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Engineering
EyobuNjineli
Ingenieurswese



Dr Caitlin Courtney~ Civil/Water Engineering

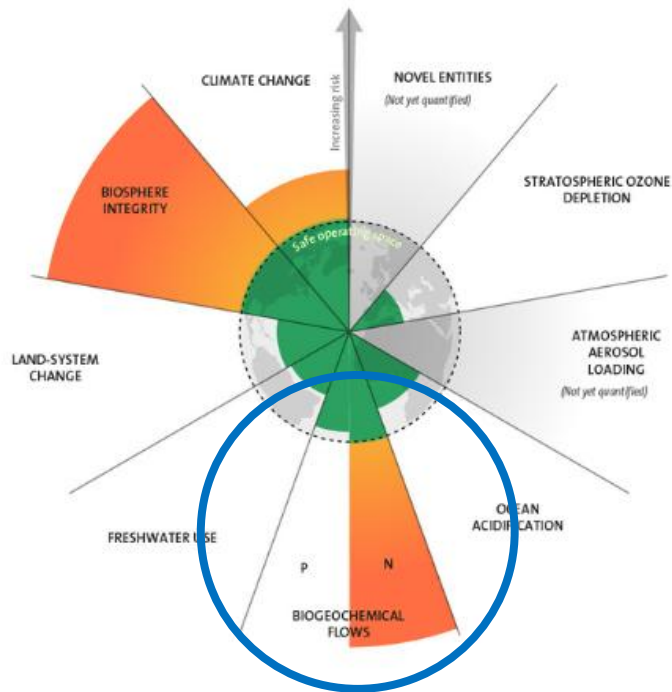
Water Without Waste: Reimagining Treatment, Reuse, and

