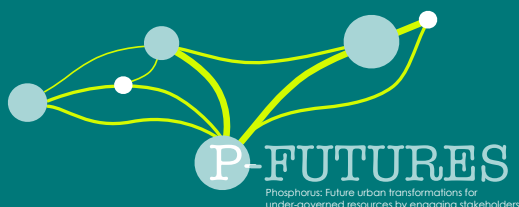


Integrating sustainable phosphorus management into urban decision-making and planning

Blantyre workshop

Centre for Water, Sanitation, Health and Appropriate Technology Development (WASHTED)
University of Malawi – The Polytechnic

9th February 2015



Introduction:

Blantyre workshop

Centre for Water, Sanitation, Health and Appropriate Technology Development (WASHTED)

University of Malawi – The Polytechnic

9th February 2015



International Research Partners



MALAWI: Centre for Water, Sanitation, Health and Appropriate Technology Development (WASHTED), University of Malawi




VIETNAM: Institute of Environmental Science and Engineering National University of Civil Engineering



U.S: Global Institute of Sustainability, Arizona State University



AUSTRALIA: Institute for Sustainable Futures, University of Technology Sydney



Funded by:




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ISSC
international social science council

Endorsed by:

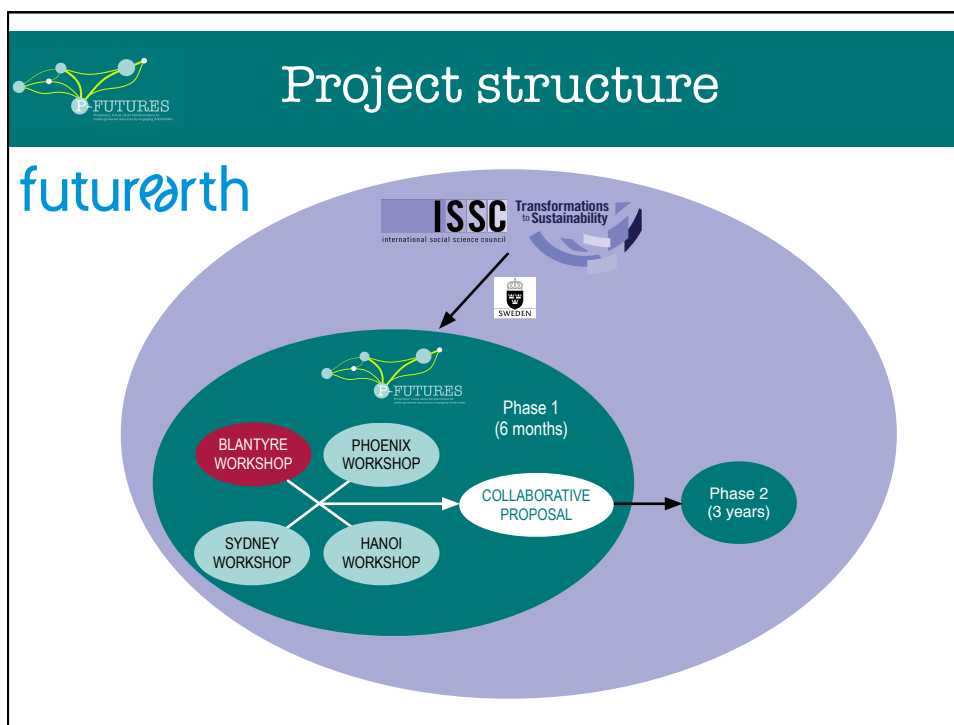





Overarching Project Goals

Together figure out what do we need to do to build sustainable cities in terms of food, water & waste in a rapidly change world

- Facilitate cities in transforming how they govern phosphorus, taking into consideration the unique **local context**, synergies with other **local sustainability goals**, and **global phosphorus security goals**.
- Co-develop a **sustainable urban phosphorus framework** with our partner cities (Blantyre, Phoenix, Hanoi and Sydney)
- Guide transformation towards phosphorus sustainability through building **capacity** and small-scale **projects**.






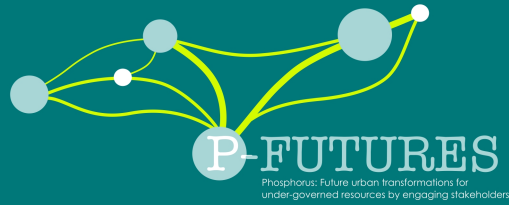
Workshop objectives

Specific objectives for this workshop are to:

- Explore **risks and vulnerabilities** for Blantyre to the **global phosphorus challenge** (such as fertilizer price spikes, algal blooms, growing food demand, inefficient sanitation infrastructure, etc.)
- Explore **opportunities** for Blantyre to **effectively adapt** to such challenges, taking into account Blantyre's future visions and existing plans.
- Contribute to **shaping the research agenda** for a larger three-year project in all four cities (Blantyre and other three cities) to develop tools to transform the way cities manage phosphorus

 <h2>Workshop agenda</h2>	
Time	Program
08:30 – 09:20	Registration
09:20 – 09:50	Welcome and Introduction
09:50 – 10:30	Global phosphorus scarcity and pollution
10:30 – 11:00	Tea/Coffee Break
11:00 – 12:00	Blantyre's priorities related to food security, water quality and sanitation goals and global vulnerabilities
12:00 – 13:30	Lunch Break 
13:30 – 14:10	International case studies of solutions to phosphorus challenges
14:10 – 15:30	Future pathways for Blantyre
15:30 – 16:00	Tea/Coffee Break
16:00 – 16:30	Wrap-up and Design future collaboration and feedback

 <h2>Activity</h2>	
<p>What would be your P-FUTURES slogan?</p> <p>E.g.</p> <p>P-FUTURES: Solid waste management transforms lives Silver water, golden maize</p>	
	



The Global P Challenge:

Too Little and Too Much



The Global P Challenge

Too Little and Too Much

**Scarcity
(too little)**



**Pollution
(too much)**





Phosphorus

Essential to all living organisms (plants, animals, bacteria)

No substitute in food production, cannot be 'manufactured'

