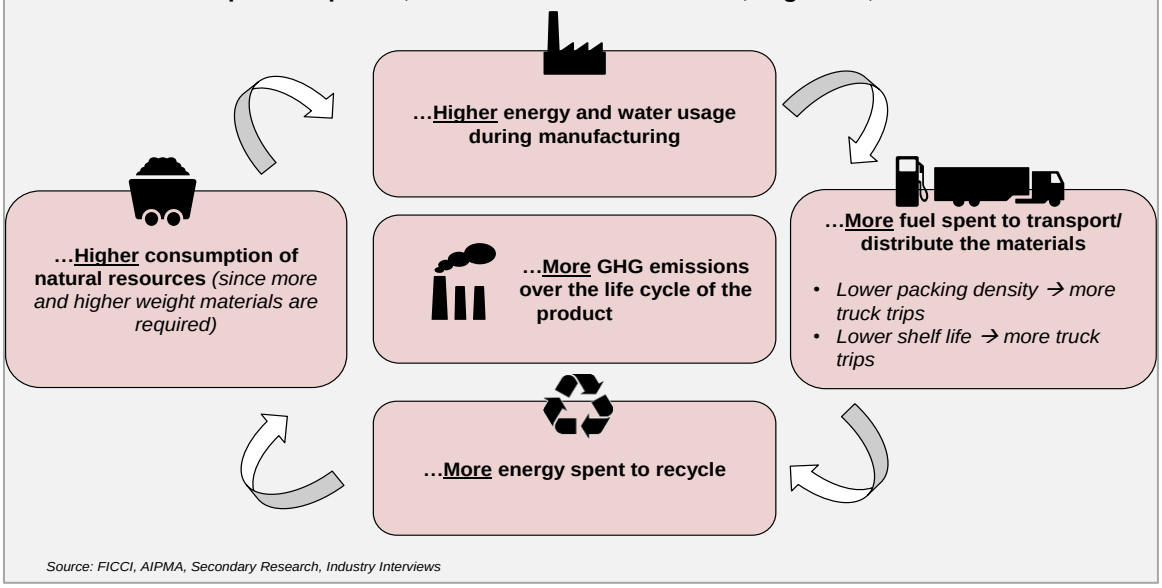
- In the **manufacturing** stage: Alternatives, in general, have lower product to package ratio, meaning higher quantities of raw material will be required to carry the same quantity. Alternatives also require higher energy and water during manufacturing. In aggregate, this leads to higher consumption of natural resources in the manufacturing stage. For instance, to carry the same quantity of beverage, ~8-10 times the weight of PET is needed if glass packaging is used.
- In the **distribution** stage: In general, use of alternative packaging materials results in a requirement for more truck trips to transport the same quantity of materials. This is driven by higher weight of materials, lower packaging density, and higher breakage rates. For instance, use of glass packaging leads to ~60-70% more trips to transport the same quantity vs. use of PET packaging. More truck trips also mean more use of fuel, and more emissions.
- In the **post-consumer use** stage: Based on industry estimates, more energy is used to recycle alternatives vs. plastic packaging.

Overall, the use of alternatives results in more greenhouse gas emissions vs. plastic packaging over the product life cycle. This relative impact is summarized in Exhibit 5.6. Some case examples of this were collated by FICCI in an industry representation (Refer Exhibit 5.7).

Exhibit 5.6

Alternatives are, in general, less environmentally friendly vs. plastic packaging

Compared to plastic, the use of alternatives would, in general, result in…



Source: FICCI, AIPMA, Secondary Research, Industry Interviews

Exhibit 5.7 EXAMPLES

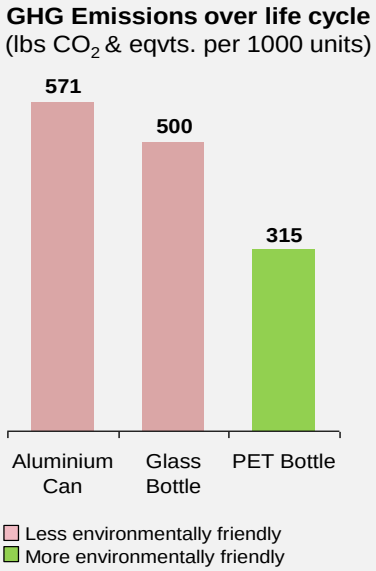
Alternatives are, in general, less environmentally friendly vs. plastic packaging

