

Article title	Dissipation and Recycling: What Losses, What Dissipation Impacts, and What Recycling Options?
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Abstract	<p>This chapter describes the activities in the Dissipation and Recycling Node of Global TraPs, a multistakeholder project on the sustainable management of the global phosphorus (P) cycle. Along the P supply and demand chain, substantial amounts are lost, notably in mining, processing, agriculture via soil erosion, food waste, manure, and sewage sludge. They are not only critical with respect to wasting an essential resource, but also contribute to severe environmental impacts such as eutrophication of freshwater ecosystems or the development of dead zones in oceans. The Recycling and Dissipation Node covers the phosphorus system from those points where phosphate-containing waste or losses have occurred or been produced by human excreta, livestock, and industries. This chapter describes losses and recycling efforts, identifies knowledge implementation and dissemination gaps as well as critical questions, and outlines potential transdisciplinary case studies. Two pathways toward sustainable P management are in focus: To a major goal of sustainable P management therefore must be to (1) quantify P stocks and flows in order to (2) identify key areas for minimizing losses and realizing recycling opportunities. Several technologies already exist to recycle P from different sources, including manure, food waste, sewage, and steelmaking slag; however, due to various factors such as lacking economic incentives, insufficient regulations, technical obstacles, and missing anticipation of unintended impacts, only a minor part of potential secondary P resources has been utilized. Minimizing losses and increasing recycling rates as well as reducing unintended environmental impacts triggered by P dissipation require a better understanding of the social, technological, and economic rationale as well as the intrinsic interrelations between nutrient cycling and ecosystem stability. A useful approach will be to develop new social business models integrating innovative technologies, corporate strategies, and public policies. That requires intensive collaboration between different scientific disciplines and, most importantly, among a variety of key stakeholders, including industry, farmers, and government agencies.</p>
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