

Study on Plastic Waste: Environmental Impacts, and Future Directions

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Abstract:

Plastic waste has emerged as a critical global environmental challenge, posing significant threats to ecosystems, human health, and sustainability. The proliferation of single-use plastics, inadequate waste management infrastructure, and limited recycling capabilities contribute to the escalating crisis. This abstract explores the multifaceted impacts of plastic waste, encompassing marine pollution, terrestrial ecosystems degradation, and the potential long-term consequences on biodiversity. The adverse effects on human health through the ingestion of microplastics and the leaching of toxic additives are also examined. Addressing the plastic waste crisis requires a comprehensive approach, involving global collaboration, policy interventions, technological innovations, and public awareness initiatives. Sustainable alternatives, circular economy models, and improved waste management strategies are essential components of a concerted effort to mitigate the detrimental effects of plastic waste on the environment and safeguard the well-being of present and future generations. Plastic waste has become a global environmental concern, posing significant threats to ecosystems, human health, and biodiversity. This research paper provides a comprehensive analysis of the current state of plastic waste, its environmental impacts, and various management strategies. The study also explores innovative technologies and future directions for mitigating the plastic waste crisis.

Keywords: Plastic Pollution, Single-use Plastics, Recycling, Waste Management Environmental Impact, Plastic Packaging

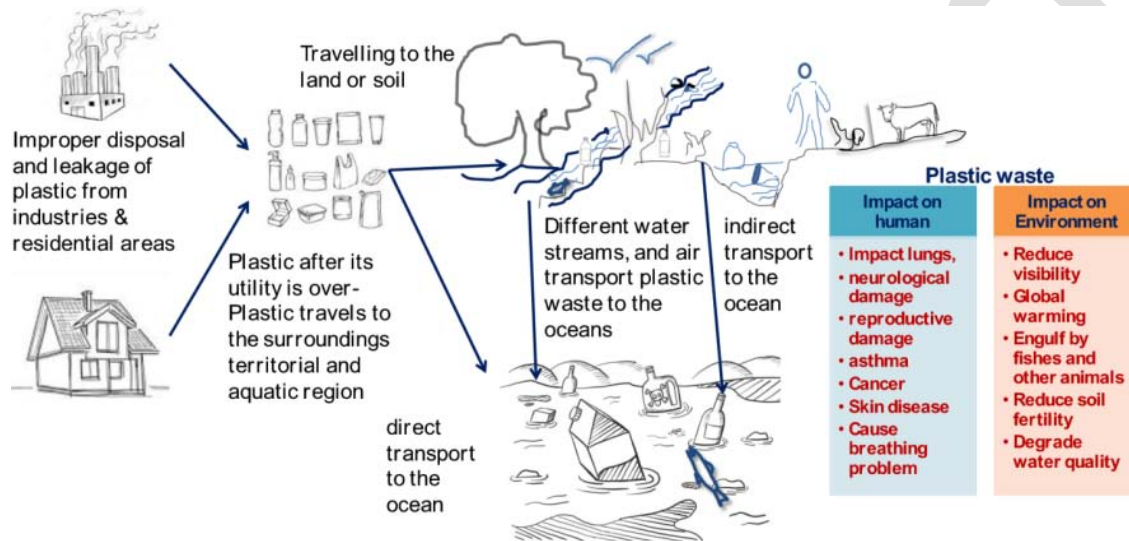
Introduction

Increased urbanization, plastic packaging and fast moving consumer (FMCG) such as cosmetics, groceries and food are the major reasons behind the huge accumulation of plastic waste in India. Not only does plastic waste harm humans, but also has a devastating impact on the environment. The major concern with plastic waste in India is not about the amount of waste produced but ineffective waste management, such as improperly collecting and recycling waste. The objective of the study was to understand the use of alternative materials or promote the development of biodegradable plastics to decrease overall plastic consumption.

The management of plastic waste is a critical issue in urban areas, including Pune city. The plastic waste cycle in Pune involves various stages, from generation to disposal. Let's explore each phase of the plastic waste cycle in Pune:

- **Generation:** Plastic waste in Pune is primarily generated from households, commercial establishments, industries, and public spaces. Single-use plastics like bags, bottles, packaging materials, and disposable items contribute significantly to the overall plastic waste generation.
- **Collection:** Pune has a waste collection system in place, with designated waste collection points and door-to-door collection services. The municipal authorities and waste management agencies are responsible for collecting plastic waste from households and commercial areas.

