

Packtech Industry-An Industrial & Environmental Issue

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Abstract: Packtech Industry (PI) comprising of High Density Polyethylene (HDPE), Low Density Polyethylene (LDPE) and polypropylene (pp) have highest usage in India due to rising demand from various segment of industry. The study analyses the issues pertaining to the growth of these three recyclable materials and their application across the different sectors of Indian manufacturing industry. The study accords particular attention in wake of the recent amendment in the policy measure in India wherein certain grades of plastics were banned across seventeen states in India. In spite of the ban the demand for Packtech is still rising due to lack of close substitutes. Packtech industry generates waste which adds to landfills, if not disposed as per the prescribes requirements for waste management. The research examines the current scenario and state of growth in Packtech manufacturing Industry of Jaipur district. The study analysis industry status, raw material consumption and firm's entry in individual markets and within Packtech industry. The study is based on Primary and secondary data were used in this study for Packtech manufacturer of bags, Layflats and woven sacks. The study found a significant difference in growth of Packtech Industry in reference of Rajasthan/ Jaipur district.

Key words Packtech Industry, Raw Material Consumption, Waste Management Strategies, and CARE Model

I. INTRODUCTION

Packtech is main derivative industry of technical textile with highest market share and significant product mix consist bags, lay flats and woven sacks of LDPE/HDPE/PP recyclable materials. PI accounts for 42% market share in India, in which 33% belong from flexible material HDPE/LDPE/PP. It is fastest growing industries in the country among 12 Technical Textiles industry segments. Its market size is estimated to be about ₹ 136,600 cores, growing at a CAGR of 14%. Global consumption of Packtech is 15 % while India has 36% and growth rate is 12% [1]. The Precise study is mainly focused on SPI material code 2, 4 and 5 only and product code "HSN number 63053200" [2] for Bags and Woven Sacks. Packtech which manufactured by Plastic derivative (HDPE/LDPE/PP) have versatile used in user industry/Sub industry. Rajasthan has enough potential for PI. The heart of the Rajasthan, Jaipur has developed as cluster of packaging industry especially for flexible packaging range from paper to plastic derivatives. The current study has been done on the plastic derivatives LDPE/HDPE/PP for product mix Bags, lay flats and Woven sacks.

In this research Packtech industry consider as manufacturing units exclude the units are engaged in distributors, supplier and wholesaler of Packtech. Below table shows the district wise status of Packtech industry and manufacturing industry. As per detail provided by Plastic Association Jaipur registered units in Rajasthan are 92 among them 52 are situated in Jaipur district and 22 are manufacturing the Bags ,Lay flats and Woven Sacks.

Table1. Status of Rajasthan Packtech Manufacturing Industry

District	No. of Packtech Industry	% Packtech Industry	Manufacturing units	% Manufacturing units
Jaipur	52	58%	22	63%
Ajmer	8	9%	3	8%
Jodhpur	8	9%	3	8%
Kota	5	5%	2	6%
Bhilwara	4	4%	1	3%
Udaipur	4	4%	1	3%
Bikaner	3	3%	1	3%
Alwar	3	3%	1	3%
Barmer	2	2%	0	0
Ganganagar	2	2%	1	3%
Sikar	1	1%	0	0
Total	92	100	35	100

Source Primary Data from PMAR

The table reveals the status about Rajasthan PI, 63% of manufacturing units are situated in Jaipur district Ajmer and Jodhpur have 8% and 8%. Jaipur is also industrial hub which is main driver for PI development. The study is focused on majestic material plastic derivative such as HDPE /LDPE/PP which is the main cause for landfill due to short spun of Packtech, used through sub industry and discarded after the open the product by end consumer. As pr the list provided by RPCB the petroleum based product fall under green industry as the product manufactured from "by-product of crude oil" [3] but product dispose off by end consumer violation create a paradox situation for industry. In societal welfare the high court ban the use of certain categories bags, but the lack in

the lack in clarity of legislation and lack of awareness for dispose off method for Packtech use, the industry growth stuck in many other states. The study based on actual situation of RMC and growth of PI which is clarity of legislation and lack of awareness for dispose method of discarded Packtech, affect the industry growth. The study based on actual situation of RMC and growth of localizes PI solution for Packtech waste management.

