



**New perspectives on
urban water management**

**SEMINARIO INTERNACIONAL
CIUDADES SOSTENIBLES Y CAMBIO CLIMÁTICO**

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La gestión de las aguas urbanas será un mayor desafío en el futuro



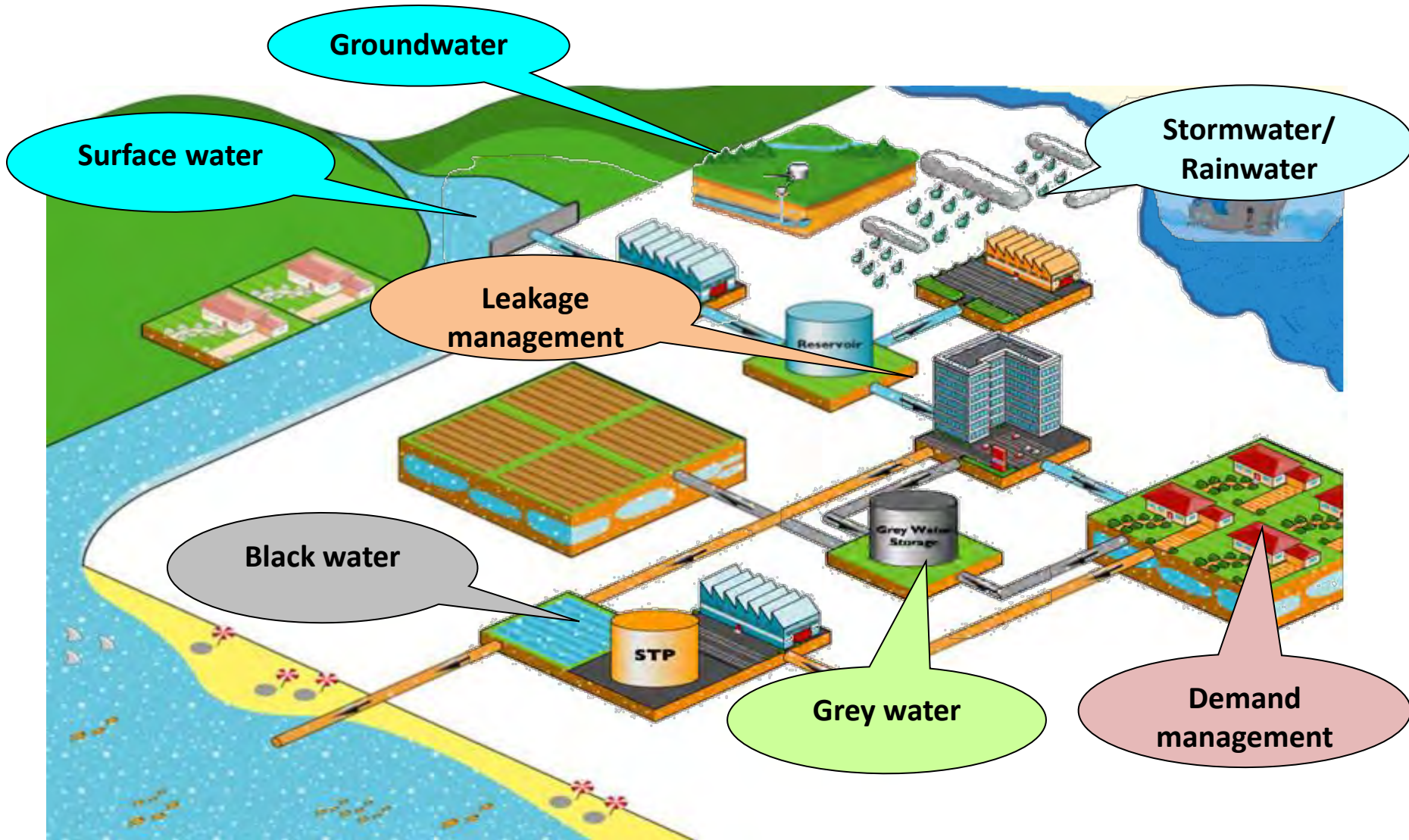
Nuestro enfoque del siglo 19 es compatible con estos desafíos?

- Linear systems – use once and discharge
- Drinking water used for all purposes
- Systems fixed, centralized designs (energy intensive)
- Stormwater viewed as a waste (not a resource).
- Institutions not conducive for integrated thinking
- Regulations stall innovation, are inflexible