Examples of Environmental Impact of Plastic vs. Alternative Forms of Packaging

For carrying 1 lakh liters of milk		Plastic Pouch	Glass bottle
Material Required (Mt)		0.4	45.4
Energy Required	In Production of raw material	32.22	671.92
	In Production of bottles/ pouches	4.56	530.27
	In Recycling *(assumed 50% recycling)*	2.28	250.83
Water Required in Manufacturing		25.6	1608
Fuel Required in Filling and Distribution		1120	2049

For packaging 1 lakh tons of 'atta'		Plastic Film Bag	Jute Bag
Material Required (Mt)		680	1960
Energy Required ('000 GJ)	In Production of raw material	38.36	21.5
	In Production of bags/ liners	24.22	47.19
	In Recycling *(assumed 80% recycling)*	13.76	n/a
Water Required in Manufacturing		264	1677
Fuel Required in Distribution (GJ)		Taken as basis	4663

Note: Jute has no barrier properties (i.e. cannot effectively guard food against oxygen and moisture) and thus cannot ensure food safety



Note: Images are used for illustrative purposes only, and have been sourced via Google Images
Source: FICCI, AIPMA

Additionally, higher breakage rates lead to higher wastage of products as well.

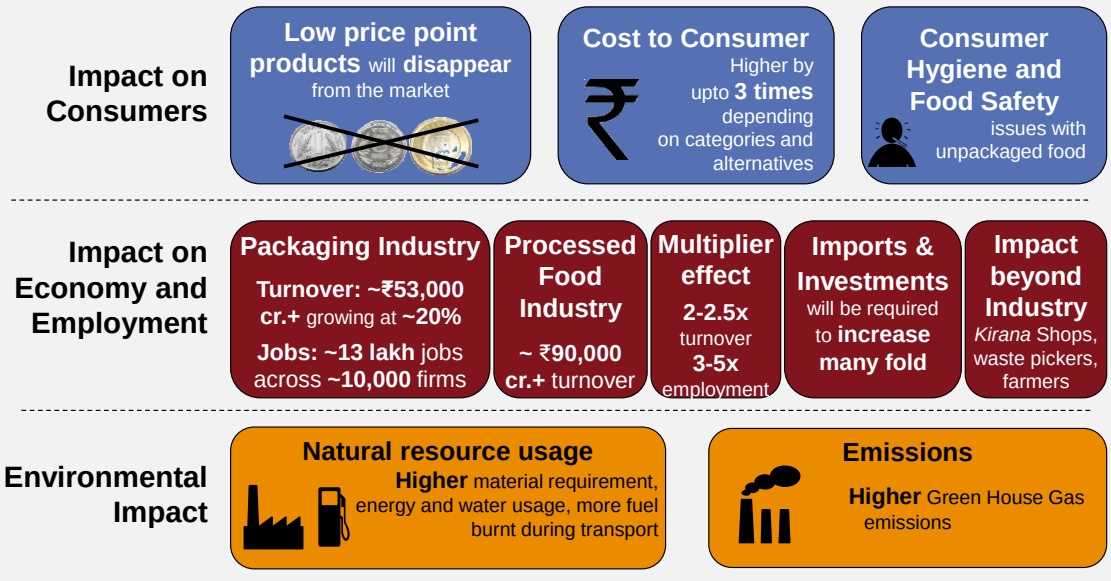
Alternatives are not without their own share of additional environmental issues either. For instance, an exponential increase in the use of glass will bring with it the issue of increased sand mining from river beds. Increase in use of paper will mean more use of timber and associated deforestation challenges. Given the fact that no packaging material is without environmental challenges, a ban will not be the right solution to address the environmental concerns associated with the use of plastic packaging.