Collected data evaluation discloses material usage 1, 88,727 MT during 2011 to 2018 by the Packtech industry. The material consumption increase 1500% across the Packtech industry on the base year 2011.

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II. MATERIAL METHOD

Raw material consumption

Industrial Consumption and Growth Status-Industrial consumption is called “indirect or productive consumption when the goods are not meant for final consumption”[4]but for producing other goods containment, support in logistic, increase self life, durability and end consumer comfort. Consumption is the beginning of all economic activities which indicate positive and negative growth of industry. Packtech product is used by food industry, auto mobile industry, construction industry, cloth and accessories industry even in new format of retailed-marketing” which denote as industrial pattern of Packtech consumption. A variety of Packtech material used in the various industries. The Packtech

material selections or industrial consumption depend on various independent variables as product safety, use of additive, hygiene and cleanliness, quality of Packtech material –weight/density/durability, logistic conveyance cost effectiveness and green production however the complexity of material that take up to 1000 years to decompose[5]. To minimize the environmental impact of Packtech waste all over world nations are taken tuff action in form of Tax& levy along with various legislations adhere on stakeholder to know their responsibilities. Strong industrialization blurs the effect of this, legislation and the consumption are growing for these Packtech material. In this concern, this research investigate localize ASI for Jaipur PI.

Table 2 Raw Material Consumption (LDPE/HDPE/PP)

PMU	2011	2012	2013	2014	2015	2016	2017	2018	Total
MUA	Nil	7300.45	8600.07	8660.72	8560.09	9577.34	9322.80	9782.32	61,804
MUB	820.11	860.21	890.21	876.23	900.70	2880.12	2750.09	5380.71	15,358
MUD	40.21	50.11	50.13	50.17	50.23	62.11	65.09	70.23	438
MUE	90.23	110.25	112.75	115.72	117.22	122.78	138.27	150.02	957
MUF	398.51	416.47	368.87	396.35	419.49	423.07	450.41	498.61	3,372
MUG	Nil	Nil	50.21	72.17	98.74	112.07	118.23	130.79	582
MUI	107.21	110.00	104.21	112.43	110.28	90.72	110.22	169.21	914
MUK	Nil	79.11	87.10	98.11	106.11	134.7	170.32	298.73	974
MUL	150.21	169.11	200.17	244.70	257.47	247.56	253.07	269.17	1,791
MUN	Nil	Nil	Nil	Nil	25.11	55.07	85.29	120.11	347
MUO	4321.71	5134.29	5341.73	5379.23	4127.43	4730.43	5140.78	5378.11	39,554
MUP	70.42	98.73	100.00	104.32	90.73	127.43	140.30	150.27	882
MUQ	50.31	54.27	66.29	65.13	65.27	82.70	91.73	91.73	567
MUR	1107.45	1579.43	1835.47	1947.56	2007.45	2119.73	2110.43	2347.53	15,055
MUS	3947.40	4763.47	4972.31	5117.63	5432.00	5797.41	6209.47	6799.23	43,039
MUT	Nil	Nil	Nil	77.56	82.97	87.11	94.72	100.23	443
MUU	Nil	221.43	237.79	244.46	250.15	289.44	278.43	300.71	1822
MUV	Nil	Nil	Nil	Nil	Nil	240.57	287.13	300.05	828
Total	11,804.24	20,947.40	23,017.41	3562.65	22701.5	27,180.5	27814.87	32,337.79	188727

Source Primary Data from PMU Jaipur

Note: - MUC, MUH, MUJ and MUM not provided the data. SI unit in Metric Ton.