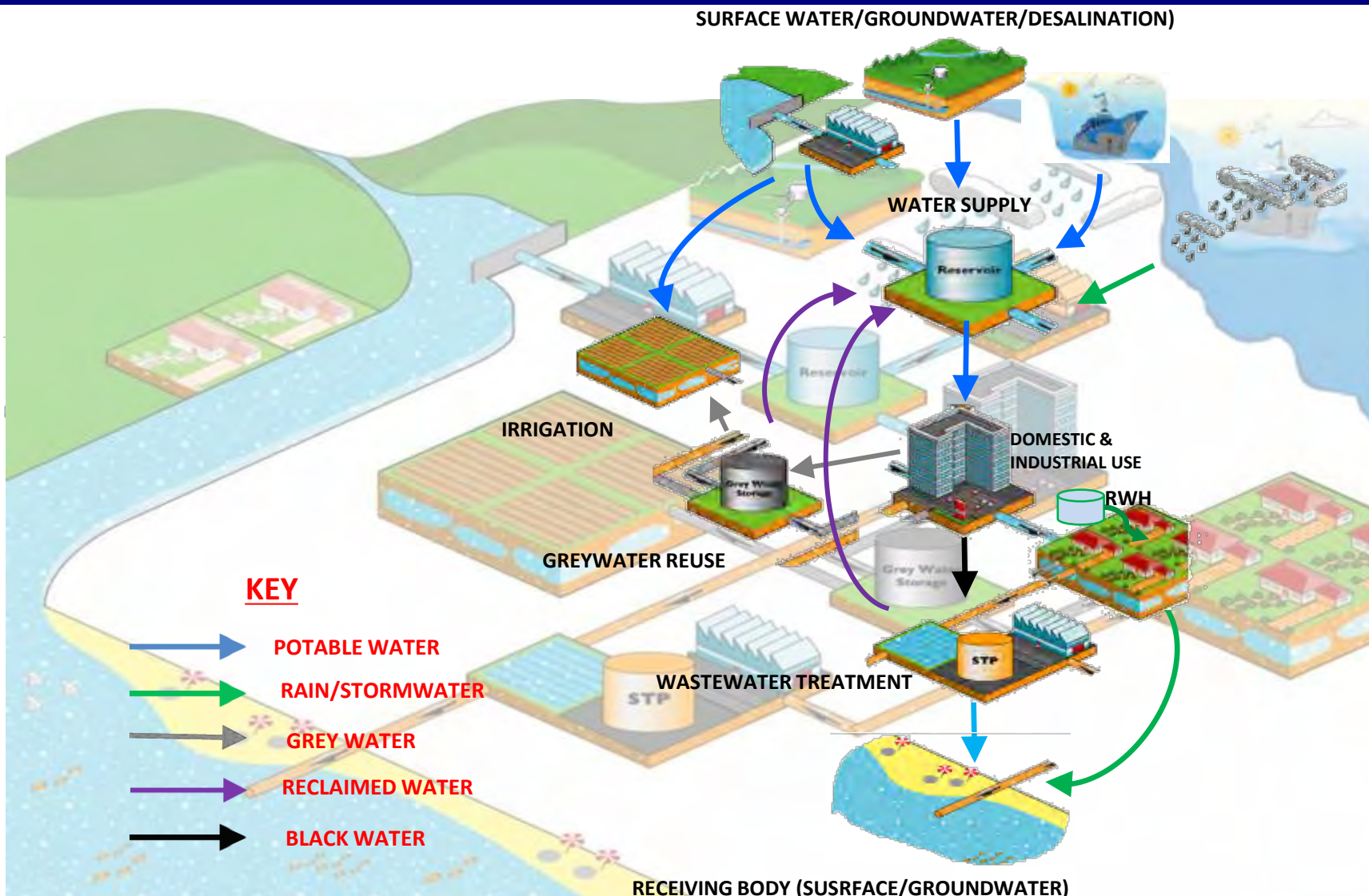


**Debemos cambiar nuestra
perspectiva?**

Necesitamos una perspectiva de sistemas del ciclo del agua



Necesitamos una perspectiva de sistemas del ciclo del agua



Explorando soluciones alternativas para una población que crece rápidamente



Water demand will at least double until 2035



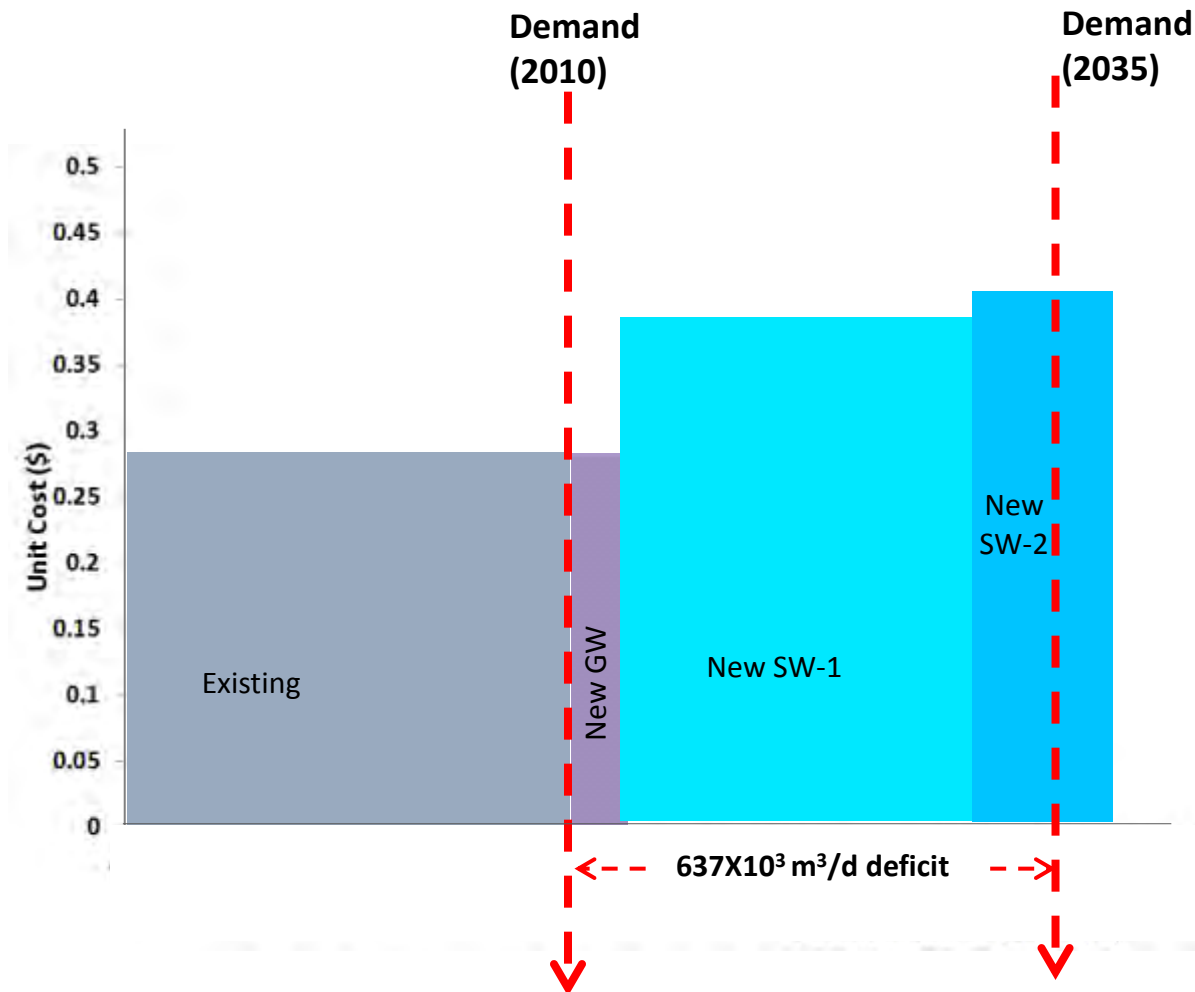
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Panafcon



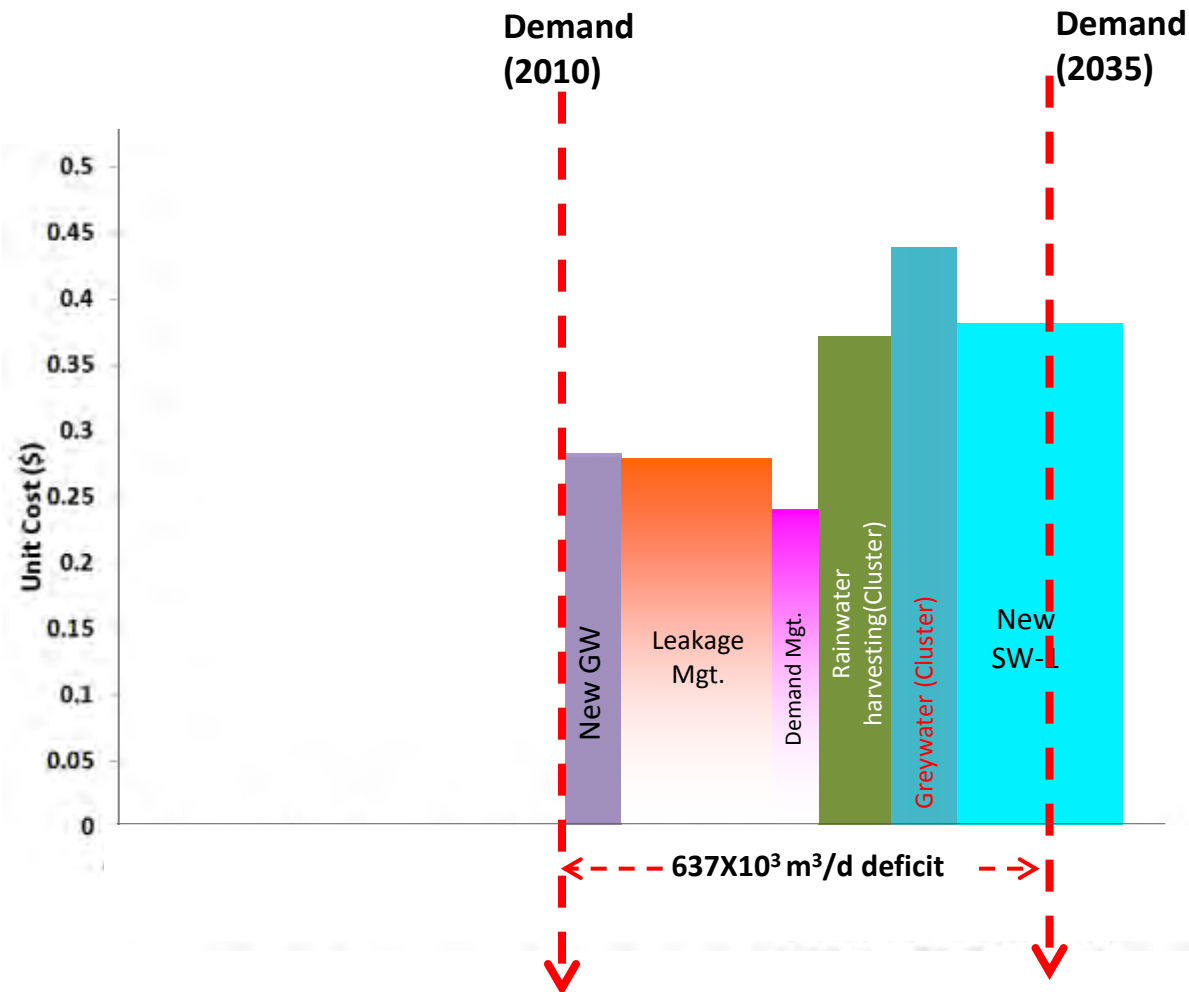
Soluciones tradicionales – traer mas agua para cubrir las necesidades

- Unit costs of **US\$ 0.36/m³**



Mejorando las medidas de producción, podemos bajar el costo unitario

- Unit costs of **US\$ 0.31/m³** (cf. to 0.36)