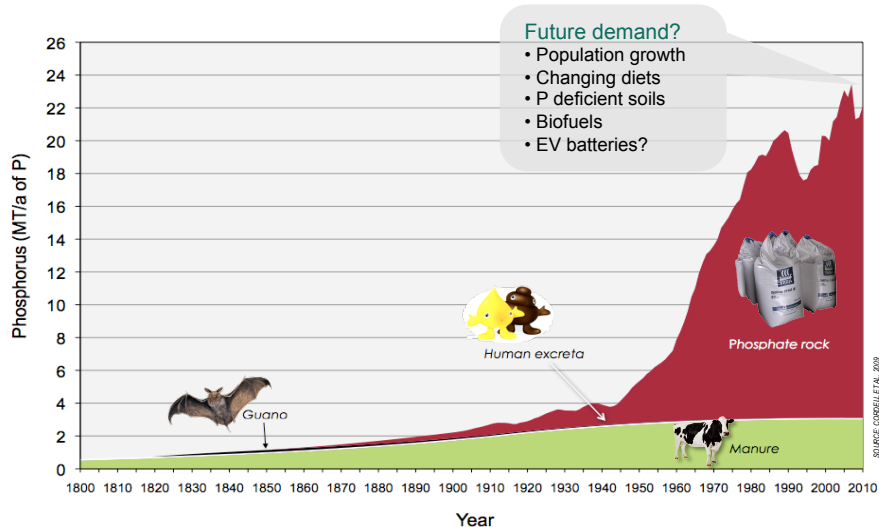
Chemical fertilizers (N,P,K) have contributed to feeding billions by boosting crop yields

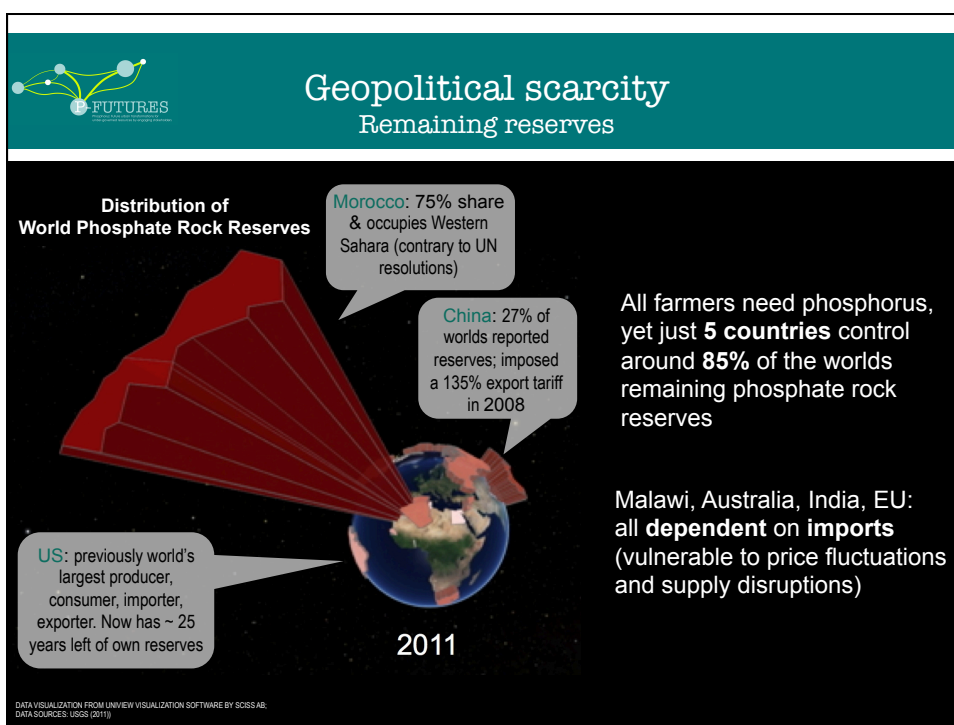
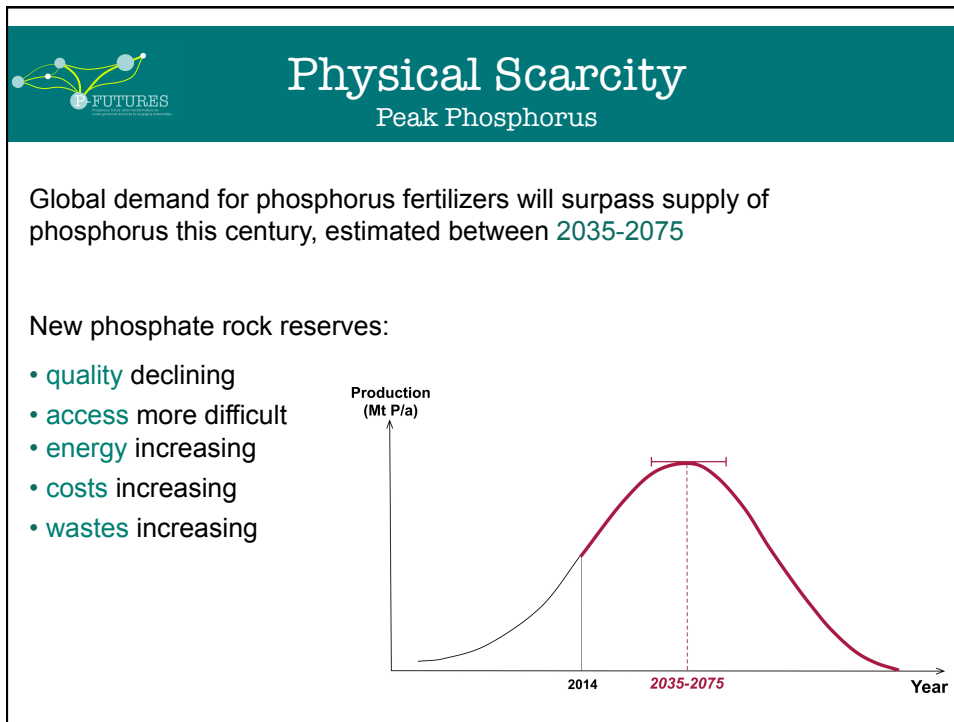
Modern agriculture dependent on phosphate rock – non-renewable, high quality reserves becoming scarce

