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Plastics in the Environment: Understanding Impacts and Identifying Solutions

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Abstract: *Plastics are one of the most used materials in the world. They are broadly integrated into today's lifestyle and are present in almost all product areas. Unfortunately, one of the characteristics of plastics that make them so useful – durability – also enables them to persist in the environment for very long periods of time. Additionally, because of their low cost, many plastic objects have long been perceived as disposable. The result is the ubiquitous presence of plastic debris all over the planet. Close attention has been paid over the years to the increasing amount of plastics in the oceans and to their adverse effects on marine fauna. The earliest discoveries of plastic debris inside dead marine birds as well as the first attempts to quantify floating plastic debris in the western North Atlantic Ocean date back more than 40 years. Since then, a large number of studies has documented their increasing prevalence and undesired effects, with a recent exponential increase in attention to microplastics.*

Keywords: Plastics, Environment and Solutions

I. INTRODUCTION

Plastics are one of the most widely used materials in the world which society will always be dependent on. This dependency has been clearly highlighted by the requirements for hygiene and protection during the recent global COVID pandemic. Plastics are broadly integrated into today's lifestyle and are present in almost all consumer and industrial sectors and their production continues to increase.

Unfortunately, one of the characteristics of plastics that make them so useful—their durability—also ensures that they persist in the environment for very long periods of time. Additionally, and because of their low cost, many plastic objects have long been perceived as disposable. The consequence of this, coupled with the difficulty in developing effective waste management strategies, has been the ubiquitous contamination of the entire planet by plastic debris.

Research on plastics is now an extremely dynamic field involving a great deal of funding and effort. There are calls to integrate and introduce more biodegradable or recyclable plastics into the market, in order to shift towards more sustainable supply chains, but there some debate about which solutions make the most sense economically and sustainably. There is also concern about some additives used in plastics, many of which are endocrine disrupting substances or otherwise harmful to the environment if released from the material. Plastics are complex matrices and understanding their complete life cycle and the (eco)toxicological implications of their extensive use is a very much needed, albeit difficult, task. We would like to welcome contributions covering all aspects of plastic research in this Research Topic in Frontiers in Environmental Science. A global, transdisciplinary problem requires a global, transdisciplinary response

Even if proposed global actions to recycle more plastic or prevent the export of plastic waste to countries with poorly developed waste infrastructure through the Basel Convention are implemented, plastic emissions are expected to increase for the foreseeable future unless significant breakthroughs in plastic design or waste management are realized. Increasing emissions also imply that exposure to plastic pollution and its degradation products, like microplastics, nanoplastics, plastic additives, and other chemical leachates, will continue to increase. Such an accumulating plastic cocktail can result in complex and unpredictable impacts, including those on ecological processes (Rillig et al., 2021) or the global carbon cycle.

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II. METHODOLOGY

The solutions are complex and include improving regulation, ramping up recycling and introducing incentives to encourage a reduction in virgin plastic production. But experts say there are several things everyday people can do to help tackle the mounting toll plastic is taking on the environment.

If someone is looking to break your addiction to plastic, take these simple steps.

Adopt a circular lifestyle

Embrace what's known as circularity, the idea that products – and the materials that go into them – should be reused instead of being thrown away.

Invest in sustainable, ocean-friendly products, like reusable coffee mugs, water bottles and food packaging. Also check out options like reusable nappies and menstrual products, bamboo toothbrushes and solid shampoos. You could save money and protect the oceans and climate at the same time.

Try to reduce your plastic footprint by choosing food without plastic packaging and bringing a reusable bag. Some shops now have plastic-free aisles and many offer loose produce or use dispensers and refillable containers. Use your own coffee mug when out and about instead of accepting a plastic one. And, of course, ditch the plastic straws and stir sticks. When shopping online, look for options that will allow you to opt out of plastic packaging.

Plastic is everywhere: it's in parks, rivers and on beaches. Join global and local movements, such as World Cleanup Day, or organize a cleanup yourself. If you jog, become a 'plogger' and pick up any litter you see on your way (all the while observing COVID-19 hygiene protocols). Some 80 per cent of marine litter originates on land and in rivers.

III. LITERATURE REVIEW

According to the main systematic literature review methodology, different types of questions were formulated, in order so that it can be schematic and to get a broad view about the evolution of green chemistry research.

The selected articles were analyzed through different criteria, were divided into different clusters, according to purposes, impacts and scope of each research.

Although the problem of plastic pollution was recognised several decades ago, research on plastics lost to the environment and their environmental and health impacts is now an extremely dynamic field involving a great deal of funding, support and effort. As an attempt to find solutions, there have been calls to integrate and introduce more biodegradable or recyclable plastics into the market in order to shift towards more sustainable supply chains. There is also some debate about which solutions make the most sense practically and economically, although it is likely that a combination of approaches may be required. An additional concern centres around the additives used in plastics, many of which are endocrine disrupting substances or otherwise harmful to the environment if released from the material.

Chemical regulators, and particularly those in Europe, have become increasing active to make plastics safer and more recyclable, but clearly plastics are complex and diverse materials and understanding their complete life cycle and the (eco)toxicological implications of their extensive use and management is a highly justified, albeit difficult, task.

IV. RESULT AND DISCUSSION

The more you recycle the plastic, the less plastic waste will be deposited in soil and seawater. Pollution of seawater is a significant concern in front of the modern world. Keeping immense benefits of reducing plastic waste in mind, innovative techniques are being used to recycle plastic quickly and sustainably.

In the production of plastic from scratch, oil is burnt. This burning of oil increases the emission of greenhouse gases into the environment and surroundings. This emission is the cause of growing pollution. Plastic production also contaminates soil and water. It is harmful to animals and plants as well.

Many resources are being used to manufacture plastic, such as energy, water, oil, coal, natural gases, etc. All these resources can be saved by recycling the existing plastic waste. Moreover, the resources and energy saved by recycling plastic can be used to produce other essential products.

By opting for recycling, you can manage your plastic waste in a better way with reduced cost. You can always use waste equipment rentals to sort and manage recyclable and non-recyclable plastic waste. This will save you huge prices, which you usually pay for plastic waste disposal.

Creation of Eco-friendly Community of Customers & Team Members

V. CONCLUSION

Plastics offer considerable benefits for the future, but it is evident that our current approaches to production, use and disposal are not sustainable and present concerns for wildlife and human health. We have considerable knowledge about many of the environmental hazards, and information on human health effects is growing, but many concerns and uncertainties remain. There are solutions, but these can only be achieved by combined actions (see summary table 1). There is a role for individuals, via appropriate use and disposal, particularly recycling; for industry by adopting green chemistry, material reduction and by designing products for reuse and/or end-of-life recyclability and for governments and policymakers by setting standards and targets, by defining appropriate product labelling to inform and incentivize change and by funding relevant academic research and technological developments. These measures must be considered within a framework of lifecycle analysis and this should incorporate all of the key stages in plastic production, including synthesis of the chemicals that are used in production, together with usage and disposal.

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