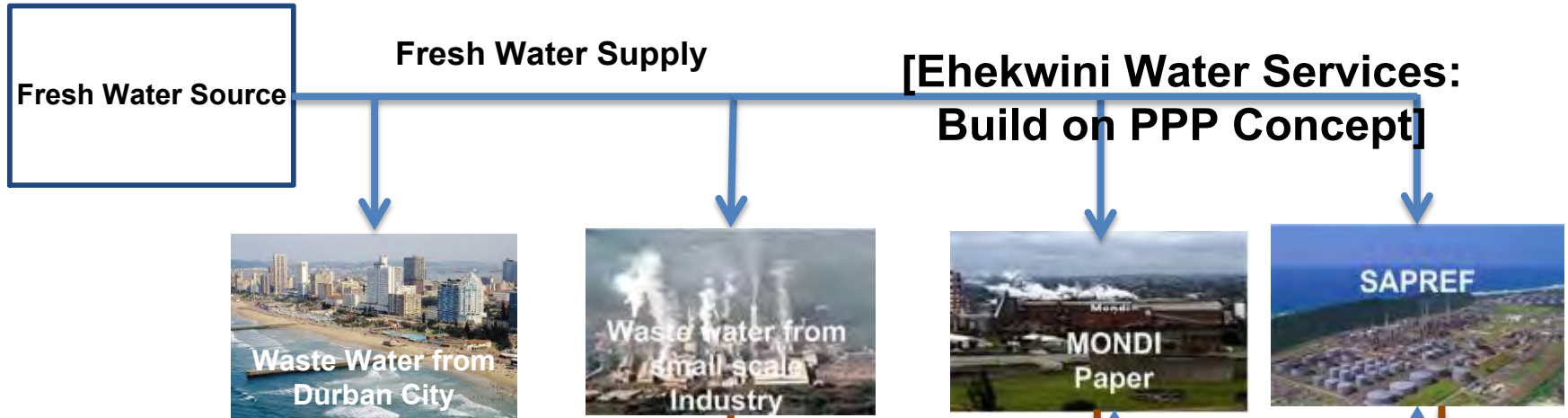


Mayores medidas de producción pueden posponer las inversiones

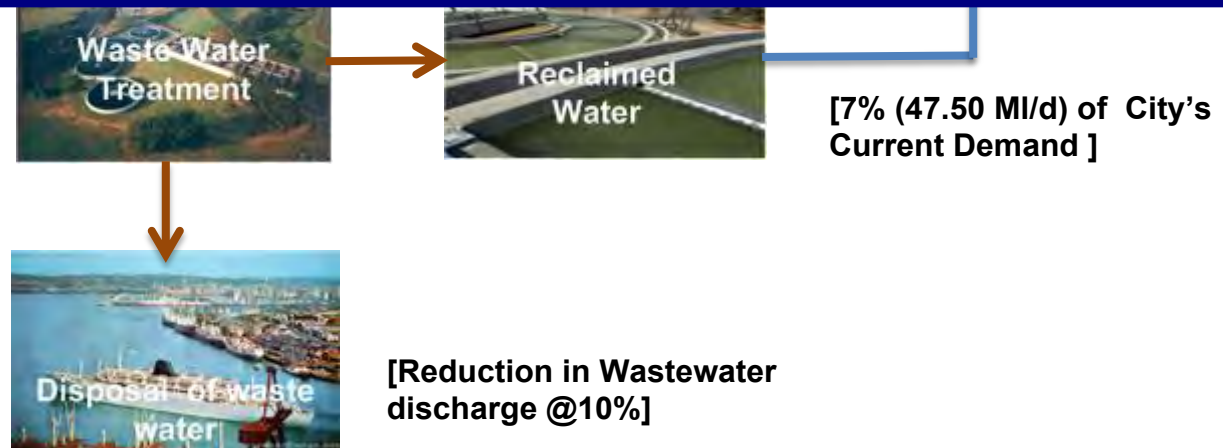
- Unit costs of **US\$ 0.40**



Los emprendedores ven el potencial, Durban. Africa del Sur



Deregulation of reuse standards required to allow entrepreneurs to enter the market



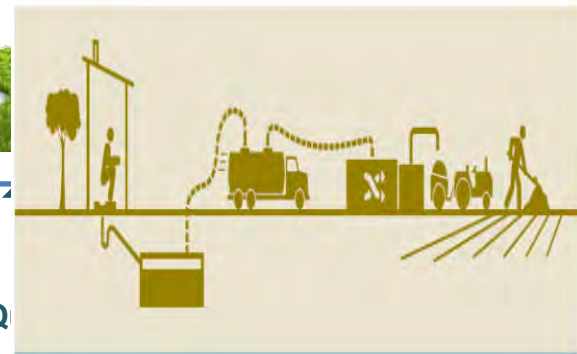
Perspectiva de uso productivo y maximización de beneficios

Productive Use

Defenitiation

1

2



Irrigation

2nd+RO+MF: **AAR**

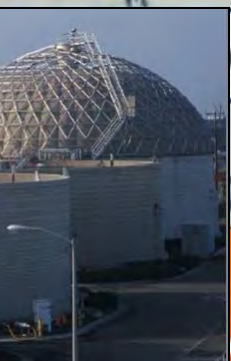
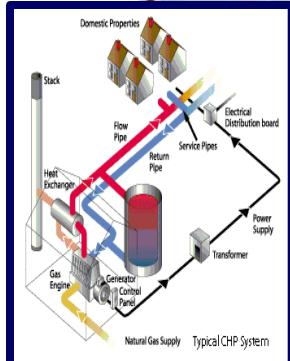
Nutrient Recovery

LaDePa Machine



Cooling

RO: **Refinery**



Algae/Biofuel(x2): **Refinery**



Biogas/CHP

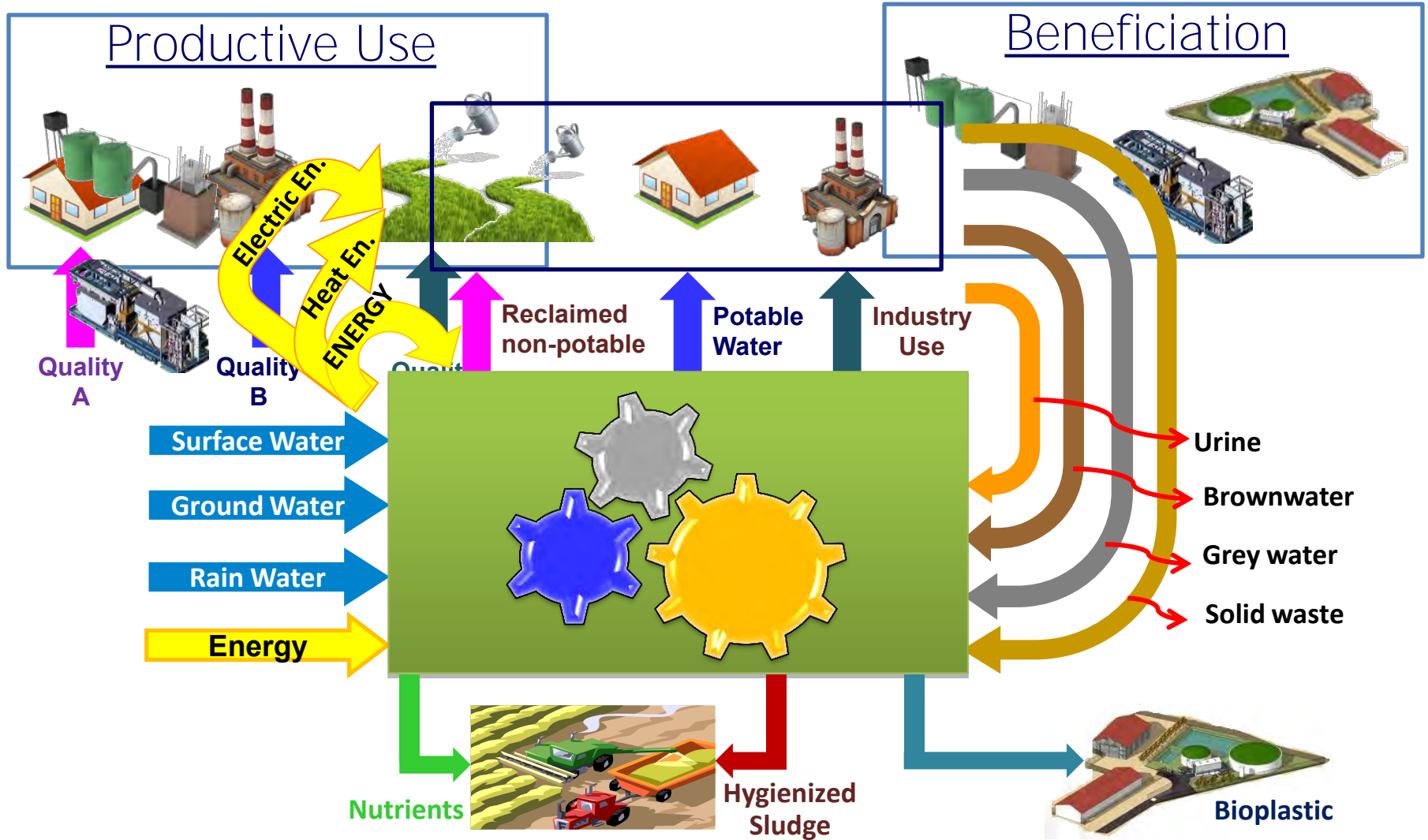
Rivers

Irrigation

Algae/Biofuel

(x2):