III. RESULTS AND DISCUSSION

Growth Status-A paradox situation has been formulated in PI, in one hand the particular material Packtech enhance the life of consumer with cost-effectiveness and sustainability credentials for industrial growth as lesser raw material required rather than the other packaging material, in other hand the wrong dispose off the particular material create environment issue which has long term impact on society and industry. Plastic Waste (Management and Handling) Rules, 2011; enforced the ban of plastic bags use the rule is adhere in Rajasthan also. In this study the data collection period has taken from 2011 as base year to evaluate the post impact of rule on growth of Packtech material use.

The major consumptions were done by MUA with 61,804 metric ton raw material usage in last 8years where as MUO and MUA is second and third largest consumer of Packtech material for construction of bags, lay flats and woven sacks used by across various industry. These industries are used the Packtech material for their product packaging which cause for landfill and waste violation. In Jaipur waste generation status is drawn the attention for worldwide problem of landfill at a glance.

Table 3 Waste Status of Jaipur City

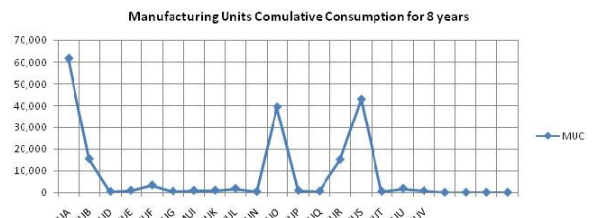
Waste Status Jaipur City	Per Day Status
Waste Quantity	1150 TPD
Waste Generation Rate	0.59 kg/c/day
Compostable	45-50%
Recyclables(Plastic Based)	12-10 %
Moisture Present	21%

Source International Journal of Engineering Research & Technology

Waste Management

The waste management was selected as the topic of this study because lack of disposal method and absent of circulatory system, the industry the industry converts in red categories which may be great barrier for growth. The waste management is a visible environmental issue that India is confronting. Jaipur in particular was selected as main hub of Packtech production and consumption in Rajasthan. Actual status of industries show that till 2018 1,88,727 MT Bags ,Layflat and woven sacks directly and indirect insert in environmental mainstream and the impact of the material exist approx 1000 years so it is a great problem for coming generation.

Packtech used in products packaging, thus construction has increased, so the amount of Packtech in waste streams has also risen. Unfortunately, while Packtech have many useful properties, but the community attitude on dispose of discarded Packtech is worst and it is very difficult to collect different type of Packtech from different location. The collection and sorting of Packtech waste is major challenges for developing country where geographic region differ in terms of industry status, consumption, sub –industry growth, life style and dispose attitude of localize population. Best practice by manufacturing industry, the public and government, it may be possible to avert the dangers related to plastic/Packtech waste and divert majority of the waste from landfills to beneficial use.



Graph 1.

Source Author

PMU provided response shows, that after adhering the plastic waste management and handling 2011 in Rajasthan , the raw material consumption yearly increase only in 2015 its slightly decrease. As per the assumption of 2011 as base year the growth determines 186 % growth from 2011 to 2018 that reveal that more number of manufacturing units establishes along with existing manufacturing units explanation, in 2011; PMU was working 13 in number which increase with 9 PMU till 2018, now in Jaipur 22 units are working with 70% growth in establishment.

