



the ecological  
sequestration trust

# **Resilient Ecological City-Region Transformation Accra and UlanBataar**

Making use of open data and open source modelling

**Supporting inclusive, resilient low carbon development  
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Chief Executive and Founder  
The Ecological Sequestration Trust

Visiting Professor Sustainable Systems Engineering  
University of Bristol

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Section 4    \_\_ Innovation in financing of inclusive,  
resilient development

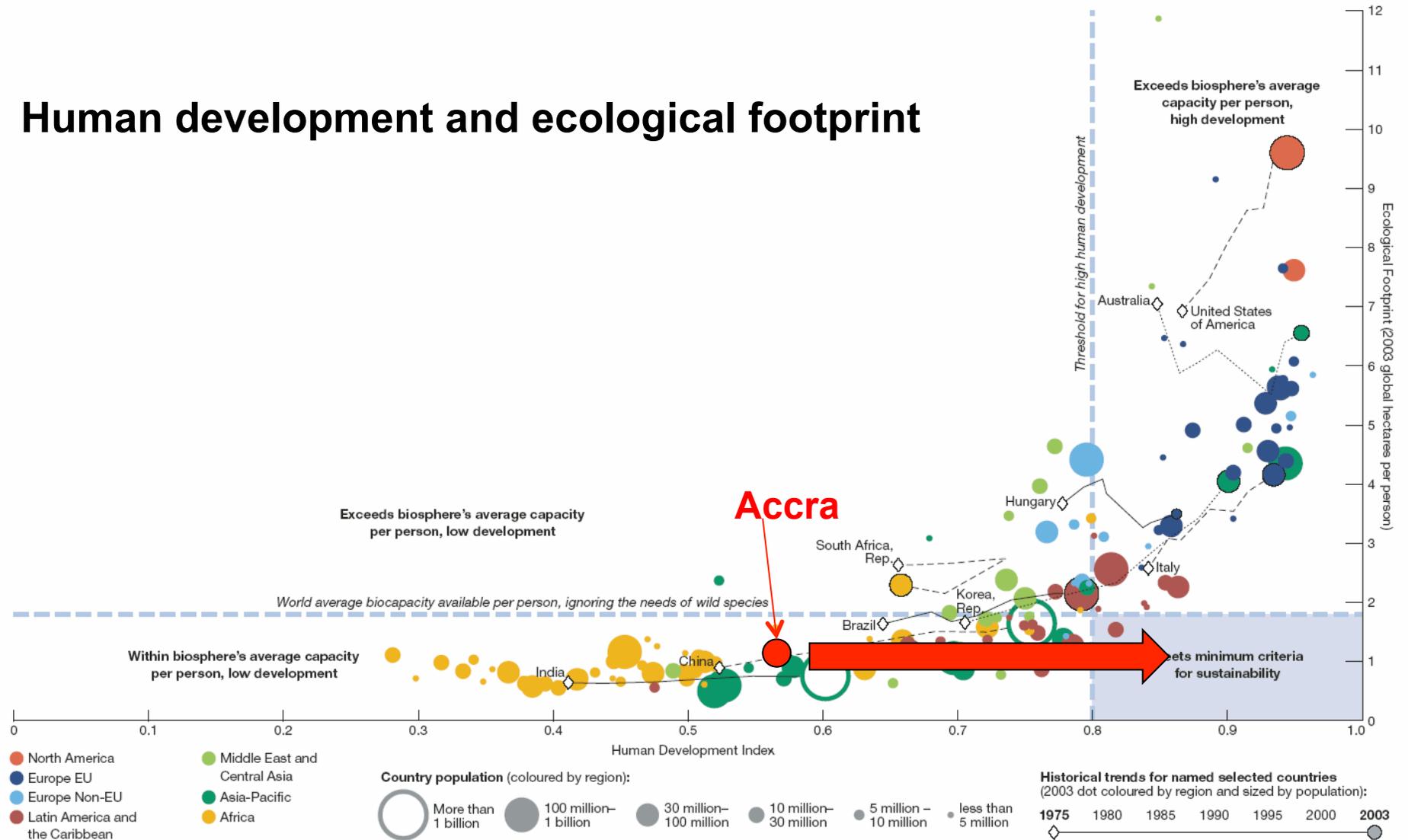
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# 1. Climate, environment, natural resource challenges

# Human development and ecological footprint

Fig. 22: HUMAN DEVELOPMENT AND ECOLOGICAL FOOTPRINTS, 2003



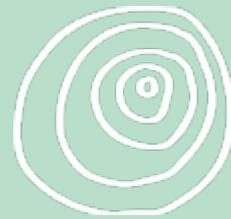
# Planetary Health Report September 2015



**Goal 11**  
Make cities and human settlements inclusive, safe, resilient and Sustainable

**Target 11.4.**  
Strengthen efforts to protect and safeguard the world's cultural and natural heritage.





## 2. Global-local action to support inclusive, resilient, low carbon development

# Target Trust Demonstrator Network

**UK**  
Demo region  
Dorset LEP  
**IFS**  
DFID

**Mainland Europe**  
Denmark,  
ICLEI GIZ **Climate KIC-IFS**

**Mongolia**  
Demo region  
UN ADB FCO

**CHINA**  
NDRC  
MOHURD  
APEC  
Eco Demo Regions  
**International Centre  
Chongqing  
University**

**Americas**  
Demo regions  
Rio de Janeiro  
USA city

**Global**  
UNEP  
UN Habitat  
UNDP  
**UNSDSN  
UCCRN**

**Cities Alliance**  
Country programme  
5 Centres  
**African Centre for  
Cities**  
**African Urban Research  
Initiative**