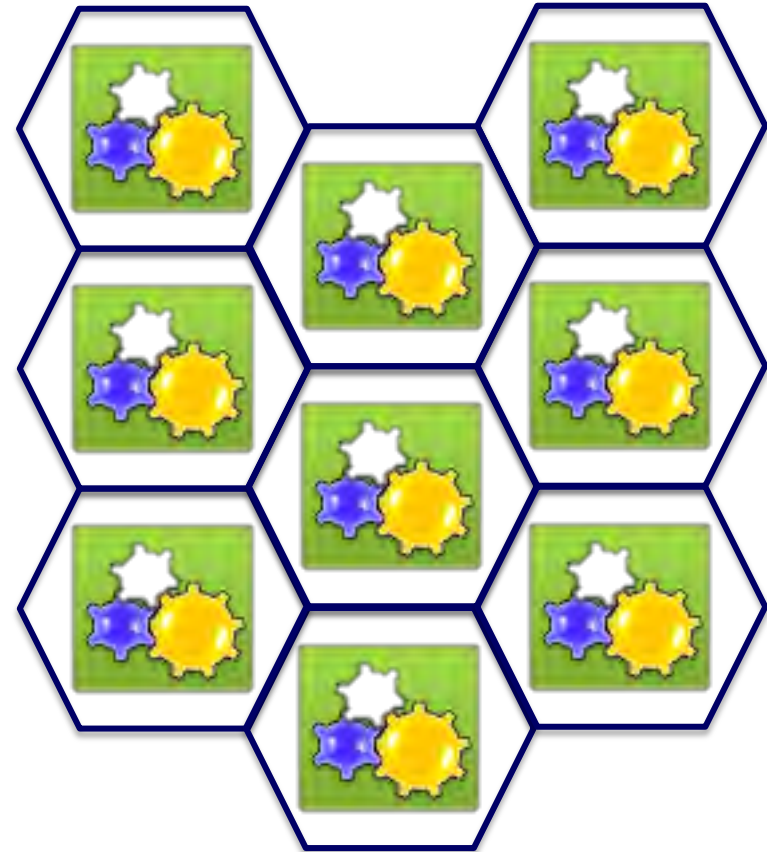
Perspectiva de uso productivo y maximización de beneficios



Estas perspectivas llevan a un modo de pensar descentralizado

Decentralization well suited for:

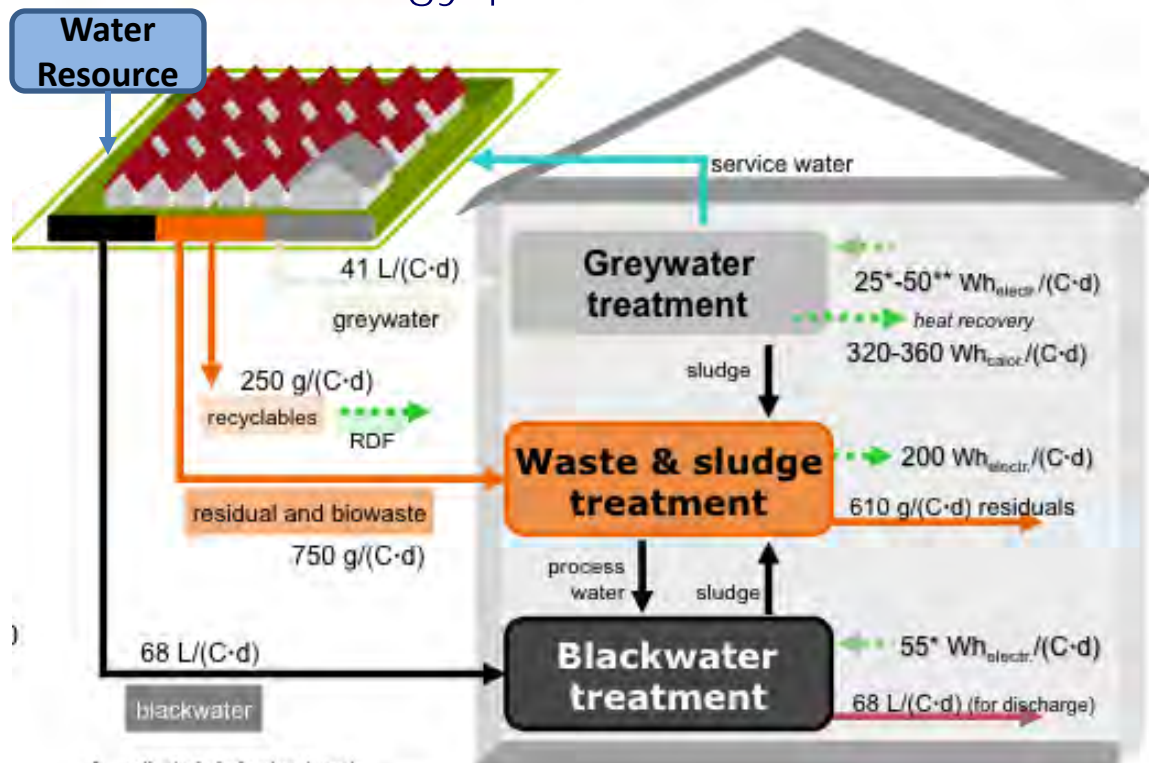
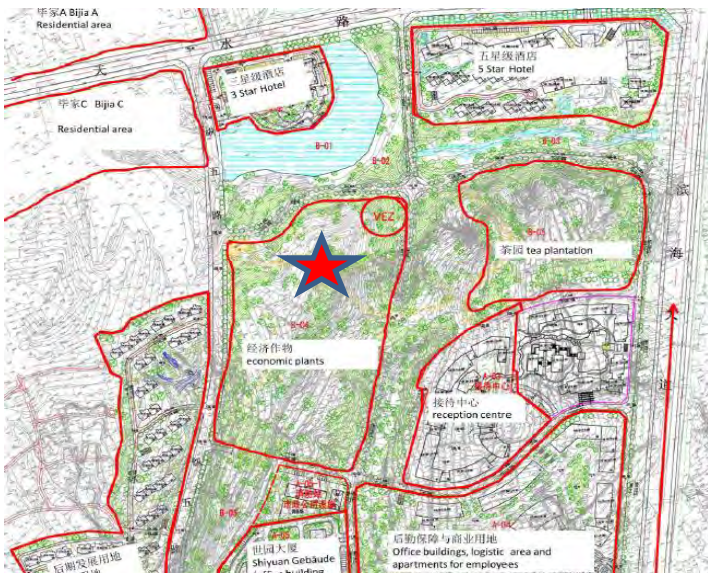
- Energy recovery (heat recovered and used close to source)
- Minimizing energy consumption (for moving water)
- Source separation (to maximize nutrient recovery)
- Adjusted growth (to deal with rapid growing cities)
- Increased resiliency (dampens the propagation of failures)



Ya está sucediendo - Qingdao, China



- 12,000 PE clusters
- Source separation and water quality matched to intended use
- Net energy positive