5.4. *Impact Summary*

In conclusion, the impact of an outright ban on plastic packaging will be multi-fold and far-fetched (refer Exhibit 5.8), and consequently unviable. More prudent actions vs. an outright ban need to be considered to address the concerns raised with respect to the use of plastic packaging.

Exhibit 5.8

Summary of Impact from Banning Plastic Packaging used in FMCG



Source: Industry Interviews, Strategy& Analysis

6. Suggested Way Forward

As discussed earlier, an outright ban on plastic packaging is not a viable option. In this section, we explore some of the other approaches to address the concerns raised with respect to use of plastic packaging. Since there are two types of issues involved – environmental concerns and health concerns (Refer Section 3.1 – Our Understanding of the Situation), our recommendations are also classified as such.

6.1. Addressing the environmental concerns with plastic packaging

This section starts with looking into the current situation of plastic waste in India, and the underlying issues associated with plastic waste management. We subsequently look at some of the steps that the government as well as the industry can undertake to tackle the plastic waste management conundrum.

6.1.1. Plastic waste – the facts

'Municipal Solid Waste' (abbreviated as MSW) consists of solid waste generated by households, commercial establishments, industries and institutions. MSW is divided into 'Wet Waste' – typically the organic waste generated from food establishments and households, and 'Dry Waste' – which includes wood, metal, glass, paper, plastic and sand/debris. Wet waste is largely 'Compostables', and dry waste can be broadly classified into 'Recyclables' and 'Inerts'. Dry waste consists of 'Plastic' and 'Non-plastic' waste.

Total waste generated in India typically has a different composition vs. MSW due to removal by various agencies such as rag pickers and crap material vendors, who segregate and collect waste at various sources such as door steps, from *ghantagadi* and municipal containers prior to formal collection by municipal workers. Exhibit 6.1 shows the composition of solid waste generated in India.

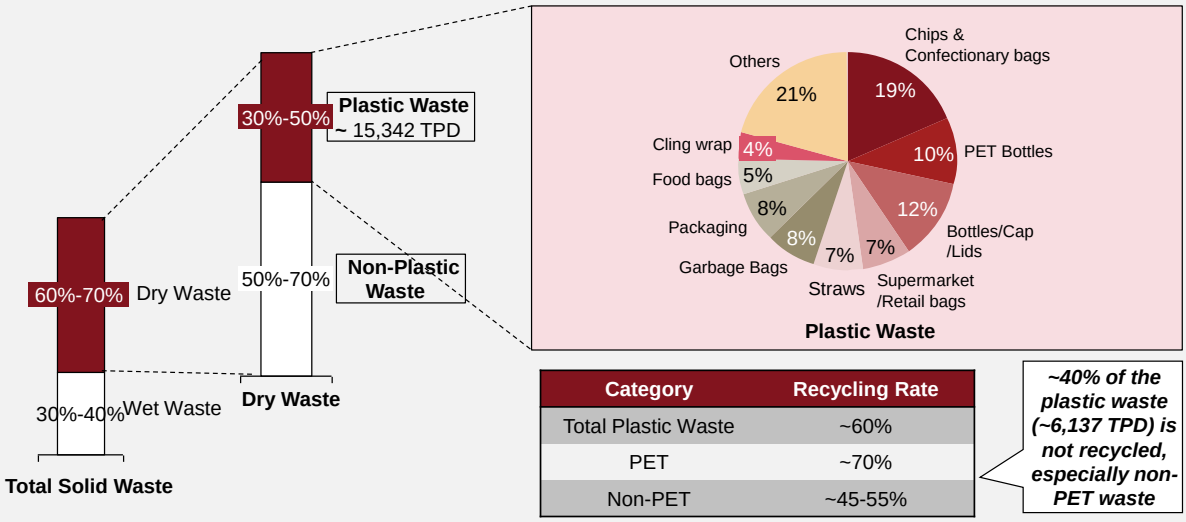
Of the total dry waste, ~30-50% is estimated to be plastic waste. This constitutes ~20-35% of the total waste generated in India. The estimates have a large variation due to waste collection and segregation by the informal sector of waste collectors that usually occurs before the formal waste collection is done by the municipal workers. According to the Central Pollution Control Board (CPCB), about 15,300 tons of plastic waste is generated daily in India. A 2012 study published in the International Journal of Environmental Sciences pegged chips and confectionary bags (~19% of plastic waste) as the single largest constituent of plastic waste, followed by bottle caps and lids, and PET bottles.