Below graph shows the major PMU used the raw material during 8 years, MUA, MUB, MUO MUR and MUS has been used 1,74,808 MT Packtech material (LDPE/HDPE/PP) while rest 13 units used only 13,919 MT. Also Forecast for year 2022, expected growth rate in Packtech industry was asked to each sampled unit. Sample mean of growth rate was calculated 11%. Since sample is small, observations are independent & behavior of data is Gaussian, to test the following hypotheses, t-test was performed to evaluate the Lower and Upper level of expected growth within PMU. The null hypothesis is tested -There is no significant growth in Jaipur PI. And alternate hypothesis is-There is Significant Growth in Jaipur PI.

t-Test

	N	Mean	Std Deviation	Std Error Mean
Expected Growth	18	11.00	6.782	1.599

	t	df	Sig.(2 tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Expected Growth %	6.881	17	.000	11.000	7.63	14.37

Result: The value of t statistic is 6.881 and p-value is 0.000. This result is significant at the level of 0.05 p-value. Hence, null hypothesis is rejected & there is a growth in industry and range of growth is 7.63-14.37 percent with 95% confidence level.

PESTAL Analysis

Political Impact-Ministry of Textiles has “undertaken several developmental activities that are oriented towards providing necessary support to promote growth of Technical Textile industry in India through FY plans and Funding schemes.GoI and federation of India Chamber of Commerce jointly organised the Technotex for increase research and development to specific sector of Packtech.Central and state governments have supported in the form of textile parks, research centers, international collaboration with foreign institutes and laboratories, training facilities” [6] etc. is also playing a significant role in the sector’s progress .Government policy for Petro based Packtech Industry Investment Subsidy of 60% of State tax due and deposited,

for ten years; and 6 Employment Generation Subsidy up to 10% of State tax due and deposited, for ten years” [7].To promote Technical Textile sector Ministry of Textile has launched various schemes for funding grants and initiatives. Technology Mission on Technical Textile (TMTT) and “two mini mission for removal the impediments hampering the production of Technical Textile industry to meet the growing domestic demand” [8].Packaging bags are now among the world’s most-banned. The United Nations counted 127 nations that have “banned or taxed bags—and bag regulations have proliferated fast”[9], especially at the local level. In India the government’s ban on polythene and plastic items”[10] will disrupt the supply chain, raise the cost of goods from milk to biscuit packets, and impact the food processing and consumer goods auto industry and construction industries. Regulatory practices and governing bodies for Plastic Packtech manufacturing are regulated at National Level by- “Central Pollution Control board and State level; State Pollution control Board and local bodies of Particular state”[11] point 12 & 13.

Economic Impact-The packaging industry is increasingly becoming technology-oriented with innovations driving the market; this is expected to lead to packaging that “increases shelf life, reduces cost and is light weight” [12]. There has been significant growth in this industry and estimated to grow by 11% which is higher than global growth of Packtech industry. It is a multi-million industry and very competitive at domestic level. It is a multi-million industry and very competitive at domestic level and identified as an area of interest of other industries development. Packtech is the segment of Technical Textiles which has a share of 43% of the entire Indian Technical Textile market. “Indian packaging industry is the fifth-largest industry in the world in 2016”[13]. This industry is highly sensitive to the prices of HDPE/PP granules which are its key raw materials constituting about 60% of the total input. Prices of polymer granules increasing sharply, the woven sack manufacturers are finding it increasingly difficult to maintain competitive prices of bags[14].

Social Impact-Demographics of PI represent the “single-largest sector of plastics use and accounts for 35 per cent of plastic consumption”[15].Packtech “applications area covers various industries including automobiles, civil engineering and construction, agriculture, healthcare, industrial safety and personal protection”[16]. Busy lifestyles ensure the prevalence of “eating and drinking on the go, and smaller pack sizes lend themselves to this trend for ready-to-eat meals which gaining high traction, owing to busy work schedules, rising number of working women, and shift toward on-the-go consumption”, which is, in turn, expected to ascend the utilization of packaging[17]. 2017 onwards, there has been a revived interest in sustainability focused specifically on packaging. This is reflected in central government and municipal regulations, consumer attitudes and brand owner values communicated via packaging [18].



In growing economy, rising incomes in the hands of a young population, expansion in the availability of products and services and easy availability of credit all has given rise to new consumer segments and a rising acceptability of debt, whether it is mobile phones, credit cards, organized retail, people clearly seem to be spending more, particularly on discretionary items, “packed fast and ready-to-serve food, Beverages, Ready to eat food , Pre-cooked food due to nuclear family system” [19].