* activated sludge treatment
 ** MBR: membrane biological reactor

...y en muchos otros lugares

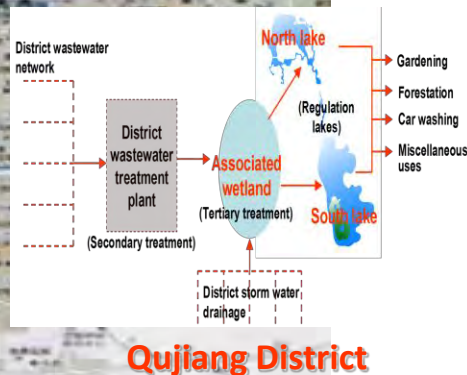
Dockside Green, BC

2,500 people; Recycling, RWH, waste-to-energy

Battery Park City NY

10,000 people, Recycling, RWH, CHP

Xi'an new Districts



Qujiang District

Siyuan Campus

18,000 students, Recycling, Comsump. down by 50%

Podemos hacer las cosas de forma distinta en las ciudades emergentes

Quick growing emerging towns



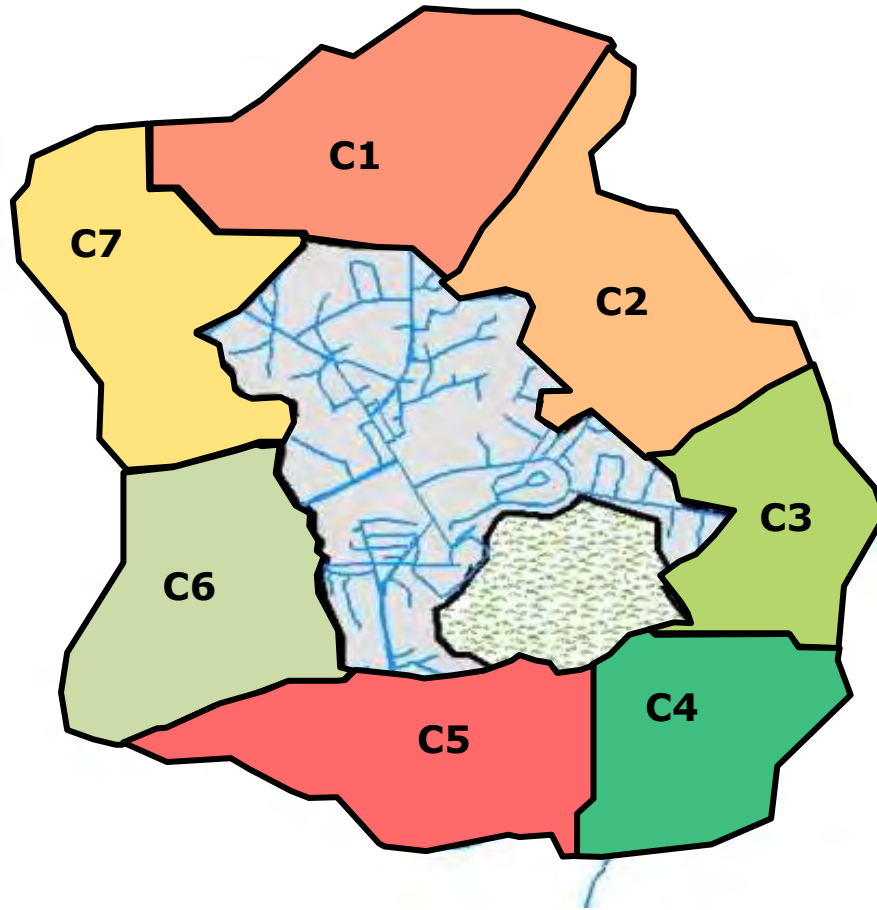
UGANDA



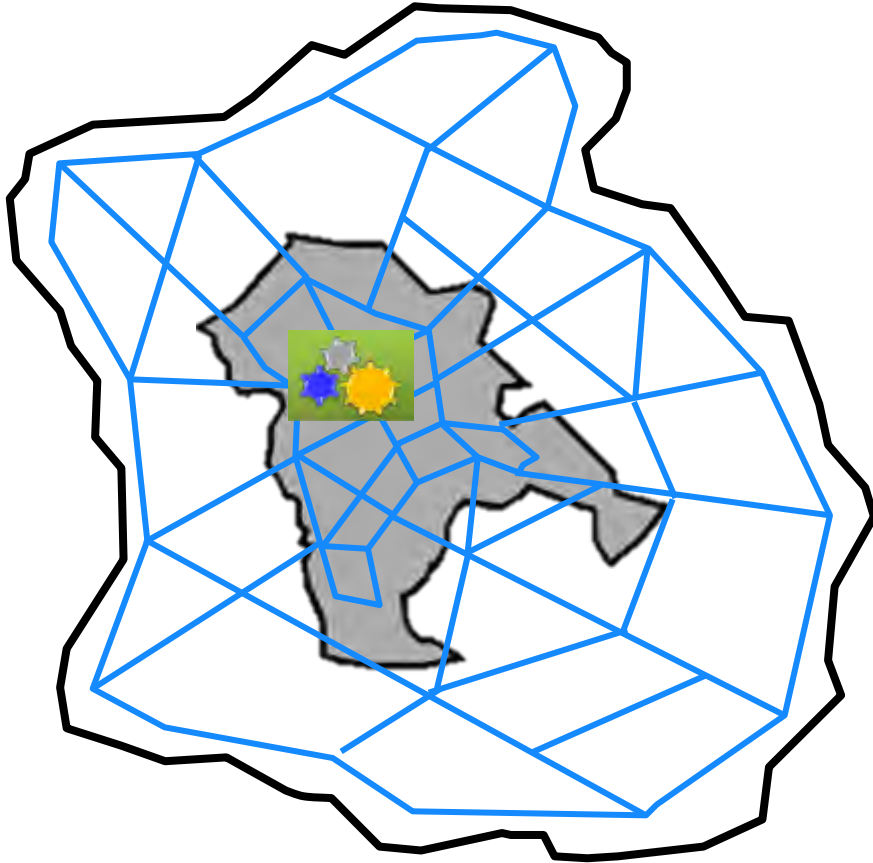
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Podemos hacer las cosas de forma distinta en las ciudades emergentes



Un sistema descentralizado es más económico?



Average Annual Costs
5,148,000 US\$



Average Annual Costs
3,787,000 US\$

La mayoría de los desafíos son políticos e institucionales

Political, Institutional & Regulatory Barriers

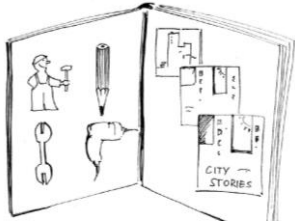


Need **collaboration, cooperation, and coordination** between institutions

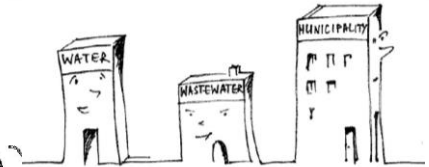
**Necesitamos involucrar a todos
los actores**