India has been quite effective in the reuse of PET plastic waste, and has one of the highest PET collection and recycling rates in the world.

Exhibit 6.1

India generates ~15,300 tons of plastic waste everyday – ~70% of PET waste is recycled vs. only ~50% of non-PET plastic

Estimated Composition of Solid waste generated in India by Weight



Category	Recycling Rate
Total Plastic Waste	~60%
PET	~70%
Non-PET	~45-55%

~40% of the plastic waste (~6,137 TPD) is not recycled, especially non-PET waste

Note: Recyclables separated before formal waste collection has been included in the estimates of generated waste based on data reported in Pune, more accurate national estimates of this may change the composition numbers
Source: Secondary Research, CPCB,reports, Industry interviews, International Science Congress Association, ISSUU

It is estimated that ~70% of the PET waste is recycled in India. The recycling of non-PET plastics is still a concern and is slowly picking up pace in the country. On an average ~6,137 tons per day (~40% of the total plastic waste) is not reused in the country which generally contains non-PET plastic waste.

6.1.2. How plastic waste can be re-used

The low rate of reuse for plastic waste is despite the existence of some conventional as well as new technologies for plastic waste management that have been developed and tested in several parts of the country.

Recycling is a well-known conventional technology for re-use of plastic waste. Recycling typically requires the plastic material to be segregated into its "pure" form (i.e. not mixed with other types of plastic) and cleaned. Indian industry is already investing in recycling - the value chain for PET recycling already exists in the country, with a total recycling capacity of 590 KTPA. Recycled plastic can be used for a variety of applications (see graphic sourced from industry presentations).



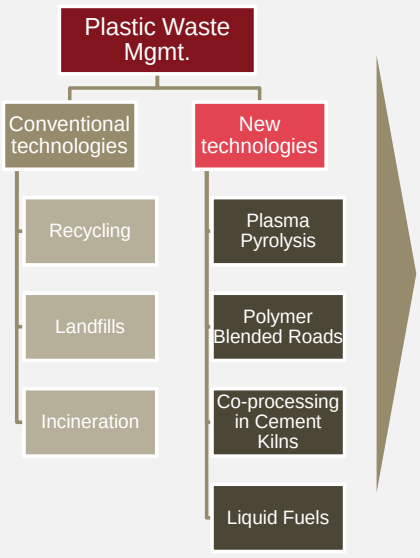
Exhibit 6.2 provides the details on some of the new technologies developed for re-use of plastic waste, and their current status in the country. A couple of these new technologies have the potential to fully solve our plastic waste problems - since they can use plastic waste together (vs. segregated into their pure form, as required for recycling) - and deserve further mention.

- **Polymer Blending in Bitumen Roads**: The process of laying roads using waste plastics has been designed and implemented successfully in various parts of India. Polymer Blended Bitumen Roads have been observed to deliver superior performance compared to bitumen roads – a CPCB study showed that such roads see no pothole formation, and have reduced bitumen bleeding in summers. Such roads have comparable costs vs. bitumen roads, and CPCB reported that they have "no observable demerit either in this process or in the road characteristics. For the last several years various roads that have been laid using waste plastics are functioning well."
- **Co-processing in cement kilns**: Similarly, plastic waste can be used as an alternative fuel in cement kilns - this

Exhibit 6.2

New technologies have been tested for reuse of plastic waste – availability of usable waste is the primary barrier