2008 phosphate price spike:
US\$50/tonne to US\$430/tonne



Dependence On Phosphate Rock







Economic scarcity

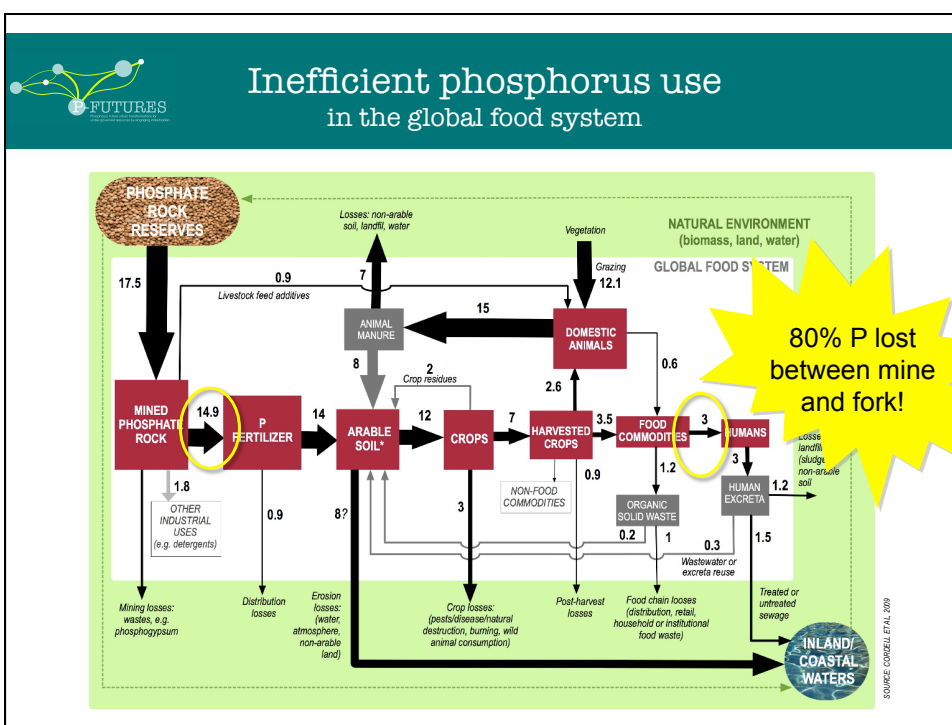
Lack of access to phosphorus


Farmers need both short- and long-term **access** to fertilizers

Almost a **billion** farmers lack purchasing power to access fertilizer markets

'**Silent**' demand from farmers with low purchasing power in sub-Saharan Africa, where soil fertility is low & food insecurity



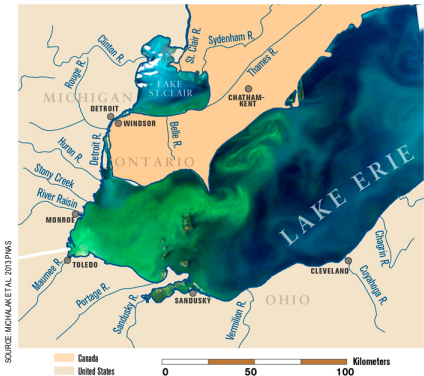






The Global Challenge

Too much

- Losses can cause **aquatic pollution** in lakes and coastal areas
- Algal blooms caused by too much P can pollute drinking water and be **toxic** to humans
- **Loss of oxygen** from algal blooms can destroy fisheries and negative affect recreation and amenities



SOURCE: MONA/METAL 2013 PWS




Losses from many sources

Concentrated and diffuse

Losses of phosphorus that cause problems can come from:

- **Runoff and erosion** from fields, gardens, and lawns
- **Sewage** that is not properly treated
- **Animal manure** if it is not properly contained
- **Detergents** and other products that are in urban water



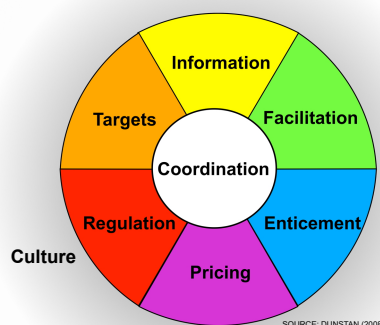


Lack of effective P governance

There are currently no international or national policies, guidelines or organisations responsible for ensuring long-term **availability** and **accessibility** of phosphorus for food production



3RD SUSTAINABLE P SUMMIT, 2012



Phosphorus Vulnerability

All counties are exposed to the same global phosphorus drivers (e.g. fertilizer price spikes)