Necesitamos romper barreras

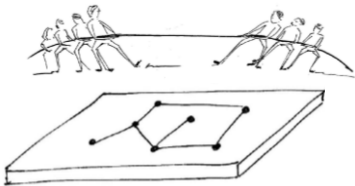
**DOCUMENTATION
& MONITORING**



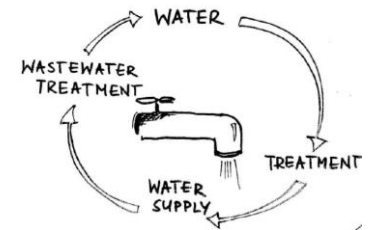
STAKEHOLDER ANALYSIS



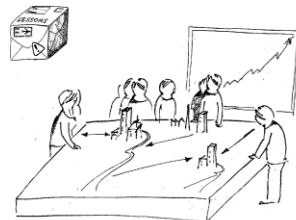
STRATEGY DEVELOPMENT



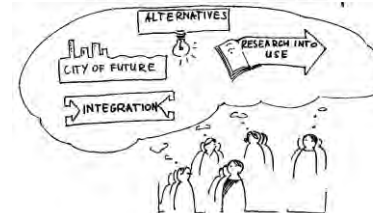
RAPID ASSESSMENT



SCENARIO BUILDING



VISIONING



SWITCH – La historia de 12 ciudades

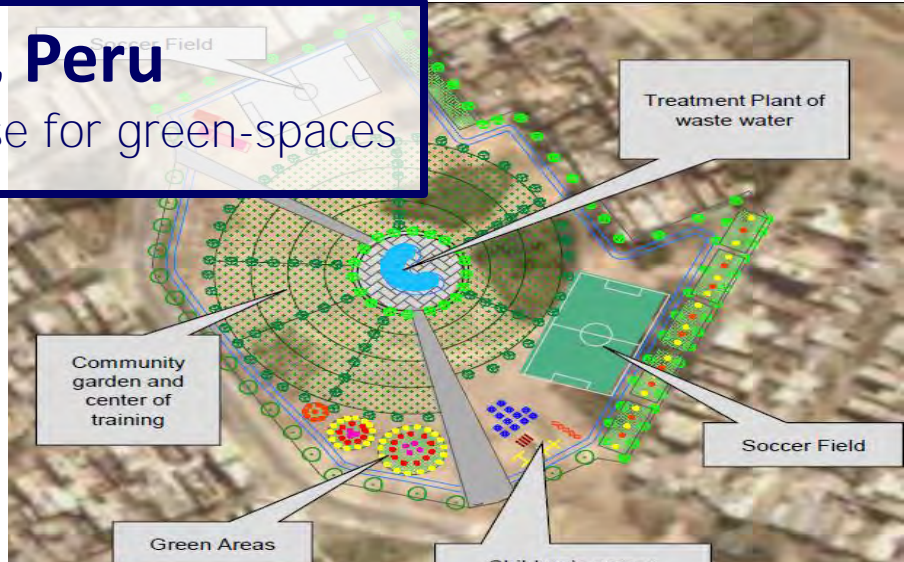


Corroboramos que funciona con proyectos de demostración - SWITCH

Lodz, Poland
River restoration using eco-hydrology



Lima, Peru
Guidelines for reuse for green-spaces



Los actores de SWITCH Learning Alliance – Lodz, Poland

City of Lodz
Service

Research

DEVELOPER

Office

REGIONAL

Schools

Regional



SWITCH
in the city

putting urban water management to the test

Edited by John Butterworth, Peter McIntyre and Carmen da Silva Wells



Water Utility
GROUPS

NGOs

ers

tion

tial Planning

e Councils

Voivodship



Debemos insertar el concepto agua en la mente de las personas

Necesitamos sistemas flexibles

**Flexibility is the ability of urban water systems to use their
active capacity to act to respond on relevant alterations
in a performance efficient, timely and cost effective way**

Tenemos que pensar inteligentemente en un mundo incierto

- **Entire earth system is changing!**



Uncertainty in storm events



Uncertainty in carrying capacity/breakage rate



Uncertainty in runoff response



Uncertainty in demand



Uncertainty in quantity & quality

Clusters give adaptive capacity



Low Impact Development



ecological
treatment



green roofs



pervious
pavement



infiltration
trench



stormwater
harvesting

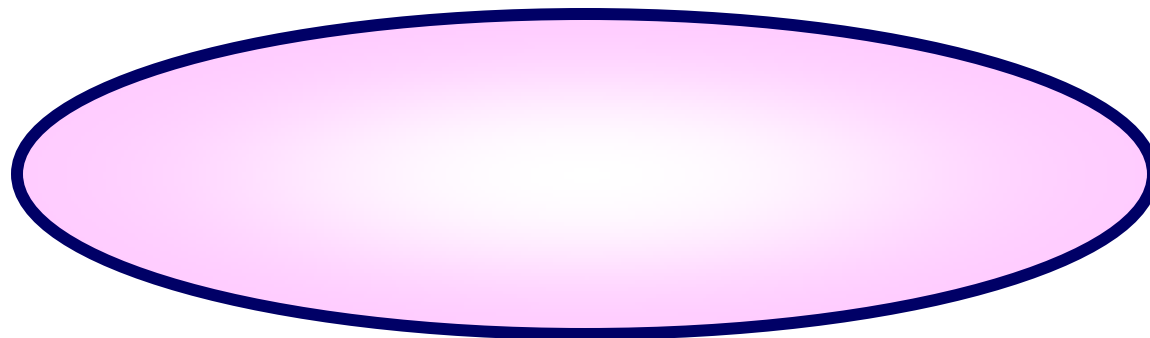
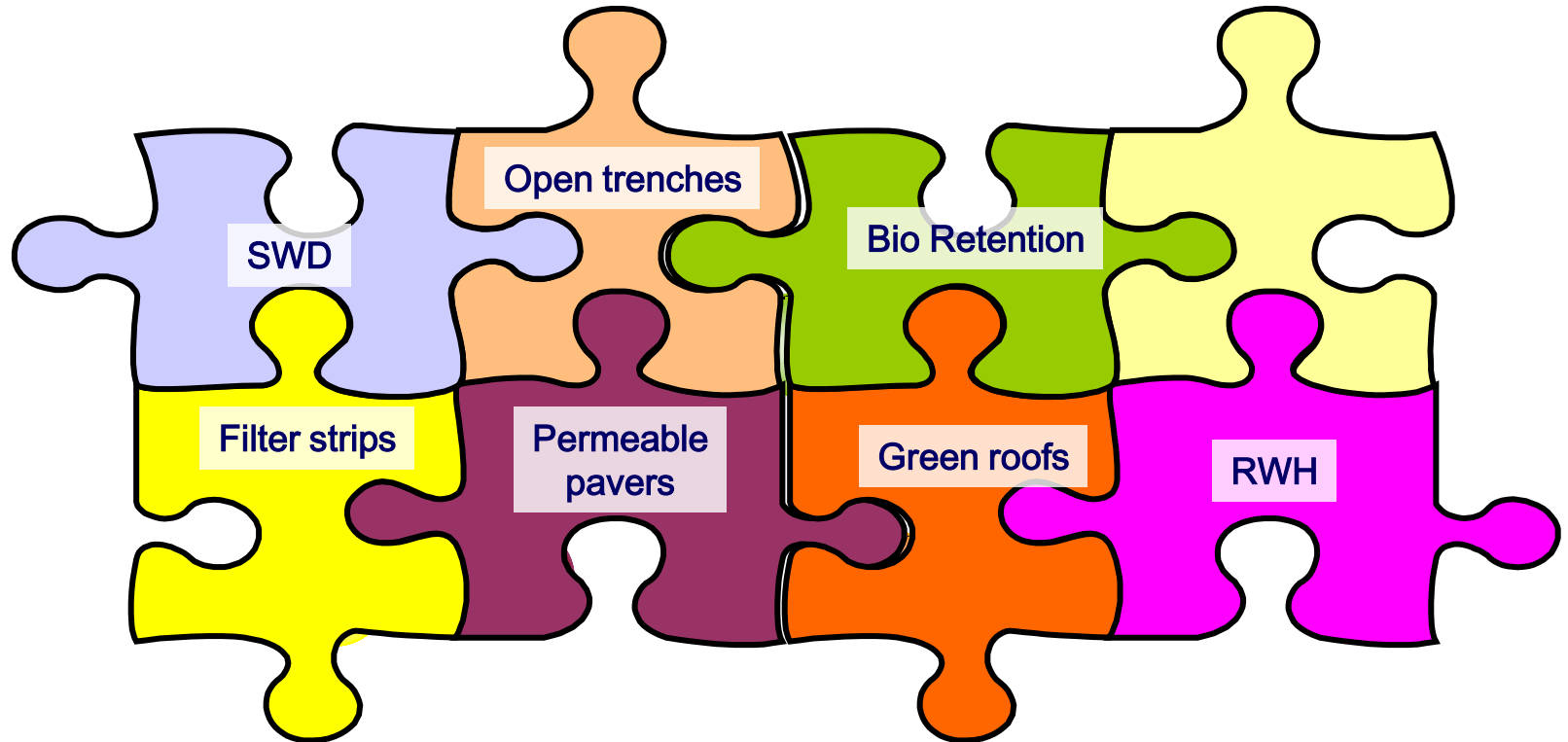


retention
pond

**LID provides modular diversity
that increases flexibility resulting
in a complex adaptive system**

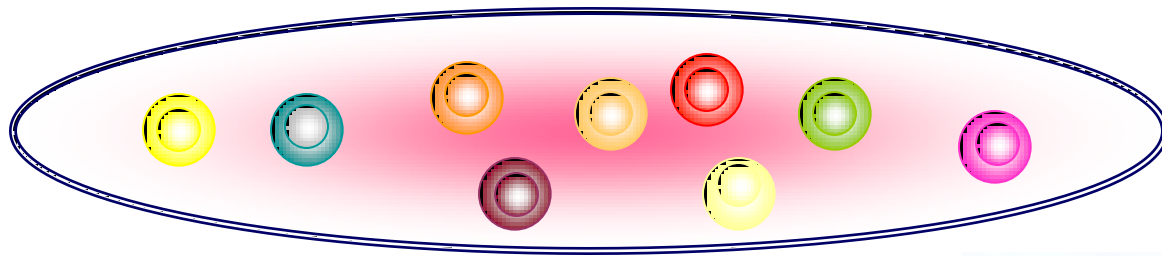
(Sieker et al., 2008, Eckart, 2008)