Technology Impact-The history of manufacturing industry has been conquered by technological disruptions dating far back in the 18th century. The first industrial revolution started with invention of steam engines, water & steam power, machine tools, and factory system took the center stage. New manufacturing processes were coming in, the most dominant being modern production methods and final output for the textile industry. The second industrial revolution widely known as the technological revolution in the late 19th century brought mass production lines and invention of electric energy as its main features. It is said that the second revolution was a rough draft of the industry today. By the time, the third revolution came into focus; globalization was already on its way catalyzed by the invention of the first computer and subsequent discovery of the World Wide Web along with rapid digitalization and automation in the manufacturing industry with the convergence of new technologies such as intelligent software, novel materials, and a wide range of web-based services. Fast forward to today, the industry is going through another paradigm shift, popularly referred to as the “Fourth Industrial Revolution” or “Industry 4.0”. The future of the manufacturing industry lies with big data analytics, robots, automatons, and the internet of things. Manual labor will be replaced with digital factories containing advanced materials and artificially intelligent machines that run entire factories on its own. Not only that, manufacturing will enable manufacturers to forecast demand, carry out predictive maintenance, estimate problems and control the problems. New products, new features & characteristics, new methods, and processes have become the tool to fulfill the ever changing customer demand[20].The online retail industry in India is leading the E-commerce growth as India has 243 million Internet users, which is more than the US but less than China which is one of the primary reasons for growth of e-commerce in India[21].E-commerce is rapidly transforming the way and creates the completely new sets of global and national trading [22]relationships. In concern of India Z generation wide used E-commerce mode, where logistic need more Packtech product for product safety.

Environmental Impact-Governments around the world are increasingly awake to the scale of plastic (LDPE/HDPE/PP) packaging pollution. More than 60 countries have introduced bans and levies to curb single-use plastic packaging.Nearly 50% of the plastic waste generated globally in 2015 was plastic packaging[23]. Environmental pollution mainly concern with Plastic derivatives waste is a global problem, but with regional variability. It is a transboundary problem which is not respected by plastic waste and necessary to propose locally tuned responses for waste control [24].Each year, an estimated 500 billion to 1 trillion plastic bags are consumed worldwide. That's over

1million plastic bags used per minute! It takes 100-500 years for a plastic bag to disintegrate (depending on the type of plastic) and hence. Theycontinue to exist, harming our environment. Plastic bags have emerged as an unsustainable option and constitute one of the most critical waste issues globally [25]. Environmental damage resulting from improper disposal of used packaging materials – including their residues [26]Plastic pollution is caused by excessive plastic production and inadequate waste management. Global production of plastics is now up to around 300 million tons and non-degradable plastic accounts for 73% of litter in any aquatic habitat with roughly 50% disposed of after a single-use[27]. India generated 26,000 tons per day (TPD) of plastic waste in 2017-18, required 2600 truck loads per truck 10 tons for transport the plastic waste[28]the cost of manage this waste is very high. Globally, U N Environment estimates that more than 8.3 tons of plastic has been produced since 1950's. About 60% of the plastic in from of packaging product has ended up in either in landfill or the natural environment [29]. In India pollution control Board plans comprehensive programme for prevention, control or abatement of pollution, lay down, modify or annul effluent standards, advise the State Government on any matter concerning prevention, control or abatement of pollution and collect and disseminate information relating to pollution[30].Consumers have a high preference for ‘green’ products, but the consistency between consumer attitudes and behavioral measures is rather low[31]which influence the industrial product.