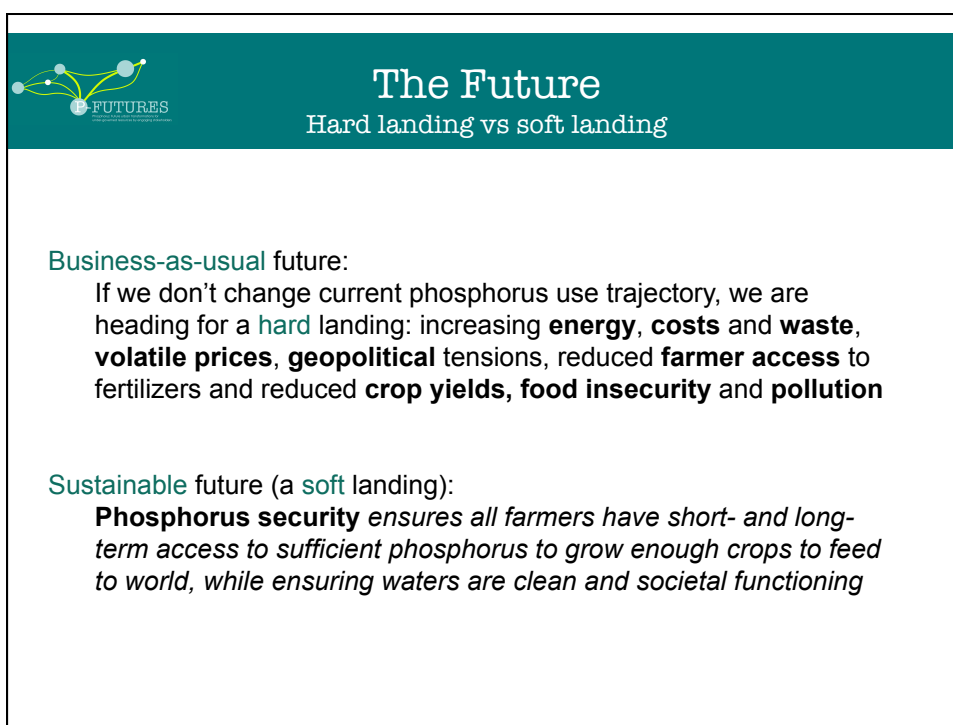
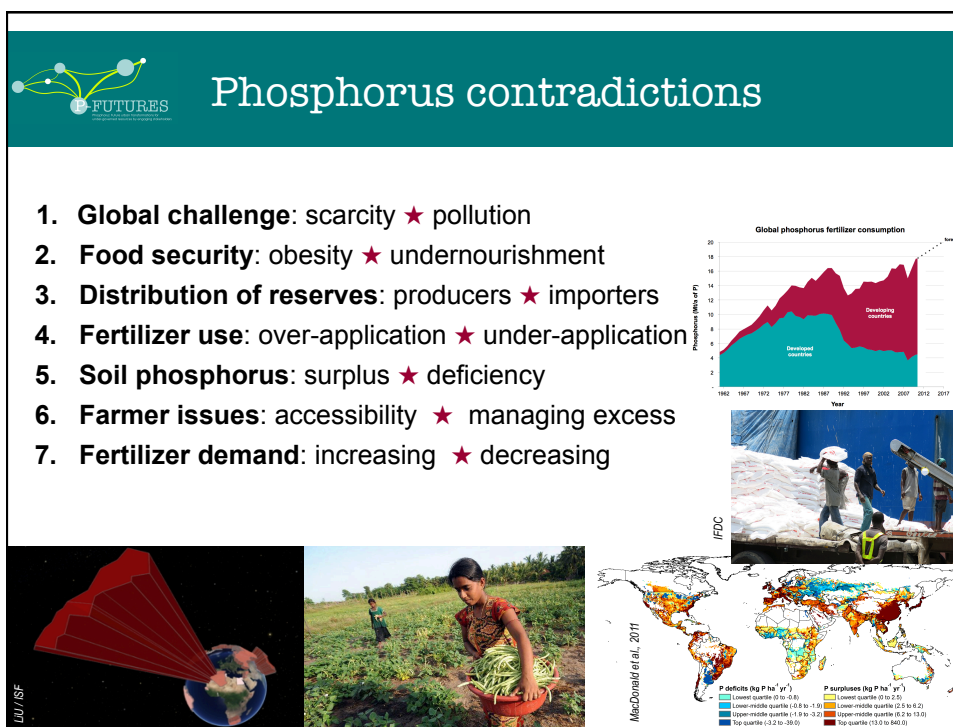
But how we cope or respond depends on our **capacity** to adapt and transform and **local conditions** (e.g. access to resources like fertilizer subsidies or information, soil fertility, state of infrastructure)

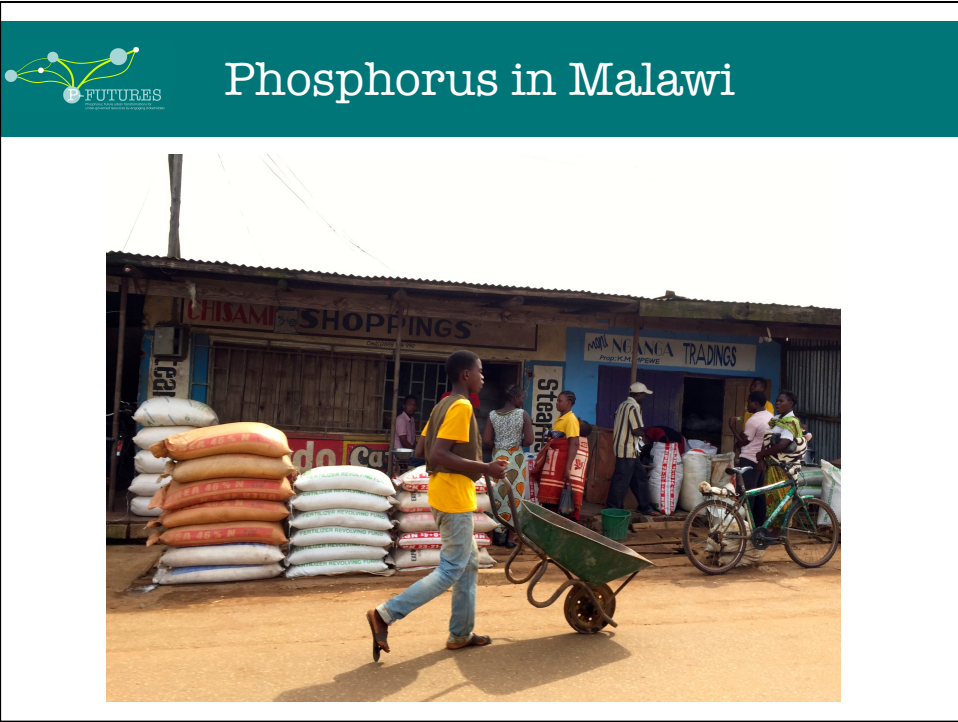
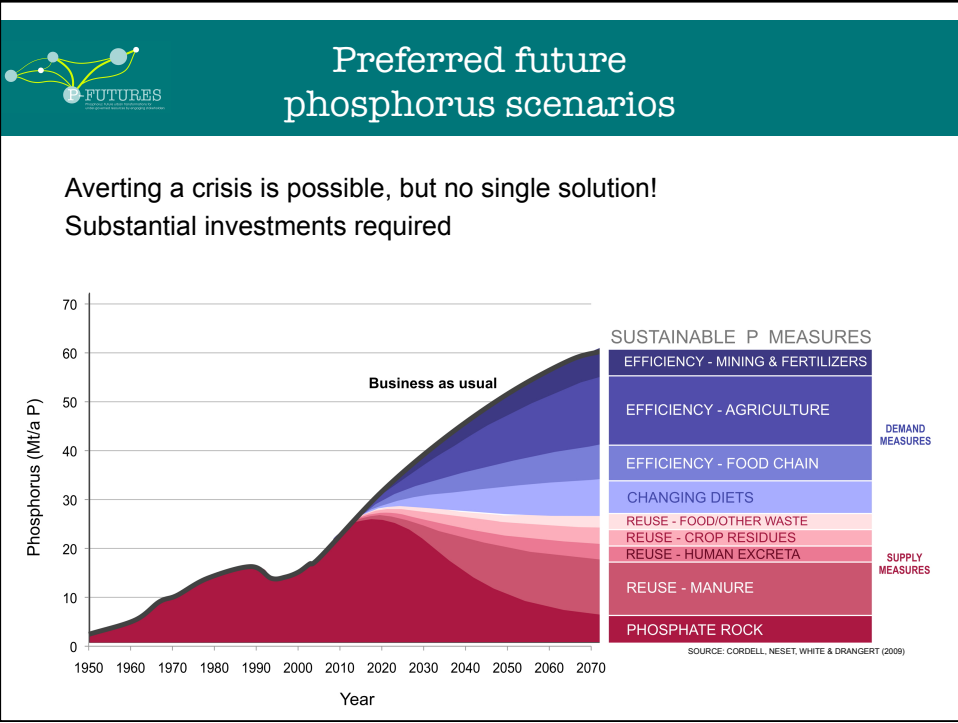
What works in one region may be **inappropriate** and **ineffective** in another region.