Resource Recovery

Industry Showcase 2026

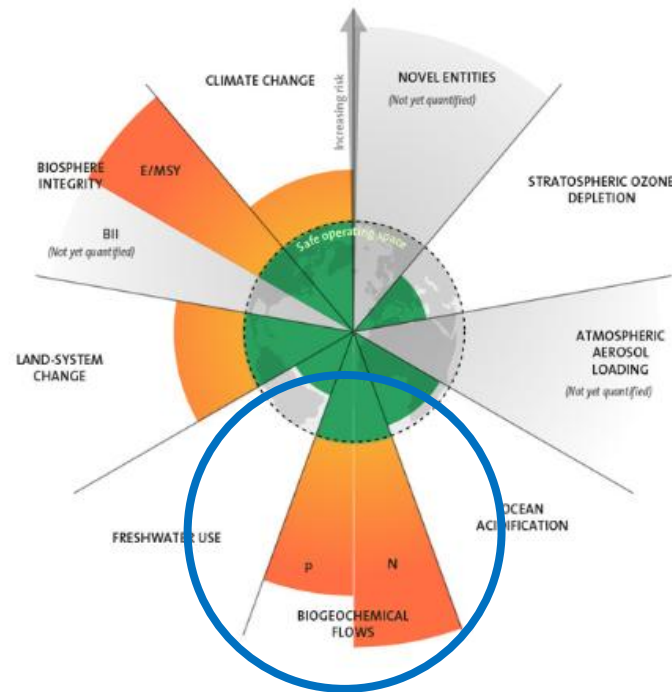
Planetary boundaries

2009



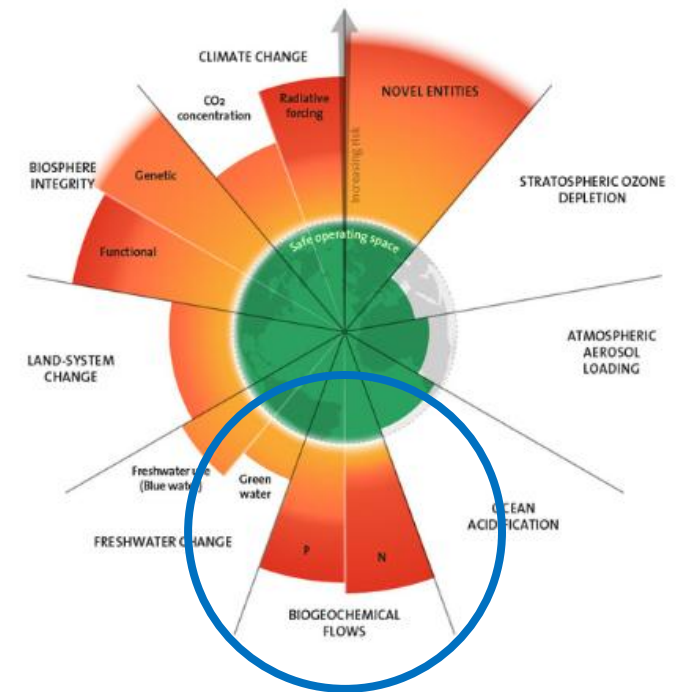
7 boundaries assessed,
3 crossed

2015



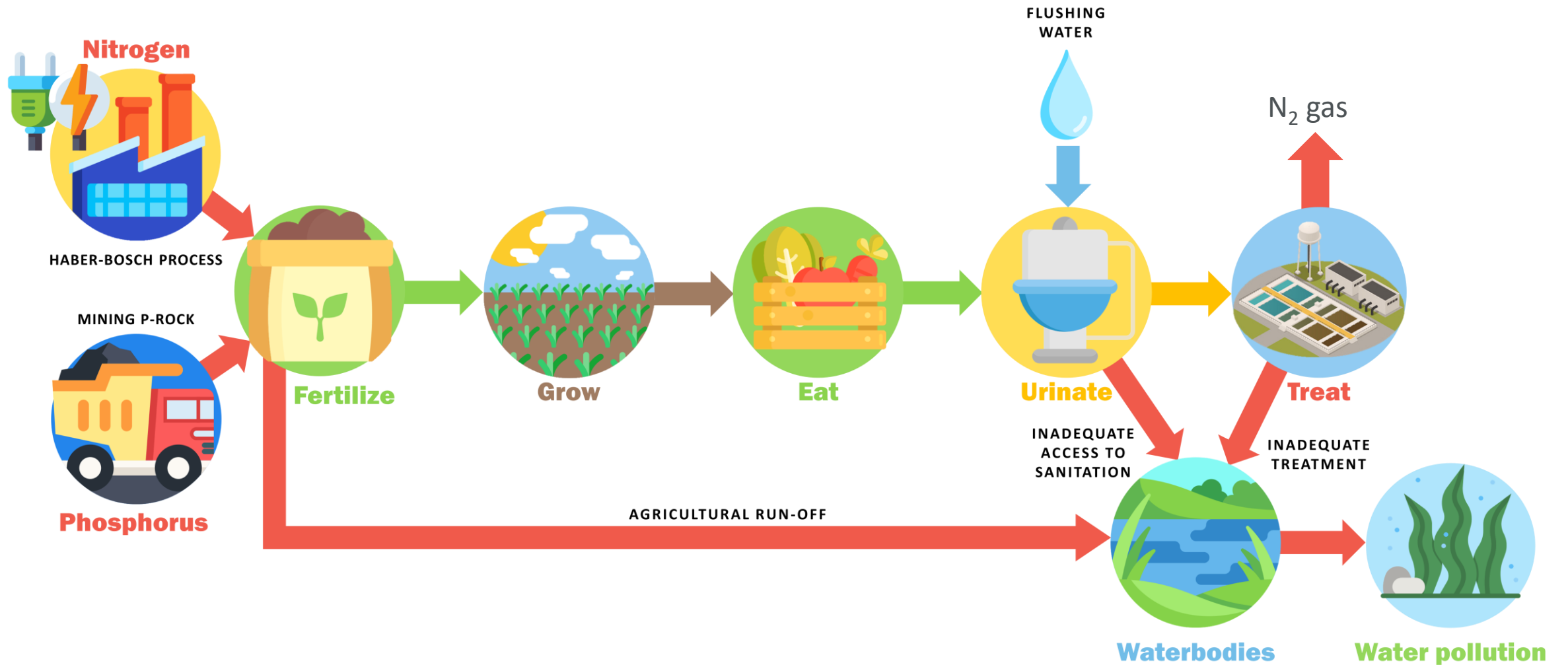
7 boundaries assessed,
4 crossed

2023



9 boundaries assessed,
6 crossed
Stockholm Resilience Center

The Status Quo: Nutrient cycle



The Status Quo: Sanitation, Wastewater Treatment, & micropollutants



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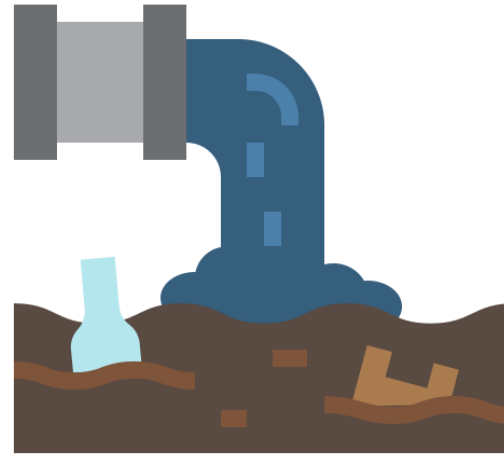
forward together
sonke siya phambili
saam vorentoe