Legal Impact-The Expert Committee on Technical Textiles (ECTT) constituted by the Ministry of Textiles has also recommended mandatory prescriptions for certain items. One of the major deterrents for the expansion of usage of many technical textiles products is absence of standards and regulatory legislation in India[32]. Government of India has recently notified 207 HSN Codes from Technical Textiles. In February 2011, the Ministry of Environment and Forests banned the use of plastic materials in sachets for storing, packing or selling. New rules stipulate that plastic carry-bags must not be less than 40 microns thick less than 8 inches x 12 inches in size revised 50 microns; earlier, the minimum thickness required was 20 microns. Thinner plastics are more difficult to dispose off. Plastic carry-bags cannot be made available to consumers free of cost; the municipal authorities have been asked to determine suitable price for these bags[33].

Potential Impact on PI

There has been growth within the sector and this growth will continue.The Technical Textile industry in India is estimated to be valued at Rs. 73,688 crore in 2013-14 and is projected to grow to Rs. 92,499 crore by 2015-16 and Rs. 1,16,217 crore by 2017-18.The industry has witnessed a growth of 12.4% over the last five years driven mainly by the growth witnessed in Packtech.The per capita consumption of polymers in India during 2014-15 was just 10.5 kg as compared to 109 kg in USA, 45 kg in China and 32 kg in Brazil. India is expected to be among the top ten packaging consumers in the world by 2016. The low level of per capita plastics consumption in India is indicative of the massive growth potential of the plastic industry[34].

There have been potential areas like circularity industry, through recycle, reuse and reproduce for sustainable business. Circularity industry of PI is economically beneficial for all stake holders from supplier to user as it's reduce the resource utilization in terms of raw material, energy and natural resources. Circulatory industry reduces the cost of environmental problem; provide the solution of infrastructure development and waste management solution for thrust problem of waste management. There is ample of opportunities for investment alliances in recycled Packtech Industry to develop circulatory industry and generate the employment to semiskilled and skilled people, employs about 5 million people directly and three times more indirectly, will continue to grow due to rapid change across the industry. Organised retail and e-commerce boom, which offer huge potential for future growth of retailing, will continue to support the packaging industry. Indian consumers are spending their money on various items has changed. The penetration of internet and social media has increased; as a result the purchasing behavior of Indian consumers has changed dramatically. Urbanization is a constant phenomena in India and is influencing the life style and buying behavior of the consumers as well industrial consumption of raw material.

Packtech industry is highly Capital intensive and labour force is required highly skillful to handle automation

process of manufacturing. More prudent actions need to be considered rather than an outright ban [35]. Recycling would go a long way to sustain the Packtech industry and need to take EPR solution for channelize the industry Extended Producers Responsibility best option to minimize the environment impact to maintain the economic growth. The legal environment is barriers towards this venture due to the banning of Packtech Product. In most parts of India, the bans have been ineffective due to various reasons, ranging from slack enforcement by the administration to lack of cost-effective alternatives [36].

CARE Model

The global problem of Packtech waste creates an arena for waste management strategies to minimize or zero waste and legislations on "Reduce, Refuse, Recycle and Reuse"[37] facilitate the working frame work for curb this global problem. Worldwide these strategies are more or less adopted but lack of proper implementation these are not working effectively now the need for alternate strategies to boost up this frame work. Only bans, law enforcement and monitoring of compliance are critical to ensure that the prohibited items are not illegally used. To curb the Packtech waste problem need to ASM along the suitable recycle infrastructure.

CARE Model for Packtech Waste Management (With Responsibilities)



CARE Model for Packtech Waste Management by Author

C-Circular Industry – PP mode, Extended Producer Responsibility, Infrastructure for recycling, Incentive policy for recycle manufactures, Authorized waste collection predefine location at block level and registered waste picker.

A-Awareness- Producer, industry user, distributors, end consumer, local bodies

R- Reduction to Phase out- Producer, industry user and end user

E-Enforcement and Evaluation- Law, ban and legislation. CARE model works effectively in developing country where the ample of opportunities to industry growth.