In what ways is Blantyre, Hanoi, USA or Australia most vulnerable to P scarcity?



PHOTO: D. CORDELL

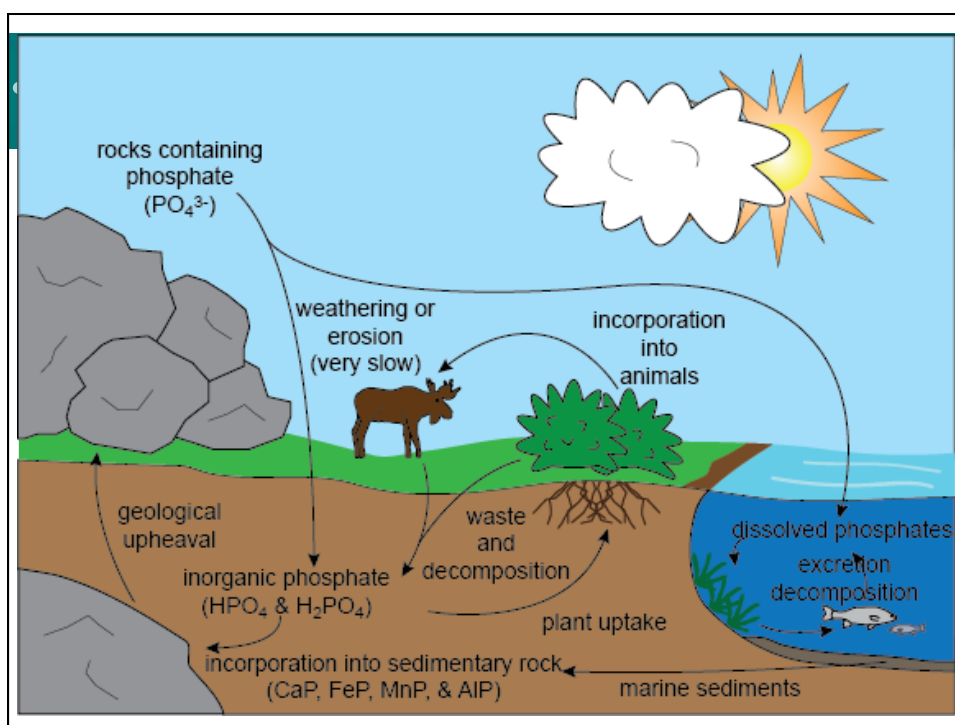






Typical phosphorus sources in Malawi

- Phosphate inorganic fertilizers,
- Organic fertilizers _ animal waste,
- Organic fertilizers _ vegetative waste,
- Apatite rock in Tundulu hill,
- Phosphatic soil environments,
- Faecal sludge {human waste},






Possible phosphorus exit points


- Waterborne sanitation systems _ P in *fs*,
- Onsite sanitation _ P in *fs*: leaching,
- Livestock droppings: leaching, burning,
- Vegetative waste: *P* losses on burning,
- Inorganic fert.,: Overdose _ leaching,
- Animal feed _ e.g. *P* losses in fish feed.

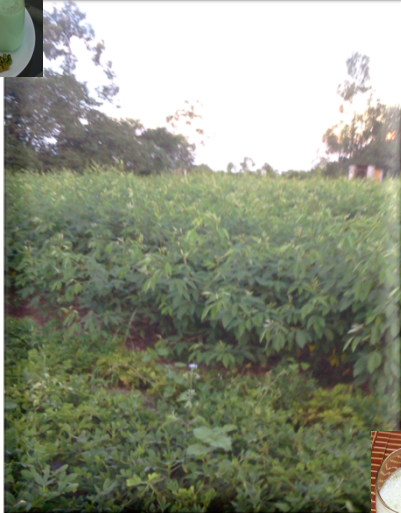



Some thoughts on *Phosphorus* in Malawi

- Regulatory framework, KAP in Malawi,
- Horticultural practices management vis-à-vis the *P* natural balance,
- Livestock management practices vis-à-vis phosphorus balance,
- *P* balance, SD & social security,
- Sanitation management & *P* recovery,










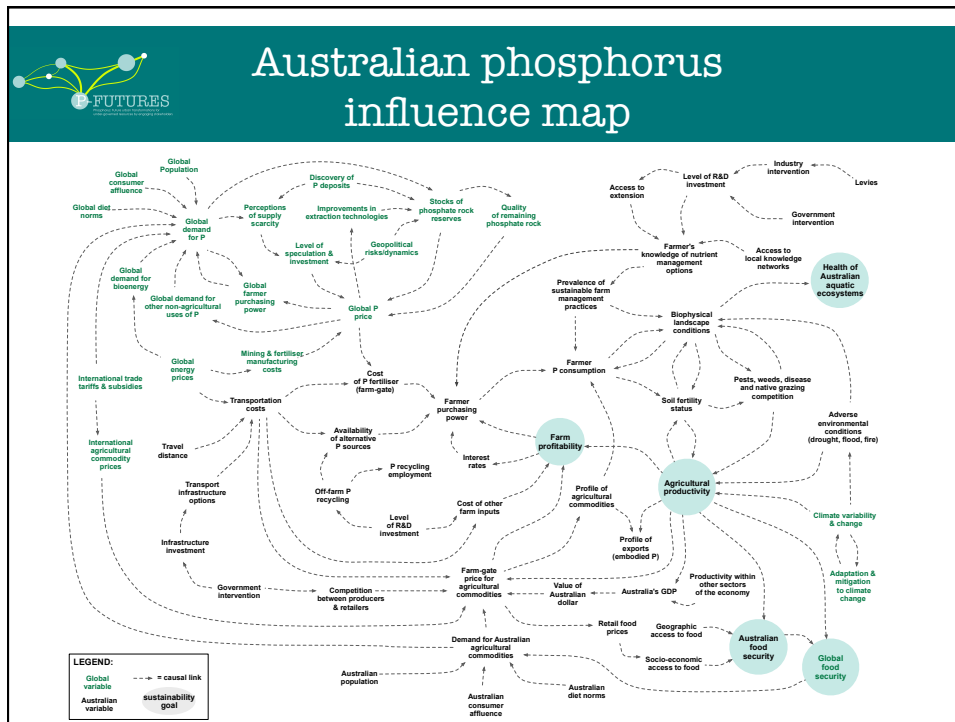
ZIKOMO

THANK YOU



Activity


What are your sector 1-2 priorities?