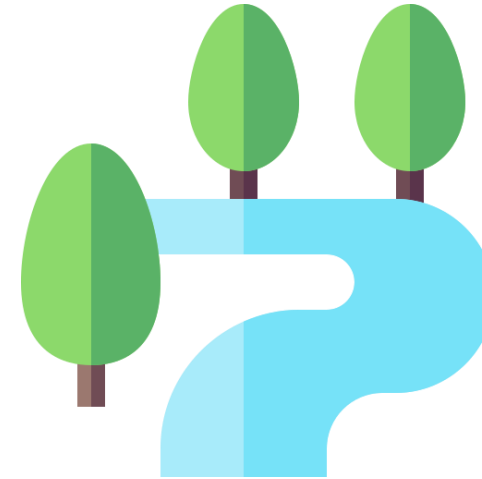
BASIC SANITATION
1.5 billion people
don't have access



OPEN DEFECATION
419 million people
defecate in the open



GLOBAL WASTEWATER
44% of domestic
wastewater is not
adequately treated



WASTEWATER REUSE
RSA is expected to
face 17% water
deficit by 2030



MICROPOLLUTANTS
Only 30% of
micropollutants are
removed in WWT

Research focus areas



Non-sewered sanitation

Treatment technologies for decentralised and off-grid contexts, including urine-diverting systems



Resource recovery

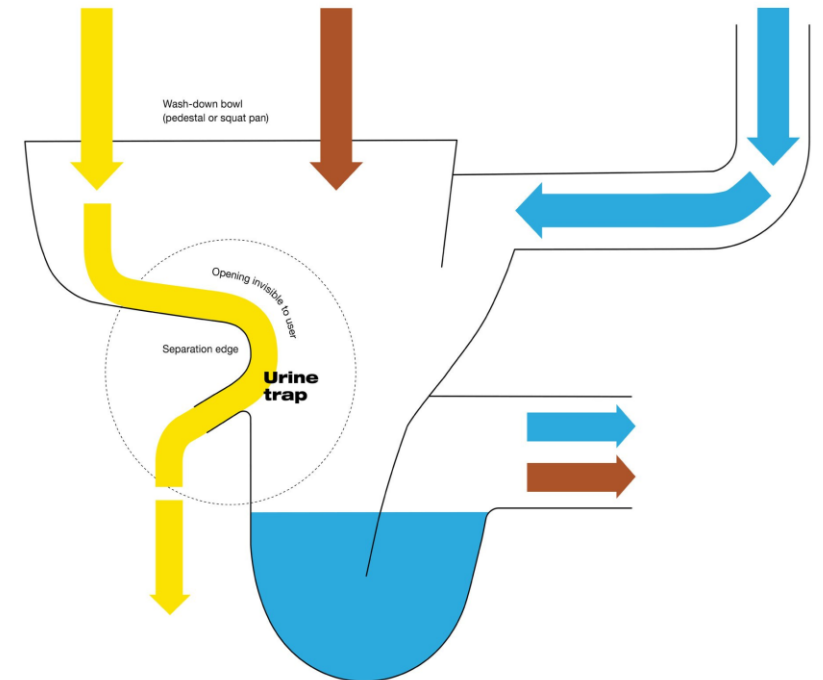
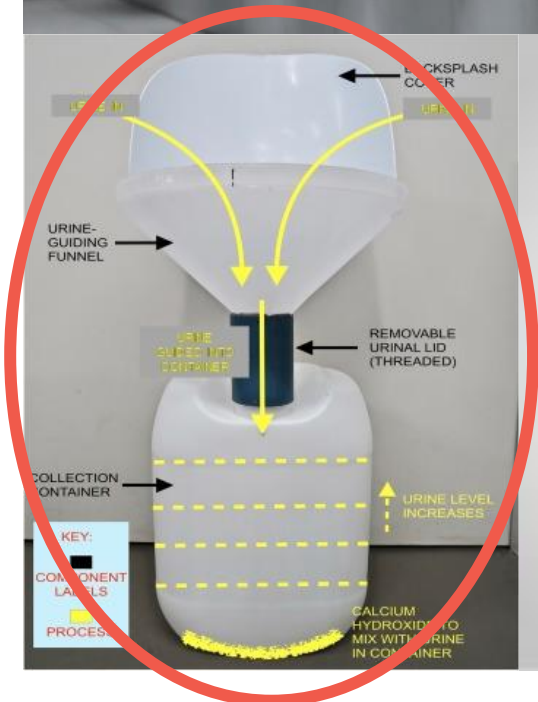
Recovering nutrients (N, P, K) and water for reuse