IV. CONCLUSION

Packtech is derivative segment of Technical Textile, growing with 41.6 % highest market share in Indian economy. The growth of Packtech industry couples with challenges of disposing the items of packaging or other short-lived products that are discarded within a year of manufacturing. Plastic/Packtech waste (PW) of polymers (like: high density polyethylene (HDPE), low density polyethylene (LDPE) and (PP), need longer time to decompose in thousands of years in normal environmental conditions result in the increase in the landfill.

Packtech Industry-An Industrial & Environmental Issue

The globally prevalent and prescribed practices fail to fit in to Indian waste management practice due to inadequate wastecollection, treatment and disposal. The study indicated that at regional level CARE model propose strong compliance to develop solid infrastructure for recycling, schedule authorize system for waste collection through registered waste picker, increase the awareness among all the stake holder, motivate the producer for reduction the phase out and substitute the green plastic and last the enforcement and evaluation exist policy for Packtech industry. Significant growth of raw material use indicates the problems in implementation by the local government.

REFERENCES

1. Indian Brand Equity Foundation. (2013). Flexible Packaging: Changing Dynamics of Indian Packaging Market . Delhi: IBEF.
2. Ministry of Textiles Government of India. (2019). Government of India's Initiatives in Technical Textiles. Mumbai: Ministry of Textiles Government of India.
3. United Nations Environment Programme. (2018). Single Use Plastic - A Roadmap for Sustainability . USA: United Nations Environment Programme.
4. Seth, T. (2018). Consumption: Meaning, Types and Importance of Consumption. Retrieved Nov 18, 2019, from www.economicdiscussion.net: <http://www.economicdiscussion.net/articles/consumption-meaning-types-and-importance-of-consumption/1455>
5. United Nations Environment Programme. (2018). Single-use plastics:A Roadmap for Sustainability. USA: The International Environmental Technology Centre.
6. Arora, S. (2019, 04 16). India An Emerging Market & Global Manufacturing Hub for Technical Textiles. Retrieved 11 5, 2019, from www.wazir.in: <https://wazir.in/india-an-emerging-market-global-manufacturing-hub-for-technical-textiles>
7. Government of Rajasthan (Finance Department). (2018). Rajasthan investment promotion scheme - 2014. Jaipur: finance department.
8. Ministry of Textile. (2018). Annual Report 2017-2018. New Delhi: Government of India.
9. Parkar, L. (2019, April 17). Plastic bag bans are spreading. But are they truly effective? Retrieved November 10, 2019, from www.nationalgeographic.com: <https://www.nationalgeographic.com/environment/2019/04/plastic-bag-bans-kenya-to-us-reduce-pollution>
10. Beniwal, B. P. (2019, October 1). Modi wants to take away India's plastic bags and spoons. Retrieved November 10, 2019, from economictimes.indiatimes.com: <https://economictimes.indiatimes.com/news/politics-and-nation/modi-wants-to-take-away-indias-plastic-bags-and-spoons/articleshow/71386214.cms>
11. Ministry of Environment and Forests. (2016). The gazette of india : extraordinary. New Delhi: Govt. of India.
12. Aggarwal, D. (2018, December 1). This industry is packaging a lot of prospects; worth a good look. Retrieved November 10, 2019, from www.economictimes.indiatimes.com: <https://economictimes.indiatimes.com/markets/stocks/news/this-industry-is-packaging-a-lot-of-prospects-worth-a-good-look/articleshow/66892561.cms?from=mdr>
13. Wisconsin Economic Development Corporation. (2017, November 1). India: the world's fifth-largest packaging industry. Retrieved November 10, 2019, from www.wedc.org: <https://wedc.org/export/market-intelligence/posts/india-worlds-fifth-largest-packaging-industry>