P-FUTURES
Phosphorus: Future urban transformations for under-governed resources by engaging stakeholders


Solutions to the phosphorus challenge:

International case studies and sustainable pathways in Blantyre




Phosphorus use efficiency in agriculture

Decreasing phosphorus losses to waterways



Natural buffer strip
Iowa, USA



Preventing algal blooms - fertilizer application guidelines
CHINA



Phosphorus recovery from wastewater

Increasing acceptance and use of urine-diversion toilets



Household delivered urine and fertilizer production
SOUTH AFRICA





Urban agriculture

Increasing food security & recycling local food waste, water, and sewage




**Vacant lot garden
Accra, GHANA**



**Onions fertilized with urine (left) & without (right)
BURKINA FASO**




**Community gardens
Montreal, CANADA**



Multi-stakeholder platforms

Dialogue & action through industry, government & science partnerships

European Sustainable Phosphorus Platform EUROPEAN UNION



Participate Collaborate Innovate

European Sustainable Phosphorus Platform (ESPP)

Sustainable management of Phosphorus is crucial for agriculture, food, industry, water and the environment. ESPP brings together companies and stakeholders to address the Phosphorus Challenge and its opportunities.

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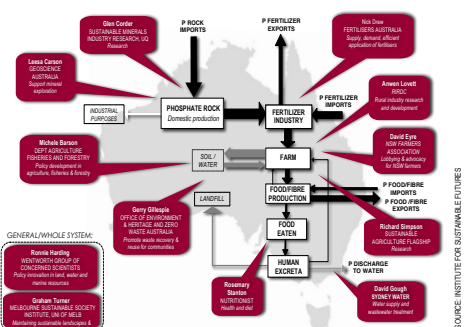
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News

Phosphate rock in EU Critical Raw Materials list

12 July 2014

The European Commission has added phosphate rock to the list of 20 Critical Raw Materials, for which supply security is of high economic importance. Phosphate rock is identified as non-renewable and of high economic importance. This




General/Whole System:

- Domestic phosphate rock production
- Phosphate rock imports
- Phosphate rock exports
- Fertilizer industry
- Fertilizer imports
- Fertilizer exports
- Farm
- Food fibre production
- Food eaten
- Human excreta
- Landfill
- Soil/water
- Industrial purposes
- Domestic phosphate rock production
- Phosphate rock imports
- Phosphate rock exports
- Fertilizer industry
- Fertilizer imports
- Fertilizer exports
- Farm
- Food fibre production
- Food eaten
- Human excreta
- Landfill
- Soil/water
- Industrial purposes

Source: Institute for Sustainable Futures

National Strategic Phosphorus Advisory Group, AUSTRALIA




Toolbox of phosphorus solutions

Selecting context-specific options
from a range of sustainable phosphorus technologies & practices

Sector	SUPPLY MEASURE (S)		DEMAND MEASURE (D)	
	Recycling (S1)	New source (S2)	Efficiency (D1)	Reduce demand (D2)
Mining (M)	MS1.1 – mine tailings ^a	MS2.1 – phosphate rock ^a	MD1.1 – reduce avoidable losses	MD2.1 – (all other measures)
Fertilizer (F)	FS1.1 – phosphogypsum ^b	FS2.1 – algae, seaweed	FD1.1 – reduce avoidable losses	FD2.1 – (AD2, LD2, PD2)
Agriculture (A)	AS1.1 – crop waste ^{a,b,c} AS1.2 – (LS1, PS1, WS1)	AS2.1 – (FS2) AS2.2 – green manure	AD1.1 – fertilizer placement AD1.2 – application time AD1.3 – application rate AD1.4 – soil testing AD1.5 – erosion reduction AD1.6 – microbial inoculants	AD2.1 – plant selection AD2.2 – improved soil characteristics
Livestock & Fisheries (L)	LS1.1 – manure ^{a,b,f} LS1.2 – bone ^{a,g} LS1.3 – blood ^a LS1.4 – fish ^a	LS2.1 – phosphate rock (supplements) ^h	LD1.1 – fertilizer placement LD1.2 – application time LD1.3 – application rate LD1.4 – soil testing LD1.5 – erosion reduction LD1.6 – microbial inoculants LD1.7 – phytase enrichment LD1.8 – manure P reduction LD1.9 – wastewater management	LD2.1 – plant selection LD2.2 – improved soil characteristics LD2.3 – animal selection LD2.4 – changing diets
Food production (P)	PS1.1 – food production waste PS1.2 – cooked food waste	PS2.1 – phosphate rock (additives) ^h	PD1.1 – reduce avoidable losses PD1.2 – producing food closer to demand PD1.3 – consumer food planning/preparation	PD2.1 – reduce P-intensive diets PD2.2 – reduce per capita overconsumption PD2.3 – healthy bodies PD2.4 – minimize use of P additives
Wastewater & human excreta (W)	WS1.1 – urine ^{a,m} WS1.2 – faeces ^{a,c,d,h} WS1.3 – greywater ^{c,h} WS1.4 – untreated wastewater ^a WS1.5 – treated effluent ^{a,m} WS1.6 – struvite ^a WS1.7 – biosolids ^{a,b,f,i} WS1.8 – sludge ash ^d		WD1.1 – repairing cracked pipes WD1.2 – minimizing sewer overflows WD1.3 – soil management WD1.4 – avoid dumping biosolids in water WD1.5 – reduce spreading biosolids on non-ag land	

Recycled via: ^a direct reuse, ^b compost, ^c precipitation, ^d incineration, ^e dewatering, ^f other chemical treatment.

SOURCE: CORDELL & WHITE 2013



Sustainable phosphorus solutions

Examples from your partner cities....