Micropollutant removal

Targeted removal of pharmaceuticals, pesticides, and industrial contaminants from wastewater

Urine Diversion and Collection Systems



Resource Recovery Options

Liquid Fertilizers



Concentrated liquid urea



Ammonium nitrate

Solid Fertilizers

Calcium Phosphate

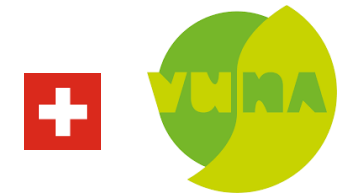


Struvite ($\text{NH}_4\text{MgPO}_4 \cdot 6\text{H}_2\text{O}$)



100% dehydrated urine

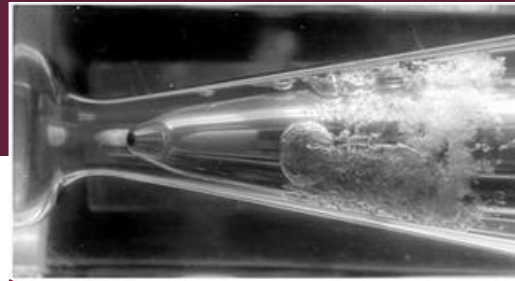
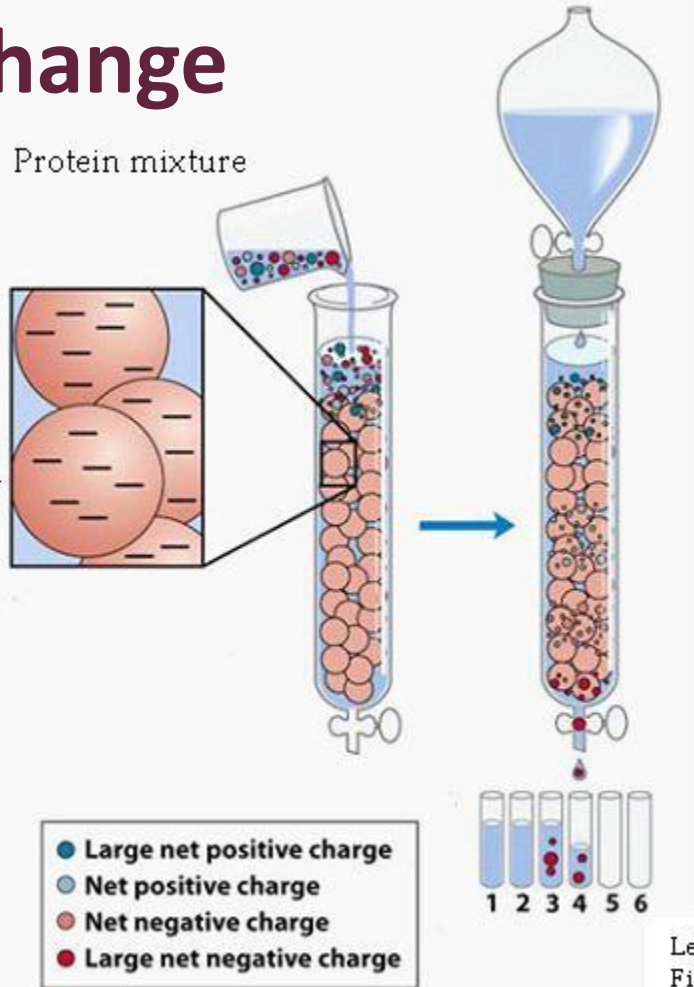
Urine recycling companies around the world



Micropollutant removal

Ion Exchange

Polymer beads with negatively charged functional groups



Hydrodynamic Cavitation





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Thank you
Enkosi
Dankie