# Linking phosphorus research to impact: advances and challenges in mapping soil phosphorus pools

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# Linking phosphorus research to impact: advances and challenges in mapping soil phosphorus pools

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Improved management of phosphorus (P) is essential for achieving a range of Sustainable Development Goals (SDGs), including maintaining food security, preserving water quality, and mitigating climate change. This requires an integration of comprehensive mechanistic understanding with accurate spatial data. In this interdisciplinary review, we combine insights from empirical P research, digital soil mapping, biogeochemical modeling, and environmental law to critically examine the current state, pinpoint challenges and propose novel pathways for desperately needed P maps. We first elucidate the relevance of spatial data on P for different SDGs. Subsequently, we summarize the current efforts in mapping P pools at regional to global scales, and discuss the challenges of mapping "available P" due to substantial local scale variability and poor correlation with predictors relative to other soil properties. The practical applicability of these recently published maps is tested by evaluating them with independent measurement data. Finally, we outline ways forward to enhance the accuracy and reliability of P maps, as a basis for science-informed management of P resources.