Transforming Blantyre

If there's one big sustainable P initiative you could see in Blantyre, what would it be?

Or what are the existing solutions that are already happening on the ground?

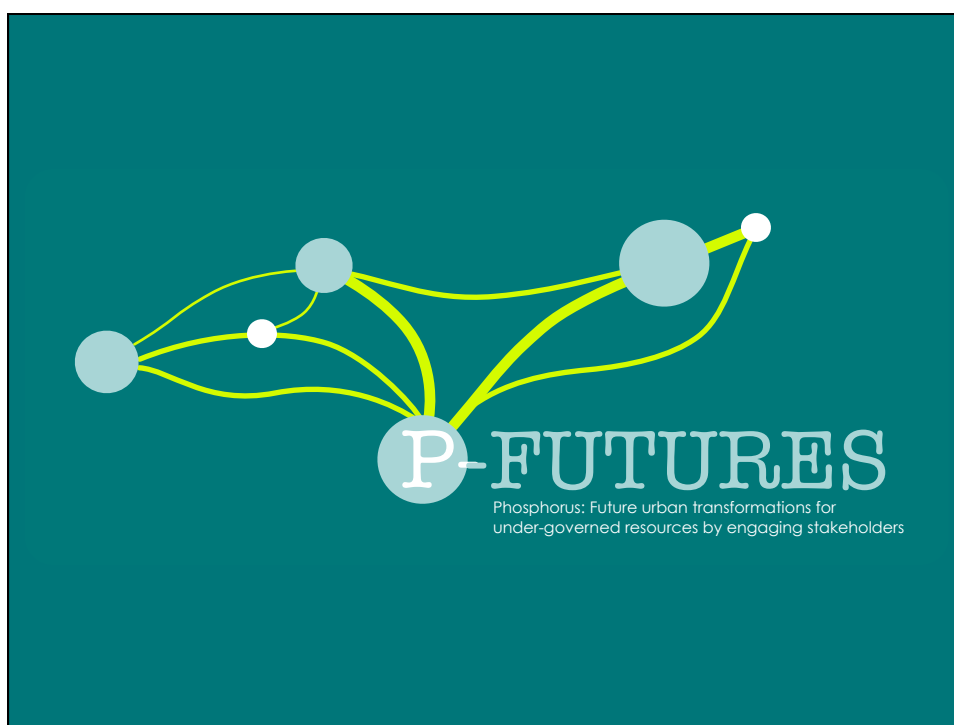


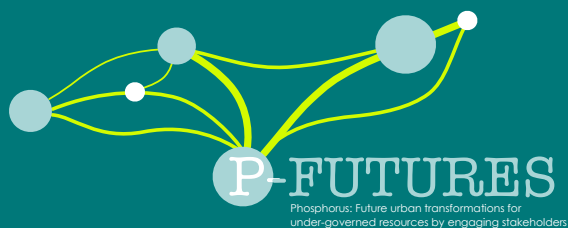
Transformative change

Principles for transformative change:

- Significant changes with big implications
- Real lasting change (persistent change)
- Affects multiple scales (household > global)
- Cross-sectorial
- Equitable (sustainable)

SOURCE: D. HANSEN





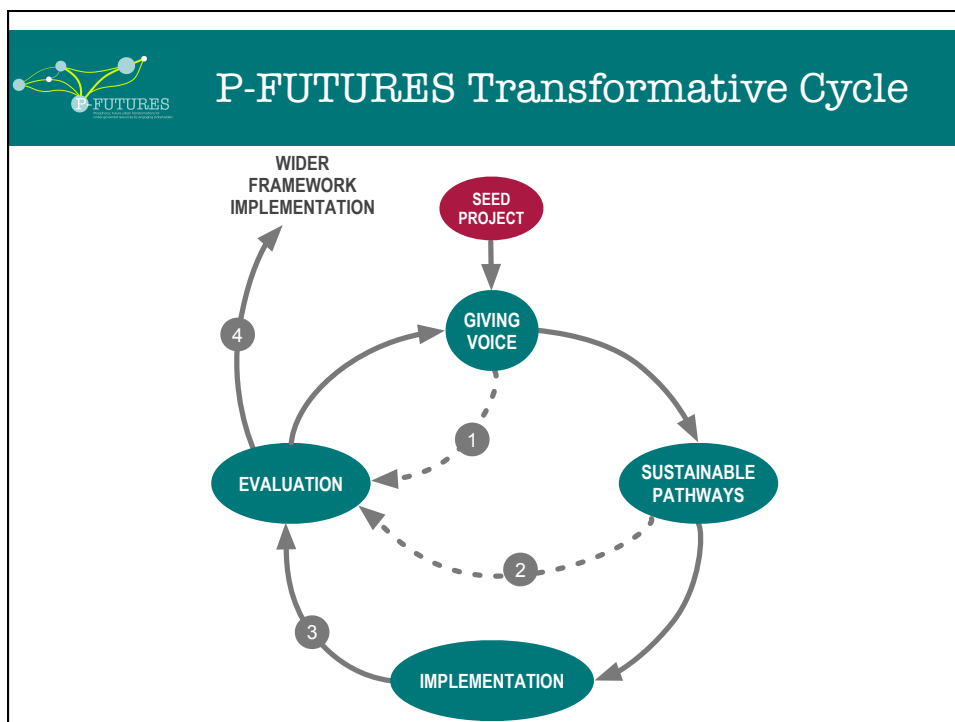
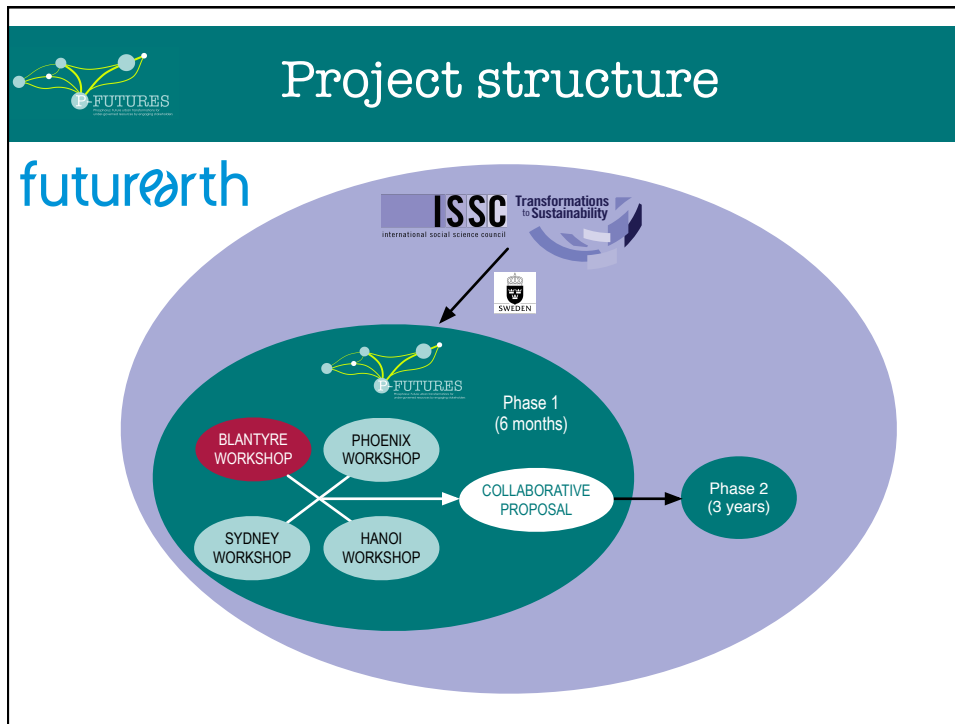
Next steps:

