



INTRODUCTION

The healthcare industry generates ~4-5% of global greenhouse gas emissions.¹ As part of their commitment to improving human health, pharmaceutical and MedTech companies are beginning to develop products and processes that prioritize sustainability. This shift has yielded early successes but is still in its initial phases; continued investment here can benefit both global health and manufacturers' bottom line.

OBJECTIVES

This targeted literature review aims to identify successful examples of recent implementation of sustainability initiatives in the pharmaceutical and MedTech industries, as well as opportunities for continued progress. Categorized by their place in the product lifecycle, these can serve as case studies for industry learning and demonstrate the value of prioritizing a shift toward sustainable practices and aligning strategy with emerging green regulatory initiatives.

METHODS

Literature published between June 2020 and 2023 was identified from PubMed, Embase, and Google, focusing on pharmaceutical and MedTech companies' environmental impact and sustainability efforts, as well as the implications of these initiatives. Peer-reviewed literature, industry publications, and company-generated reports were captured. Search terms included "pharmaceutical", "environmental impact", "initiatives," etc.

RESULTS

Industry Environmental Impact

Pharma generates **>50% more emissions per dollar of revenue than the automotive industry**²

Pharma manufacturing is **water-intensive**³, and generates significant levels of **waste-water**⁴

Recyclability is limited, with pharmaceutical products producing **>100,000 tons of trash globally annually**⁵

If unchecked, sector emissions have been projected to grow by

3x by 2050⁶

Environmental Degradation Leads to Declining Human Health

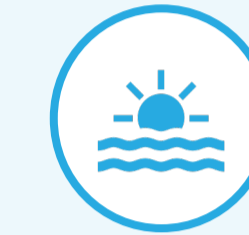
The World Health Organization predicts

250,000

global excess deaths per year attributed directly to climate change, 2030-2050⁷



Vector-borne



Heat-related



Non-communicable diseases (NCDs)



Respiratory



Water-borne/related



Extreme Weather-related

Strides Being Made: Success Stories

- A total of 16 sources covering the pharmaceutical and MedTech industries' environmental footprint and initiatives to improve sustainability were identified, including high-impact case studies focusing on success stories from across the product life cycle⁸
- Early actors in pharma and MedTech are starting to look beyond carbon emissions and corporate sustainability standards to examine water use, raw materials sourcing, and waste generation resulting from choices in the R&D process, product manufacturing, and packaging/disposal decisions

	Research & Development	Materials Sourcing	Manufacturing	Packaging	Distribution & Storage	Use & Disposal
Initiative	Partnered with My Green Lab to reduce environmental impact, including the lab's Freezer Challenge ⁹	Aims to reduce non-renewable components within their products, devices, and packaging ¹⁰	Sanofi EVolutive Facilities in France have digitalized and "greened" vaccine and biological manufacturing by going paperless and are aiming carbon neutral ¹¹	Implemented a "SMASH Packaging" strategy, optimizing resources and using sustainable materials that maximize recycling potential ¹²	Shipping and storage needs for Merck's products generate fewer emissions than competitors', due to less packaging & energy need ¹³	Philips's EcoDesign initiative focuses on device energy efficiency, raw materials use, and recyclability ¹⁴
Impact	Yielded over 1 million kWh/year in energy savings through initiatives ⁹	Targeted elimination of PVC in packaging by 2025 and plastic neutrality by 2030 ¹⁰	Lowered environmental footprint with renewable electricity and energy; commitments of 100% renewable energy sourced by 2030 ¹¹	Reductions in packaging size and weight have yielded fewer carbon emissions ¹²	One unit of Allergan's Botox® generates ~100x the emissions of Merz's Xeomin® due to differences in cold chain handling and packaging needs ¹³	EUR 1.63 billion in savings realized in 2022, and these standards will be used in all new product development by 2025 ¹⁴

DISCUSSION, LIMITATIONS, AND CONCLUSION

Discussion

Environmental sustainability improvement in pharmaceutical and MedTech manufacturing is gaining traction, but slowly. While we have identified initial success stories here, these initiatives are still nascent and do not holistically address the industry's environmental impact – continued attention is required. Beyond benefitting the planet, sustainability goals are beneficial to industry: they bring cost savings, make companies more attractive to shareholders, payers, investors, & consumers,¹⁵ and mitigate risk from future legislation.^{16,17,18}

Limitations

Examples of success stories and records of their specific impact were challenging to find; many focused on general corporate sustainability rather than initiatives specific to the life sciences and pharmaceutical/MedTech product life cycle. The case studies outlined here are based on company-reported publications rather than peer-reviewed literature, so have not been independently verified. Due to the nascency of these initiatives, consistent metrics for outcomes measurement often do not exist, making direct comparisons difficult.

Conclusion

These initial success stories may signal a shift to a wider recognition of the criticality of sustainability and its associated business benefits across the industry. Sustainability is becoming a valuable commercial factor and represents an opportunity to drive uptake and regulatory approval in regions with carbon neutrality goals and in markets with limited differentiation otherwise. Future research on these initiatives should seek to understand return on investment and identify the most impactful opportunities across the product life cycle.

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