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How biodegradable plastics can help to solve plastic pollution and accumulation

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In just over 60 years since the world began to produce plastic products in earnest, close to 5 billion tonnes of plastic has been produced and this volume is set to exponentially increase. Almost all of this plastic is still present in one form or another and is accumulating both on land and in the oceans. It is imperative that plastic pollution and accumulation is reduced. One proposed solution is biodegradable plastics. However, there is a debate surrounding their ultimate role in solving plastic waste accumulation and assisting the transition towards a circular economy. The purpose of this review is to objectively review both sides of the debate so as to present a considered conclusion. The review focuses on a number of key points such as the need to challenge aspects of the debate that revolve around factors, which while having some basis, can be addressed. These include the perceived lack of true biodegradability in the marine environment, the perception that biodegradable plastics cannot readily be recycled, and the concern for emissions of methane when disposed of in anaerobic landfills. Discussion also touches upon the implications of the limited mechanical recycling lifetime of all plastic materials. The conclusion is that biodegradable plastics are a part of the solution to waste accumulation but that their efficacy will depend on the co-emergence of affordable waste sorting technology and investments in organic waste handling facilities (compost and anaerobic digestion). Significantly, this work develops the idea that there are a range of target plastic products and materials where substitution with biodegradable plastics would be the most effective way to address the issue of plastic solid waste accumulation. These can be determined by considering material flows and identifying the materials most likely to be mismanaged or not practically recyclable.

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