Plastic Waste Management Technologies in India



Technology	What it does	Status in India
Plasma Pyrolysis	• Intense heat generation to dispose of all types of plastic waste in a safe and reliable manner	• Tests are being conducted by CPCB • Energy recovery being tested to make it economically viable(1)
Polymer Blended Bitumen Roads	• Plastic wastes mixed with granite to improve the life and strength of roads • Lower pothole formation, reduced bitumen bleeding in summers	• Testing Phase - technology already used for road construction in Pune, Bangalore, Madurai • Costs comparable to regular roads (2% more expensive)(3)
Co-processing in Cement Kilns	• High calorific value of plastic wastes can replace fossil fuels in cement kilns • At 10% replacement rate, 170 cement Kilns could dispose of the entire plastic waste generated in India(2)	• Trials conducted by ACC Kymore Works ('08) and Ultratech Cements ('12) • Hampered by availability of usable waste, cumbersome approval processes from statutory bodies
Liquid Fuels	• Plastic waste heated at higher temperatures in absence of oxygen using a catalyst converts it into liquid RDF (Refuse-derived fuel)	• Materials and technology have been tested • Availability of usable waste is the major issue

Source: (1),(2) CPCB reports (3) Journal of Chemical & Pharma Sciences; CII Waste Exchange – List of trials for Co-Processing, Secondary Research, Strategy& Analysis

has already been tested at various places in India. According to a list of co-processing cement kilns published by CII, Kymore Works in MP, Ultratech Cement Ltd in Rajasthan and Lafarge India Pvt Ltd in Uttar Pradesh have tested plastic waste for co-processing with coal between 2008 and 2013. Based on a report by CPCB in 2010, India has a potential to utilize the entire plastic waste generated for co-processing! At a 10% replacement rate, 170 cement kilns in India could dispose of the entire plastic waste generated in the country today with an additional benefit of reduction in the use of fossil fuel - coal. The process is being hampered by lack of availability of usable waste and the cumbersome approval processes from statutory bodies.

- **Converting to Liquid Fuels**: Similarly, the technology for converting plastic waste to liquid RDF (Refuse-Derived Fuel) exists. Plastic waste is heated in the absence of oxygen in a specially designed reactor. The process works only on plastic waste – so the availability of usable waste for the technology still remains the major concern.

6.1.3. So, why is re-use low?

It can be seen that while viable technologies exist, a couple of factors have hampered their wider adoption - with availability of usable waste being the major barrier. It can be concluded that the problems associated with plastic waste management in India stem from two root causes:

1) **All waste is collected in one, non-segregated stream**

All municipal solid waste (MSW), irrespective of its type (compostables/ recyclables/ inerts) is collected in one stream. Mixed solid waste minimizes reusability of components of the waste – e.g., in Delhi, of the 11,500 TPD of MSW generated, ~50% is compostable; but only 825 tonnes or ~7% is actually composted.

Unusable waste typically ends up in landfills, despite several objections relating to the harmful effects and long-term threats to soil and ground water. A Ministry of Finance Position Paper on Solid Waste Management had estimated that waste generated by 2021 would need a 590 sq. km. land fill – the area of Hyderabad; and by 2047, 1400 sq. km. would be needed – the combined area of Hyderabad, Mumbai and Chennai.

2) **Segregation and reuse is largely dependent on economic value to the informal sector**

Waste segregation and collection in India is almost entirely undertaken by the informal sector – comprising waste pickers, waste buyers (‘*Kabariwala’s*), waste dealers and recycling units. Generally, recyclables are collected in one of the two ways: i) paper, glass and metal are collected before they enter the MSW stream by ‘*Kabariwala*’s, ii) plastics are collected by waste-pickers from litter on streets or from landfills.

Dependence on informal sector for segregation of waste means that only those types of wastes are segregated out that hold some economic value to the informal sector. Hence, the sector’s collection efforts focus materials that have a high demand and are heavier in weight – i.e. PET (that has a market value of ~₹ 35-40/ kg), leaving single layer, lighter weight plastics and multi-layer plastics back in MSW heaps.

A ban on specific types of non-PET packaging would still not address our plastic waste problem since all lighter weight plastic waste – irrespective of whether single layer or multi-layer – holds low value to the informal sector, and consequently has low rates of segregation and re-use. Thus, any solutions for the plastic waste management problem need to fundamentally address the question of how to make the waste generated usable.

