Research Report

GA4

Transitioning away from single-use plastic and non-biodegradable materials

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Introduction

The current environmental crisis comes from the extensive use of single-use plastic materials and other non-biodegradable substances. The production of these materials depends on fossil fuels while their manufacturing process needs significant energy consumption, and they fail to decompose or get recycled efficiently. The combination of these qualities leads plastic waste to end up in landfills and incinerators and natural environments where it stays for hundreds of years while damaging wildlife populations and human health and environmental systems.

The high demand for single-use plastic exists because these products offer affordable prices and versatile uses and long-lasting durability. Environment Texas explains that businesses maintain their use of non-recyclable flexible plastic packaging because these products provide extended durability and economic benefits that recyclable materials cannot deliver. The recycling industry faces challenges when processing thin or laminated plastics because these materials include products like cling wrap and snack wrappers. The current throwaway society leads to excessive plastic manufacturing because people discard most plastic waste which the NRDC shows amounts to 91% of total plastic waste.

The widespread production of single-use plastics makes their reduction essential for environmental protection while also requiring fundamental changes to existing systems. The transition away from these materials demands both new technologies and enhanced recycling facilities together with changes in business operations and government rules and public consumption patterns. The evidence demonstrates that single-use plastic usage runs deeply throughout our systems yet the environmental and financial and social expenses from this practice have reached unacceptable levels.

Definitions of Key Terms

Single-use plastics (SUPs) - Plastics designed to be used once and then thrown away. These are the main target of bans and reduction laws.

Biodegradation - Breaking down through natural biological processes (microorganisms) and not leaving harmful residue.

Environmental persistence - How long a substance remains in the environment without breaking down.

Bioaccumulation - The buildup of harmful substances such as microplastics or toxins in living organisms over time.

Microplastics - Tiny pieces of plastic (less than 5mm) formed when larger plastics break down. They are found in water, soil, food, and even air.

Mechanical recycling - Plastic is cleaned, melted, and remoulded into new products. It works best when plastic is not mixed or contaminated.

Chemical recycling (Advanced recycling) - Breaks plastic down into basic chemicals or fuels. It allows some hard-to-recycle plastics to be reused.

General overview

The worldwide usage of single-use plastics together with non-biodegradable materials has established a major environmental crisis which damages ecosystems and human health and destabilizes natural resource systems. Single-use plastics serve their brief purpose yet they stay in the environment for hundreds of years or more. The non-degradable nature of plastics leads to their accumulation in landfills and oceans and soil where they transform into toxic microplastics that contaminate food webs and water resources.

The current recycling systems fail to solve the ongoing problem with waste management. The recycling process faces challenges when dealing with plastics because certain types cannot be recycled and soft or multi-layered plastics require expensive processing methods. The world fails to recover more than a tiny amount of plastic waste because most plastic waste remains in the environment to cause harm. The combination of affordable production costs and simple manufacturing and multiple uses and extensive product options makes single-use plastics the preferred choice for numerous businesses. Single-use plastics continue to dominate worldwide plastic production despite their widespread use.

The transition from single-use plastics needs businesses and governments and individual consumers to work together as a single unit. New solutions for replacement materials exist but they have not gained widespread acceptance. The combination of high production costs and insufficient recycling facilities and people's preference for disposable products leads to a slow transition toward sustainable alternatives. The world implements bans and taxes and extended producer responsibility schemes and educational programs to speed up the transition toward sustainability.

In conclusion, getting rid of single-use plastics is tough, but it is a very important matter, if we want to tackle pollution. This shift needs innovative ideas and collaboration and partnership between member states. Not only do we need to improve our technology, but also the way

we think through and our community. We are steadily on our way to a world with less plastic, but we are far from done.

Major parties involved

United Nations Environmental Programme (UNEP) - UNEP is important because it **leads global environmental action**, coordinates international agreements, and provides scientific assessments on plastic pollution. It supports negotiations for a **global treaty to end plastic pollution**, guides countries on sustainable policy, and raises worldwide awareness. UNEP helps unify nations so that plastic reduction efforts are consistent and effective across borders.

European Union (EU-commission – Environment Directorate-General) - The Environment Directorate-General of the EU Commission plays a vital role as it formulates some of the most stringent plastic regulations globally, which encompass prohibitions on numerous single-use plastics throughout all EU member states. Furthermore, it formulates strategies aimed at promoting a circular economy, sets recycling targets, and influences global standards. Considering that the EU represents a major economic entity, its policies exert a direct impact on international markets and motivate companies to adopt more sustainable materials.

Timeline of Key Events

1973 – Invention of the PET plastic bottle, causing an increase in plastic beverage packaging.

1989 – The regulation of transboundary movement of hazardous waste is adopted by the Basel Convention.

1997 – Discovery of the Great Pacific Garbage Patch.

2010 – UNEP report highlights plastics as one of the top environmental concerns.

2017 - "**Plastic Free July**" movement becomes globally recognized.

2018 – The EU proposes the Single-Use Plastics Directive.

2019 - The **Basel Convention** to control plastic waste exports.

2021 - EU **formally bans many single-use plastics.**

2022 - UN Environment Assembly agrees to develop a legally binding global treaty to end plastic pollution by 2024.

Previous attempts to solve the issue:

1. Policies and regulations have been wielded by governments of both countries and cities, such as bans or taxes to discourage use of plastic bags. Moreso the EU implemented Extended Producer Responsibility (EPR), a regulation that shifts the waste-management responsibility from governments to manufacturers. This way the manufacturers carry the responsibility for the entire life cycle of the products they produce including waste collection and recycling. Many countries also implemented Deposit Return Schemes (DRS), where you pay a deposit on recyclable bottles and cans. Once you put the bottles or cans in the recycling bin, your deposit will be refunded. Making use of these programs provide 70-95% recycling rates.
2. Currently we are working hard on both technical and industrial innovations. We see a lot of progression around biodegradable, compostable and reusable packaging, such as refillable bottle programs and the developing of materials made of durable products. While there is no way that these products can completely replace plastic, because of costs and performance issues, they are coming up a lot more and aim to completely replace plastic packaging in the near future. Actions executed in the past, like the closed-loop systems, are becoming more common. By looking further into advanced ways of recycling, such as chemical recycling, we can reuse many more kinds of plastic that cannot be mechanically recycled.
3. Movements have been initiated to raise awareness and do something about our plastic usage by both non-governmental organisations and local communities. Think about Plastic Free July, which challenges us to reduce plastic waste, and zero-waste communities, that promote durable ways of living. Coastal cleanup campaigns are organised all over the globe to prevent plastic waste from entering the ocean. If we look on a smaller scale, there are schools that set an example by implementing reusable lunchbox programs or ban plastic cutlery. There are also many social media campaigns that push greener consumer behaviour, which is an accessible way to inform civilians.

Possible solutions

1. Replace single-use plastics with biodegradable and composable alternatives;
2. Phase out non-essential single-use items through bans and regulations;
3. Increase development on recycling infrastructure and technology;
4. Conduct large-scale public awareness campaigns.

Further Readings

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