Low Impact Development

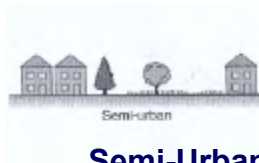
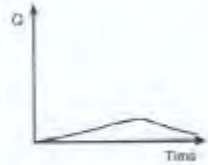


Suite of Options

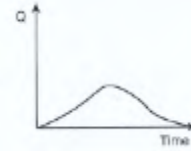
LID provides Complex Adaptively



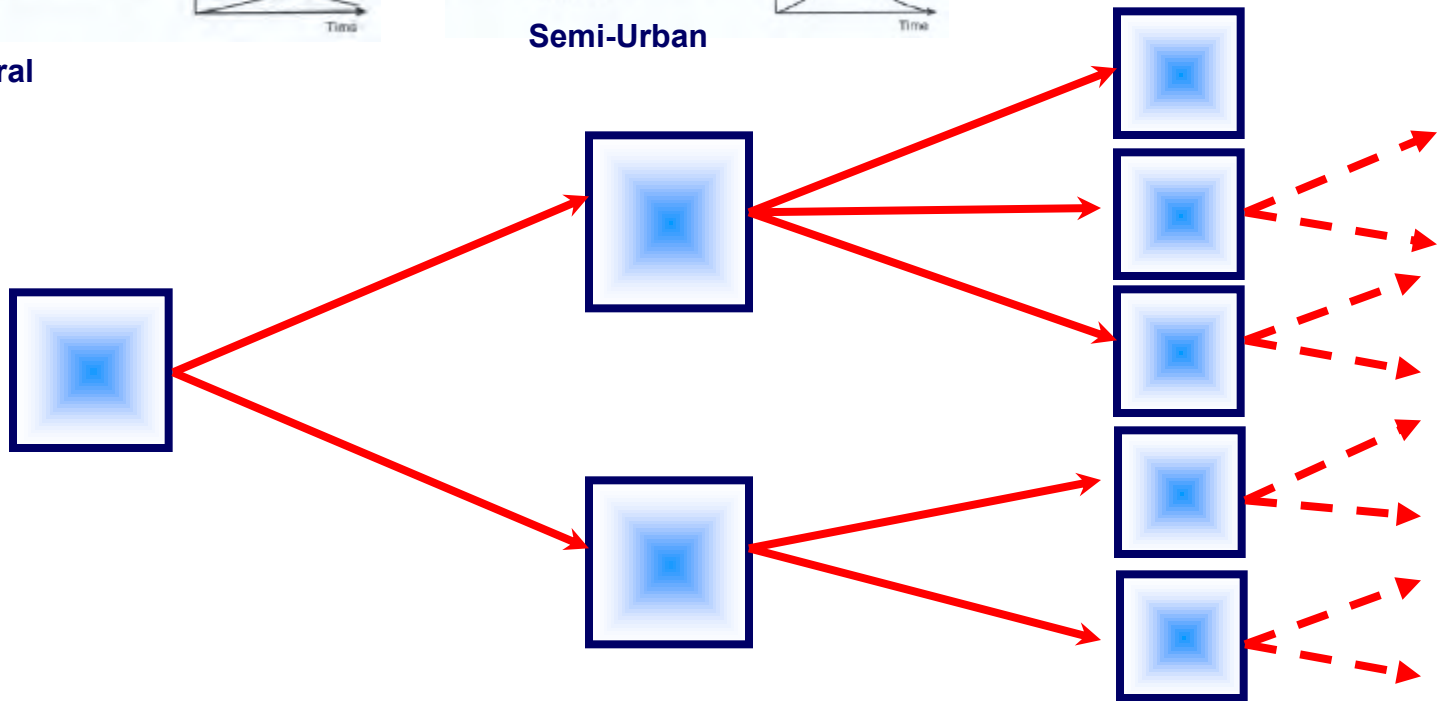
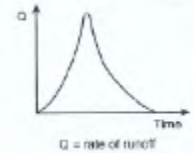
Rural