- **Segregation:** After collection, the plastic waste undergoes segregation to separate different types of plastics and non-plastic materials. Informal waste pickers and formal waste management workers are often involved in this process.
- **Recycling:** Pune has recycling facilities that process the segregated plastic waste. The recycling process involves cleaning, shredding, melting, and forming new plastic products. The city aims to promote recycling as a sustainable solution to reduce the environmental impact of plastic waste.
- **Disposal:** Plastic waste that cannot be recycled is sent to landfill sites. Pune faces challenges related to the availability of suitable landfill spaces and the environmental impact of landfilling.



Consequences of Plastic pollution

1. **Environmental Impact:** Plastic pollution poses a severe threat to ecosystems, marine life, and, leading to long-term ecological damage.
2. **Resource Depletion:** The production of plastic involves the extraction and consumption of finite fossil fuel resources human health. The non-biodegradable nature of plastics means they persist in the environment for centuries. As the demand for plastic continues to rise, there is a growing concern about resource depletion and the environmental impact of extracting and processing these materials.
3. **Waste Management Challenges:** Inadequate waste management systems contribute to the accumulation of plastic waste in landfills, oceans, and other environments. Developing countries often face greater challenges in managing plastic waste, leading to widespread pollution.
4. **Microplastics and Health Risks:** Plastics break down over time into smaller particles known as microplastics. These microplastics can enter the food chain, posing potential health risks to both wildlife and humans. The full extent of these health risks is still under investigation.

How is plastic waste managed in India - As India's plastic demand crossed 20.89 million tonnes in 2021-22 and projected to continue growing to 25million tonnes by 2024, the responsibility lies on the industry to adopt circular economy principles, not only to minimize waste and pollution but also to open new opportunities for growth and innovation. As many as 5,000 registered units are engaged with plastic in 30 States/Union territories in India, a report by CPCB said. The report added 823 unregistered plastic manufacturing/recycling units in nine states/UTs. The informal sector handles 40-85 percent of waste, which lacks basic disposal techniques. The informal sector diverts the majority of waste to landfills due to a lack of knowledge and technology-enabled machinery, and waste material collected by the informal sector is not channeled transparently. Material recovery facilities and recyclers in the waste management industry often receive contaminated waste that cannot be

recovered and is eventually disposed of in landfills. The Indian government claims that [60%](#) of the country's plastic waste gets recycled. However, the reality is somewhat different, as India could only recycle [12%](#) of its plastic waste, according to CSE statistics based on CPCB data. Besides this, 20% of plastic waste is diverted to co-incineration, plastic-to-fuel, and road construction, meaning that 20% of our plastic waste gets burnt and 68% is unaccounted for. Overusing plastic and neglecting disposal solutions for plastic over a long time led not only India but many other nations to adopt laws to limit plastic because of its increasing environmental damage.

Annual plastic waste is generated in India - India produces 9.3 million tonnes of plastic annually, with 25,490 per capita. Plastic waste generation has quadrupled in India over the past five years. Also, the pandemic created a surge in plastic production from FMCG markets, e-commerce, food-delivery services etc. The main problem is the uncollected plastic waste, which accounts for 40% dumped in landfills, clogging water bodies and polluting streets. This unmanaged plastic waste makes it easy to enter animal bellies and simultaneously to the plastic crisis and overproduction of plastic. 60% of the plastic waste collected is not recycled, and there are many reasons why every kind of plastic is not recycled; by this, we can understand that only a small percentage of plastics are recycled, and the remaining all end up in landfills. Ocean plastic waste is also a severe problem in India; according to a study by Phew Trusts (2022), the plastic waste entering oceans is at an annual rate of 11 metric tonnes, harming marine life and damaging habitats. If it continues, it poses a considerable risk, especially in waterways and when wind pushes the plastics deeper into the oceans. The oceans around Mumbai, Kerala, and the Andaman and Nicobar Islands are among the world's most polluted. Plastic waste impacts at least 267 species worldwide, including 86% of sea turtle species, 44% of seabird species, and 43% of marine mammal species.

And the massive accumulation of plastic waste in India is due to increased urbanisation, the rise of retail chains, and plastic packaging for groceries, food, cosmetics, consumer products, etc., which is the primary cause of environmental and human-kind damage.