6.1.4. Plastic waste - The way ahead

The problem of plastic waste management needs to be tackled more holistically. The solution should be an outcome of a consultative and participatory process partaken by the government and the industry. The two key stakeholders will have to make joint efforts as well as individual efforts to drive tangible results.

A four-pronged approach to enhance the usability and utility of plastic waste via collaboration between government and the industry is suggested (refer Exhibit 6.3).

Below are a few effective means that the government can adopt:

Exhibit 6.3

A four-pronged approach to enhance the usability and utility of plastic waste via collaboration between government and the industry is suggested

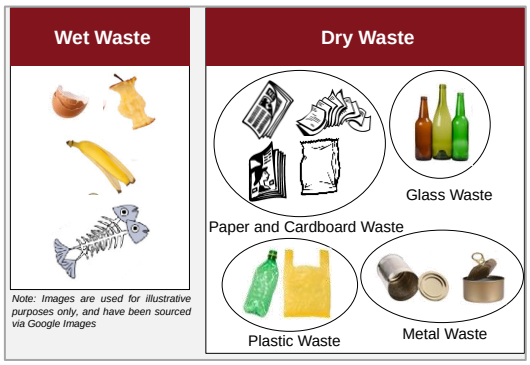
Recommended Four-Pronged Approach to tackle the Problem of Plastic Waste



In partnership with NGOs and industry associations

1) Segregate waste at source - make waste usable

'Waste segregation at source' refers to dividing waste into wet and dry waste at the point of origin and then transferring the segregated waste to recycling/reuse sites or landfills. Segregation at source is successfully practiced in developed economies to separate and manage municipal solid waste. Increasingly, developing countries are segregating waste at source as well - there have been successful cases of source separation on a city scale in Asian cities such as in *Markina City* in Philippines and in *Phitsanulok City* in Thailand. Segregation at sources is illustrated below:



Although Municipal Solid Wastes (Management and Handling) Rules, 2000 had directed municipalities in India to segregate at source; a 2008 study in a sample of municipalities had found that segregation was taking place only in 10% of the sampled municipalities. Only 12% of the municipalities had conducted awareness programs to even educate its citizens on segregation of waste.

Municipal governments must be encouraged to undertake necessary action to move waste collection from one unusable waste stream to multiple segregated and usable streams. The central government in its part can specify actions required by state governments, to enhance compliance of municipal governments. For instance, state governments can be encouraged to mandate segregation at source by municipalities, and authorize action against commercial establishments/ wards/ housing societies etc. for non-compliance.

Regulation must be accompanied by effective citizen education. This can be undertaken in partnership with the industry and NGOs (see recommendations around "Educate the masses" for further details).

2) Enhance the economic value of plastic waste through regulation

The informal sector's participation in collection, segregation and recycling of non-PET plastic will increase if the market demand, and consequently the market value for these plastics increases. Central and state governments can play a role in encouraging re-use, and consequently enhancing the demand for non-PET plastic waste in different ways:

a) **Mandate usage thresholds** in industries that can reuse the plastic waste. As discussed in Section 6.1.1., plastic waste can be used in industries such as road construction and cement manufacturing. If usage thresholds are mandated – for instance, a certain percentage of road kms constructed can be mandated to be polymer blended while awarding tenders for road construction – it will enhance the market demand for plastic waste.

b) **Provide governmental incentives for use of plastic waste** – In the absence of clear incentives, the industry

may not be encouraged to make the switch from 'business as usual' to usage of plastic waste in road construction, cement kilns etc. The government can consider providing incentives such as tax breaks, equipment subsidies, etc. to encourage this switch. Any investment by the government on this can be recovered via plastic producer levies, as done in parts of developed countries.

c) **Encourage education** of these industries on how they can use plastic waste, the associated benefits and regulations, via industry associations.

Creation of demand pockets and the resulting enhanced economic value of waste will encourage the informal sector to channel collection efforts on non-PET plastic as well, and will increase plastic recycling levels in the country.