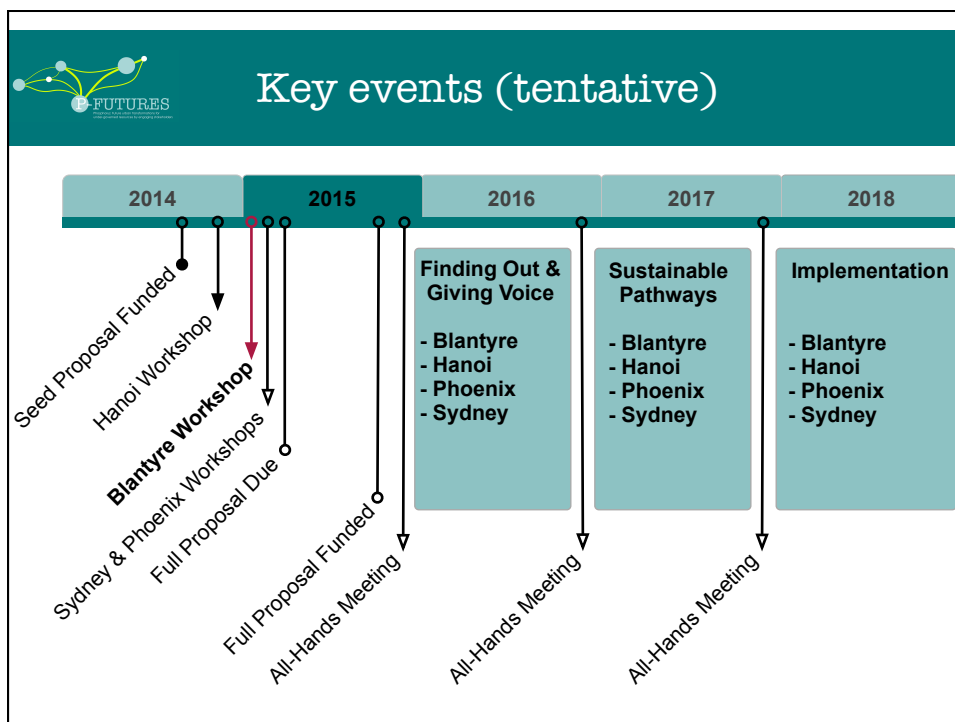
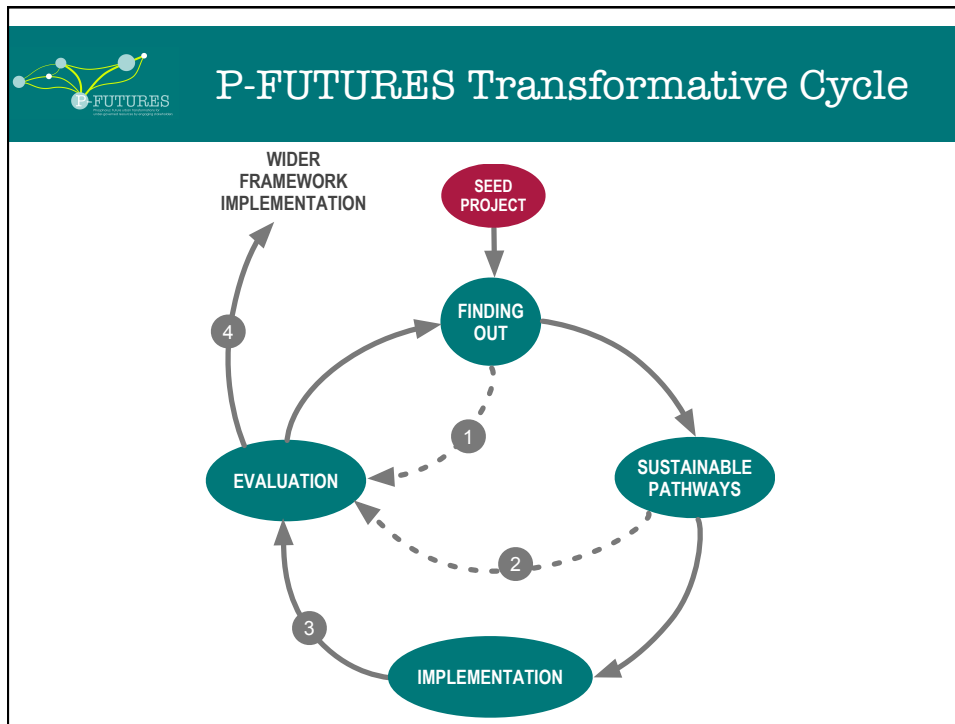
Designing a future collaborative project



Overarching Project Goals

Together figure out what do we need to do
to build sustainable cities
in terms of food, water & waste
in a rapidly change world







P-FUTURES: Blantyre

How can this 3 year project help us reach our goals?

What are the types of activities, projects or tools?

Who else should be involved?

How do we want to interact with our partner cities?

Thank you!



P-FUTURES
Phosphorus: Future urban transformations for
under-governed resources by engaging stakeholders