Semi-Urban

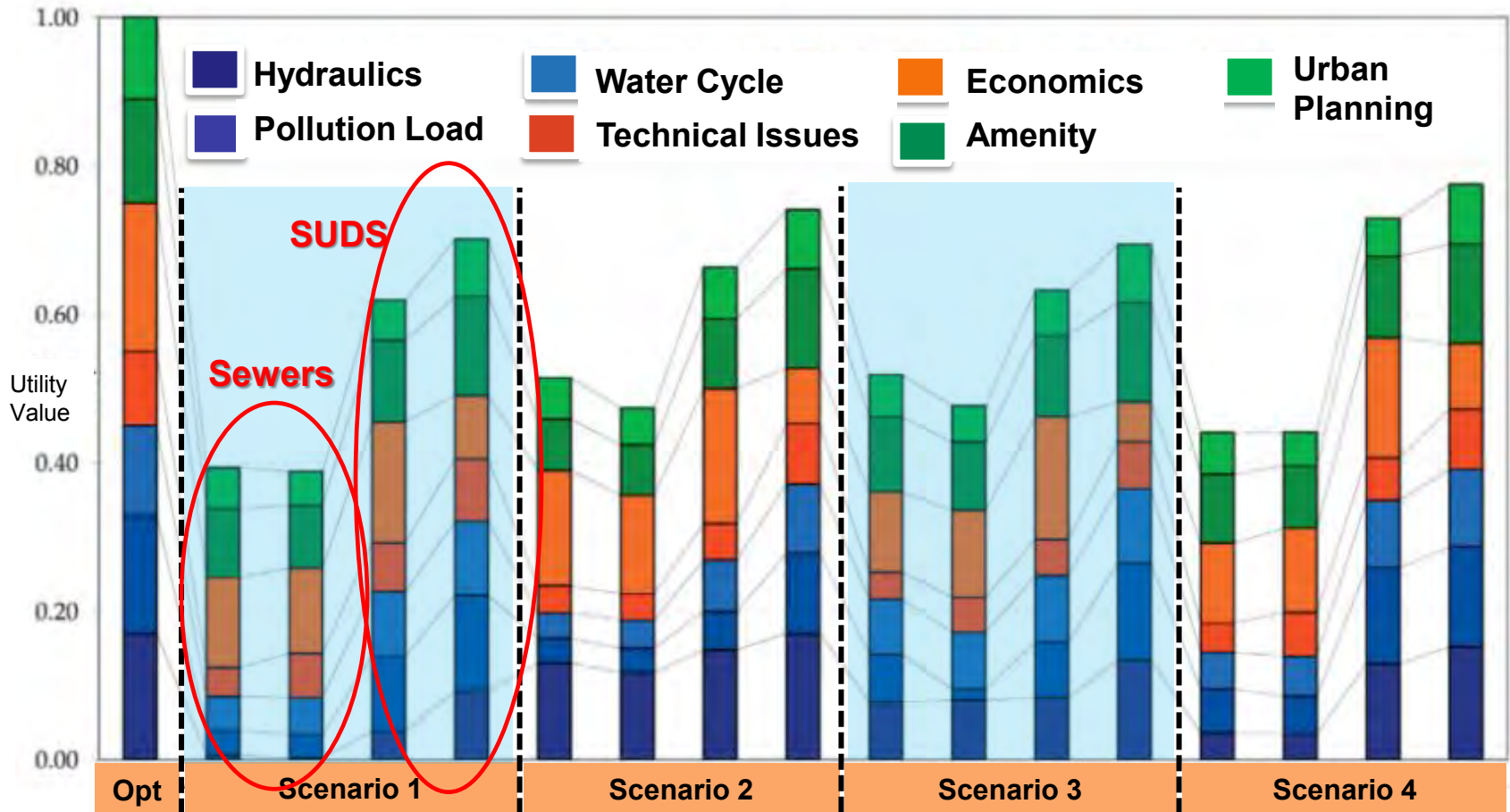


Urban



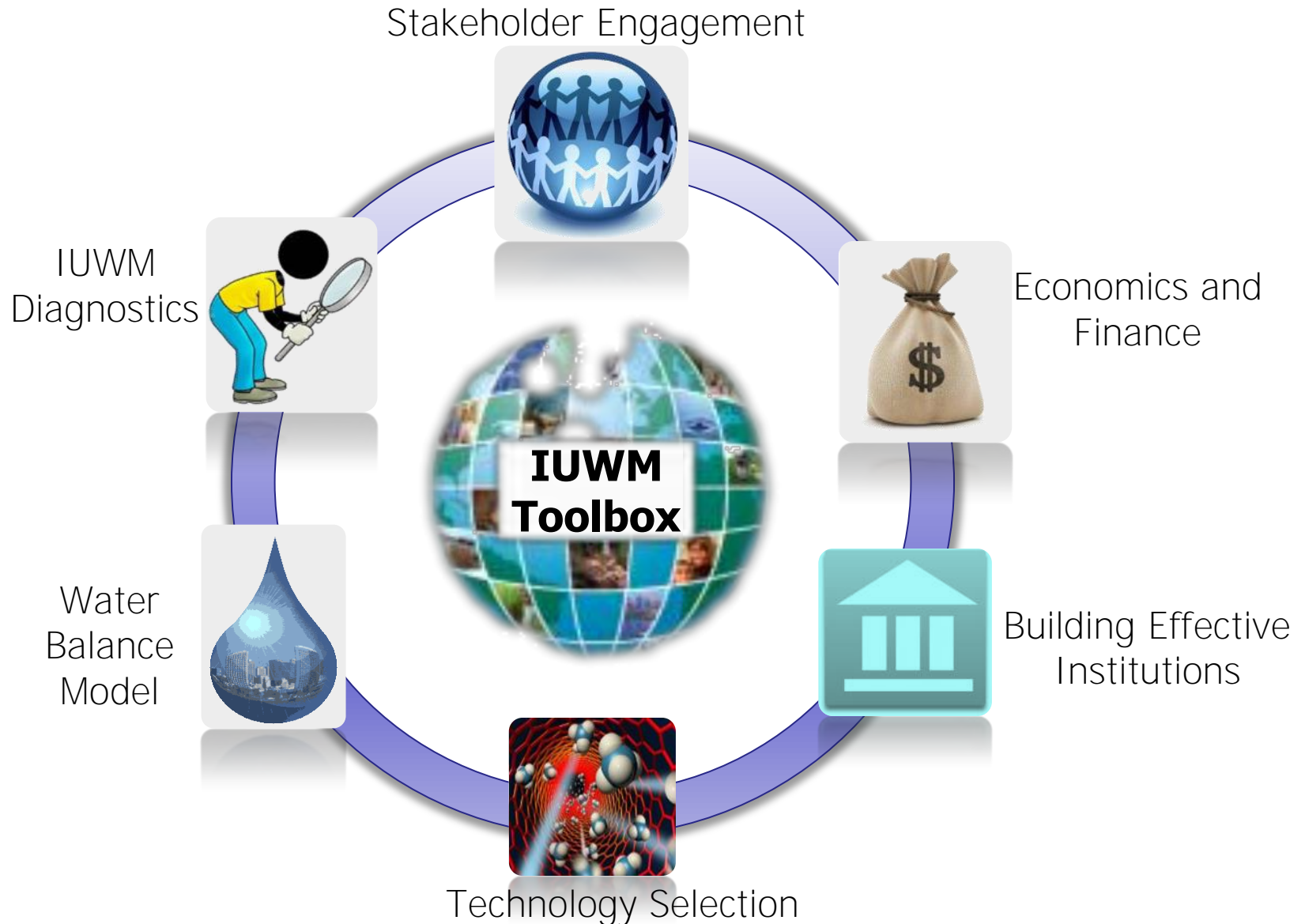
LID have better performance for all future scenarios = higher flexibility

Case Study: Kupferzell Germany

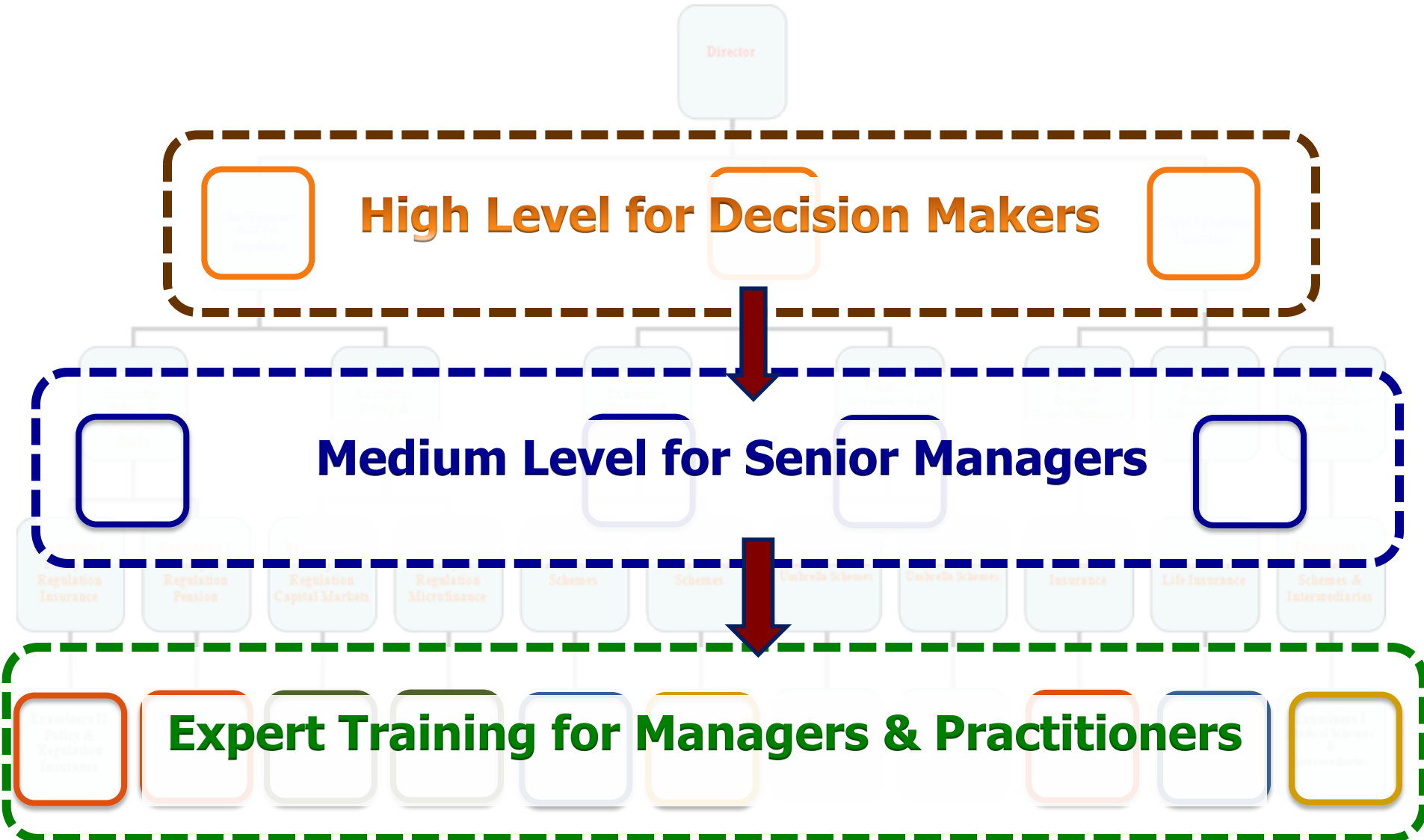


**Necesitamos campeones del
cambio**

GWP + USF + WB developing IUWM Toolkit



A strategy that cascades change



Las opciones que tenemos

Quedarse en
la línea sin
cambiar nada

Ponerse mas
fuerte con
sistemas
tradicionales

Tener un
enfoque
completamente
diferente





Muchas gracias

Kalanithy Vairavamoorthy