



Anno 2015: Phosphorus recovery potential from wastewater for agricultural reuse

Dirk-Jan Kok and Saket Pande

Department of Water Management, Delft University of Technology, Delft, Netherlands

Phosphorus is important to the global food security. It is an element necessary for the development of crops, and is thus applied in the form of synthetic fertilizers to sustain agricultural production. Phosphorus occurs naturally at globally uncertain quantities in phosphate rock formations. It also concentrates itself in waste and wastewater from urban areas and livestock industries wherefrom it is often lost as a pollutant. Analysing the phosphorus recovery potential from wastewater in meeting partial agricultural demand can be an important tool in tackling both phosphorus pollution as well as phosphorus depletion from natural sources. In this study, phosphorus consumers and potential producers are connected in an alternative, phosphorus trade network through a model that considers recovery potentials, recovery costs and distances between the actors. The results reveal that 3.7 Mt of phosphorus can maximally be recovered from urban sites, satisfying 20% of the estimated global fertilizer consumption. However, only 11% of fertilizer consumption can be accommodated through P-recovery in an economically competitive manner. This recovery is most competitive in parts of Asia and South America, where population densities of humans and livestock is high and occurs at close proximity to agricultural demand sites that are situated relatively far from phosphate mines. These potentials along with the network maps show that phosphorus recovery from wastewater can contribute substantially to creating sustainable communities and fixing a broken phosphorus cycle.