The government's efforts must be complemented by the industry, which is better equipped to be at the forefront on two areas:

3) Educate the masses to segregate at source

The government's actions on the regulatory front to make plastic waste usable must be accompanied by mass education about the importance of, and ways to segregate at source. The industry – specifically industries that produce and/or use plastic – can be asked to lead multiple campaigns to generate mass awareness - to educate and encourage consumers and other stakeholders (e.g., waste pickers) to segregate at source. The education can also be undertaken via modified packaging labels e.g., specifying best uses and encouraging segregated disposal.

The government in its part can specify industry participation levels and/or investment levels expected in mass awareness programs. The programs will have maximum success if the industry is encouraged to work in partnership with governments across levels. Industry associations can act as rallying points and coordinate efforts.

4) Invest in and pilot re-use technologies

There are several new technologies that are being developed for plastic waste management in India and abroad. Different industries can carry out tests for proof of concept, conduct pilot projects and invest in recycling plants to enhance use of plastic waste.

In addition to the four pronged approach specified above, the government can consult the industry to evaluate the best ways to **enhance producer responsibility via CSR initiatives** in post-consumer use stages. The success story of Germany in managing plastic waste is a case in point that India can apply learnings from (refer sidebar).

Sidebar: Germany and Enhanced Producer Responsibility

Context:
In 1991, Germany passed an ordinance requiring manufacturers, producers and distributors to take care of the disposal and recycling of all packaging material (includes plastic and other materials) they sell including all the collection, sorting and recycling costs. The ordinance thus shifted the cost of packaging waste management from the public sector to the private industry.

Key Features:
The retail and consumer goods industry in response established an umbrella non-profit organization - Duales System Deutschland GmbH (DSD) - to help producers and distributors fulfil their obligation to collect and recover the packaging waste.

- DSD neither owns nor operates any collection or recycling facilities – it works with 400 waste management partners including municipalities.
- Manufacturers and distributors are required to pay a license fee (that finances the sorting and recycling) to DSD to be able to put a 'green dot' label on their products - DSD only takes responsibility for the wastes bearing the mark.
- License fees paid to DSD is structured to be proportional to costs of collection/ sorting/ re-use the packaging material; and varies based on type of packaging material weight, volume and surface area of the package
- DSD established a 'dual' system of waste collection – a) 'curb-side system' where consumers dispose of materials with the green dot in yellow colored bins/bags provided by DSD to their households, that is collected as part of regular garbage pick-up and b) 'bring system' where customers bring their wastes to a central location or to public containers where it is sorted

Results:
Germany's packaging waste recovery rates doubled in 10 years to >75%; putting Germany at the top in recycling rates in Europe. 26 European countries have now followed suit and adopted similar systems

The Indian industry has already started doing its part on its front but there is opportunity to systematize and scale up efforts:

- The Indian Beauty and Hygiene Association (IBHA) has undertaken a 'Zero Waste Project' in association with an NGO 'Stri Mukti Sanghatna' where they incentivize rag pickers to pick multi-layer flexible waste, such as food packets and sachets. As of April 2015, 766 kgs. of multi-layer waste was reported to have been collected in Mumbai, with plans to recycle the waste to produce oil and carbon. The project currently covers 13 of 26 wards in Mumbai.
- HUL, in an early pilot, was reported[3] to be trying to create market value for discarded sachets and lighter plastic packaging so that ragpickers find incentives to collect them from the streets. The company had entered into a partnership to turn such flexible plastic waste into fuel oil at a viable cost, and use this fuel to power the boilers of its plant in Pondicherry.
- Dabur was reported[3] to have partnered with TetraPak India to mobilise ragpickers to collect discarded packaging of food products. The waste was recycled to create a variety of products such as roofing sheets and office stationery.

Jointly, the industry and the government can work towards tackling India's plastic waste problem, and set an example for the world to follow.

6.2. *Addressing the health concerns with plastic packaging*

As discussed in section 3.1, the ban is also being considered as a response to some health concerns raised that are PET-specific.