14. ICRA Management Consulting. (2015). Baseline survey of the Technical Textile industry in India. New Delhi: ICRA Management Consulting Services Limited.
15. Toxics Link. (2014). Plastics and the Environment-Assessing the Impact. New Delhi: Toxics Link.
16. Flexituff International Limited. (2016). MANAGEMENT DISCUSSION AND ANALYSIS. New Delhi: F lexituff International Limited.
17. Mordor intelligent. (2018). PACKAGING INDUSTRY IN INDIA - GROWTH, TRENDS, AND FORECAST (2019 - 2024). Retrieved November 10, 2019, from www.mordorintelligence.com: <https://www.mordorintelligence.com/industry-reports/packaging-industry-in-india>
18. Smithers. (2018). Four key trends that will shape the future of packaging to 2028. Retrieved November 10, 2019, from www.smithers.com: <https://www.smithers.com/resources/2019/feb/future-packaging-trends-2018-to-2028>
19. Dey, S. (2017). A Study on Changing Buying Behaviour of Indian Customers. Global Journal of Marketing Management and Research , 1-4.
20. Wazir Advisors. (2018). Building a New Age Textile Industry. Mumbai: FICCI.
21. Rhitabrata Kumar, D. A. (2018). An analysis of the rise of e-commerce in india. Symbiosis Institute of Management , 1-20.
22. Khan, A. G. (2016). Electronic Commerce: A Study on Benefits and Challenges in an Emerging Economy. Global Journal of Management and Business Research , 1-4.
23. United Nations Environment Programme. (2018). Single Use Plastic - A Roadmap for Sustainability. USA: United Nations Environment Programme.
24. University of the West of England. (2011). Science for Environment Policy-Plastic Waste: Ecological and Human Health Impacts. Europe: European Commission's Directorate-General Environment.
25. Toxics Link. (2014). Plastics and the Environment-Assessing the Impact. New Delhi: Toxics Link
26. FP& M and SETA. (2014). A profile of the packaging sub-sector. South Africa: Fiber Processing & Manufacturing Sector Education and Training Authority.
27. Tan, H.-S. (2018). Green products consumption behaviour among industrial engineering. The 2nd International Conference on Eco Engineering Development 2018 ((pp. 2-11). Indonesia: IOP Publishing.
28. Seetharaman, G. (2019, September 22). How plastic ban will affect businesses and consumers. Retrieved November 10, 2019, from www.economictimes.indiatimes.com: <https://economictimes.indiatimes.com/industry/indl-goods/svs/paper/-/wood/-/glass/-plastic/-marbles/how-plastic-ban-will-affect-businesses-and-consumers/articleshow/71236532.cms?from=mdr>
29. U N environment. (2018, June 5). Our planet is drowning in plastic pollution. Retrieved november 13, 2019, from www.unenvironment.org: <https://www.unenvironment.org/interactive/beat-plastic-pollution/>
30. ICED. (2016). EFFECTIVENESS IN THE FUNCTIONING OF STATE POLLUTION CONTROL BOARD. jaipur: ICED.
31. Uusitalo, J. R. (2008). Preference for green packaging in consumer product choices – Do consumers care? International Journal of Consumer Studies , 516-525.
32. Ministry of Textile. (2012). Compendium on Standards in Technical Textiles sector. New Delhi: Govt. of India.
33. FICCI. (2016). Plastic Packaging- the sustainable choice. New Delhi: Tata Strategic management Group.
34. FICCI. (2016). Plastic Packaging- the sustainable choice. New Delhi: Tata Strategic management Group.
35. Sundaresan, N. B. (2015). Plastic Packaging the sustainable and smarter choice. New delhi: Strategy& Booz & Company.
36. Toxics Link. (2014). Plastics and the Environment-Assessing the Impact. New Delhi: Toxics Link.
37. Trade, D. f. (2017). www.makeinindia.com/article/-/v/technical-textiles-a-bright-future. Retrieved from [www.make inindia.com](http://www.makeinindia.com): <http://www.makeinindia.com/article/-/v/technical-textiles-a-bright-future>

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