Means to reduce plastic waste in India- It is not simple to lower our use of plastic. But if we take it seriously, we can make a significant difference in our lives and the lives of others.

Avoid using single-use plastics - The Indian government enacted a ban on [single-use plastics on July 1, 2022](#). It is a commendable decision by the government since single-use plastic waste accounts for [43 %](#) of plastic waste generated in India. Individuals must still take responsibility for reducing their usage of single-use plastics at home and while shopping.

Remember to bring a cloth bag with you when shopping or grocery shopping - It is critical to utilise reusable bags such as fabric, wicker, or string instead of plastic bags. This one simple step builds a will to enhance our planet's health. Glass or steel containers should be used instead of plastic – It seems easy to carry a Tupperware lunchbox and a water bottle to work. What is vital is understanding how plastic ware affects our environment, mainly how plastic containers release harmful substances when exposed to heated food.

Avoid using cosmetics microplastics; use biodegradable brushes and natural textiles - Choose plastic-free alternatives, such as wooden brushes, micro-plastic-free lipstick, and T-shirts made of natural fibers.

Choose to reuse and repurpose some of the packaging - If you purchase a plastic bottle or container at the grocery, reuse it rather than toss it away. A bottle may be refilled as many times as needed, and containers can be used to hold more food. Recykal channeled 3,71,345 metric tonnes of waste from landfills over the years and aimed to divert even more in the coming year through our digital solutions.

Conclusion - Plastic consumption is continuously increasing owing to urbanisation and the growing global demand. Although the rising rates of plastic production project positively for Indian businesses and the economy, unscientific waste management practices are leading adverse environment effects.

Bio-based and biodegradable plastics offer sustainable alternatives to curb plastic use and waste minimisation. The use of biodegradable plastic must be promoted, especially in large-scale applications, such as manufacturing of agricultural mulch films, superabsorbent composites used for waste water treatment, and sustained release of pesticides. There is a further need for the upscaling and commercialisation of these products through a facilitation of research and industry tie-ups.

This is where Biodegradable Future additives play a major role in replacing the traditional plastics that persist in landfills and ocean and harm the environment. Biodegradable Future is committed to improving our environment through material advances. They believe that through the research, invention and creation of biodegradable plastic, they can make actual improvements in peoples' lives by putting less stress on the planet. Through a variety of properties— recyclability, compostability, sustainability- they make us believe that plastics are part of the solution, not the problem.

References:

1. Geyer, R., Jambeck, J. R., & Law, K. L. (2017). Production, use, and fate of all plastics ever made. *Science Advances*, 3(7), e1700782.
2. Thompson, R. C., Moore, C. J., vom Saal, F. S., & Swan, S. H. (2009). Plastics, the environment and human health: current consensus and future trends. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 364(1526), 2153-2166.
3. Andrady, A. L. (2011). Microplastics in the marine environment. *Marine Pollution Bulletin*, 62(8), 1596-1605.
4. Derraik, J. G. (2002). The pollution of the marine environment by plastic debris: a review. *Marine Pollution Bulletin*, 44(9), 842-852.
5. Worm, B., Lotze, H. K., Jubinville, I., & Wilcox, C. (2017). Plastic as a persistent marine pollutant. *Annual Review of Environment and Resources*, 42, 1-26.
6. Lebreton, L. C. M., van der Zwet, J., Damsteeg, J. W., Slat, B., Andrady, A., & Reisser, J. (2017). River plastic emissions to the world's oceans. *Nature Communications*, 8, 15611.
7. Hopewell, J., Dvorak, R., & Kosior, E. (2009). Plastics recycling: challenges and opportunities. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 364(1526), 2115-2126.
8. Ellen MacArthur Foundation. (2016). *The New Plastics Economy: Rethinking the future of plastics*. Retrieved from <https://www.ellenmacarthurfoundation.org/publications>
9. Jambeck, J. R., Geyer, R., Wilcox, C., Siegler, T. R., Perryman, M., Andrady, A., ... & Law, K. L. (2015). Plastic waste inputs from land into the ocean. *Science*, 347(6223), 768-771.
10. United Nations Environment Programme. (2018). *Single-Use Plastics: A roadmap for sustainability*. Retrieved from <https://wedocs.unep.org/handle/20.500.11822/25496>