Specifically, it is being stated that "leaching" of certain harmful chemicals – BPA (Bisphenol-A), an endocrine disruptor, and antimony – occurs

Exhibit 6.4

International studies that consider PET to be a food-safe packaging material

Source	Details
FDA	"FDA's current perspective, based on its most recent safety assessment, is that BPA (Bisphenol-A) is safe at the current levels occurring in foods. Based on FDA's ongoing safety review of scientific evidence, the available information continues to support the safety of BPA for the currently approved uses in food containers and packaging." – FDA
World Health Organization	WHO Prequalification of Medicines Program (PQP) helps ensure that the medicines supplied by or through international procurement agencies (UNICEF, UNITAID, etc.) meet acceptable standards of quality, safety and efficacy. The WHO prequalification of medicines is preceded and succeeded by extensive rounds of research and rigorous assessments to ensure that the specifications are continually met. Out of the 419 medicines in the PQP list (as of 23/4/2016) for priority diseases (HIV/AIDS, TB, Malaria, etc.), 383 medicines are available in different forms of plastic packaging including 8 that are available in PET packaging.
Schweizerische Eidgenossenschaft Confédération suisse Confederazione Svizzera Confederaziun svizra	"The Swiss Federal Office of Public Health (SFOPH) mentions that the risk to consumers from possible migration of antimony from PET bottles is negligible ." – IDMA
ILSI International Life Sciences Institute	"PET itself is biologically inert if ingested, is dermally safe during handling and is not a hazard if inhaled.. Negative results from Ames tests and studies into unscheduled DNA synthesis indicate that PET is not genotoxic.." - ILSI
EPA United States Environmental Protection Agency	"Polyethylene Terephthalate does not appear in the universe of 10,000 chemicals shortlisted from 85,000 chemicals for EPA's 'Endocrine Disruptors Screening and testing Program (EDSP). Though, glass appears in the list as a potential Endocrine Disruptor." - IDMA
National Center for Biotechnology Information NCBI	"The NRDC has petitioned the FDA to ban the use of BPA in food packaging, but on 30 March 2012 the FDA issued an interim ruling denying that request, pending further research. Currently the FDA allows the use of BPA in food-contact applications."
Government of Canada	"BPA from food packaging is not a health risk to Canadians, including newborns and children." – Govt. of Canada

Source: FDA, ILSI, IDMA, NCBI, WHO, Canadian Government website, Secondary Research

[3] The Economic Times (2013), *FMCG companies like HUL, Dabur woo ragpickers to clean up sachets & lighter plastic packaging*. Retrieved 4 May, 2015.

under varying storage temperatures and also when the packaging becomes old. In a country like India where logistics is largely an unorganized sector, the consignments could be left stranded in sub-optimal storage conditions and temperatures, thus increasing the chances of leaching.

A list of international studies that indicate that PET is a safe material for food packaging is included in Exhibit 6.4. The literature states that:

- BPA is neither added nor generated while making PET. Additionally, as per the safety assessments conducted by USFDA (US Food and Drug Administration), the amount of BPA that occurs in food due to other forms of plastic packaging is safe for consumption. FDA permits the use of BPA in food-contact applications. The Canadian government has also deemed BPA from other forms of plastic food packaging risk-free for health. This has further been corroborated by United States Environmental Protection Agency which has not shortlisted PET to the universe of 10,000 chemicals for its 'Endocrine Disruptors Screening and Testing Program' implying that it does not qualify as an endocrine disruptor.
- The Swiss Federal Office of Health has stated that the risk from a possible migration of antimony is negligible.
- World Health Organization (WHO) also considers plastics to be a safe material for packaging. Out of the list of 419 medicines prepared by WHO for its 'Prequalification of Medicines Program' for priority diseases, 383 medicines are available in different forms of plastic packaging, including 8 that are available in PET packaging.

Since very little literature has been published in the Indian context, it is difficult to address the specific issues raised with a strong degree of certainty. Since there is sufficient international literature that states that PET is a safe material for food packaging, further study is recommended to evaluate the concerns raised in the Indian context before decisions are made to address this concern.

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Notes to the Reader

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