# ACCRA CITY RESILIENCE 100 RESILIENT CITIES

*The capacity of individuals, communities, institutions, businesses, and systems within a city to survive, adapt, and grow no matter what kinds of chronic stresses and acute shocks they experience*

AGING INFRASTRUCTURE

DISEASE OUTBREAK

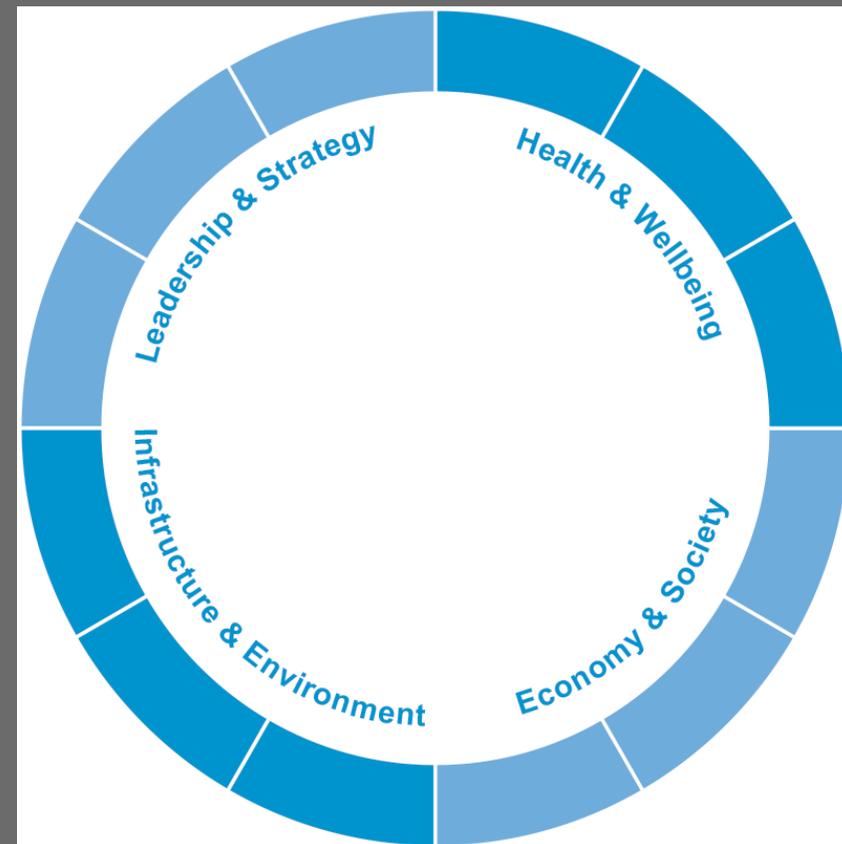
FLOODING (COASTAL AND RAINFALL)

INFRASTRUCTURE FAILURE

LACK OF AFFORDABLE HOUSING

POLLUTION OR ENVIRONMENTAL  
DEGRADATION

SOCIAL INEQUITY



FOOD



RAW MATERIALS

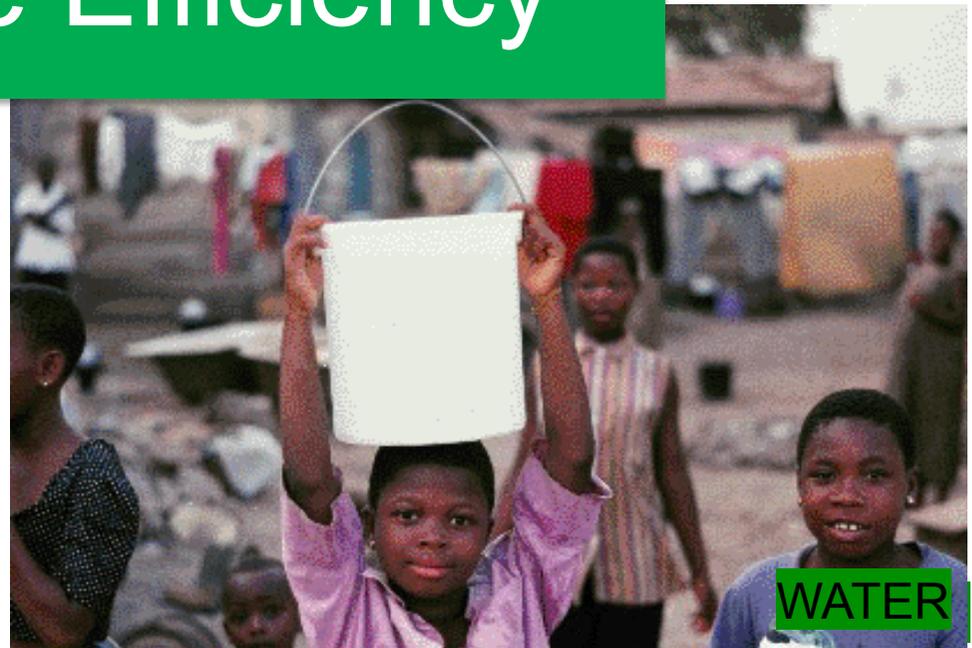


# Resource Efficiency

ENERGY



WATER

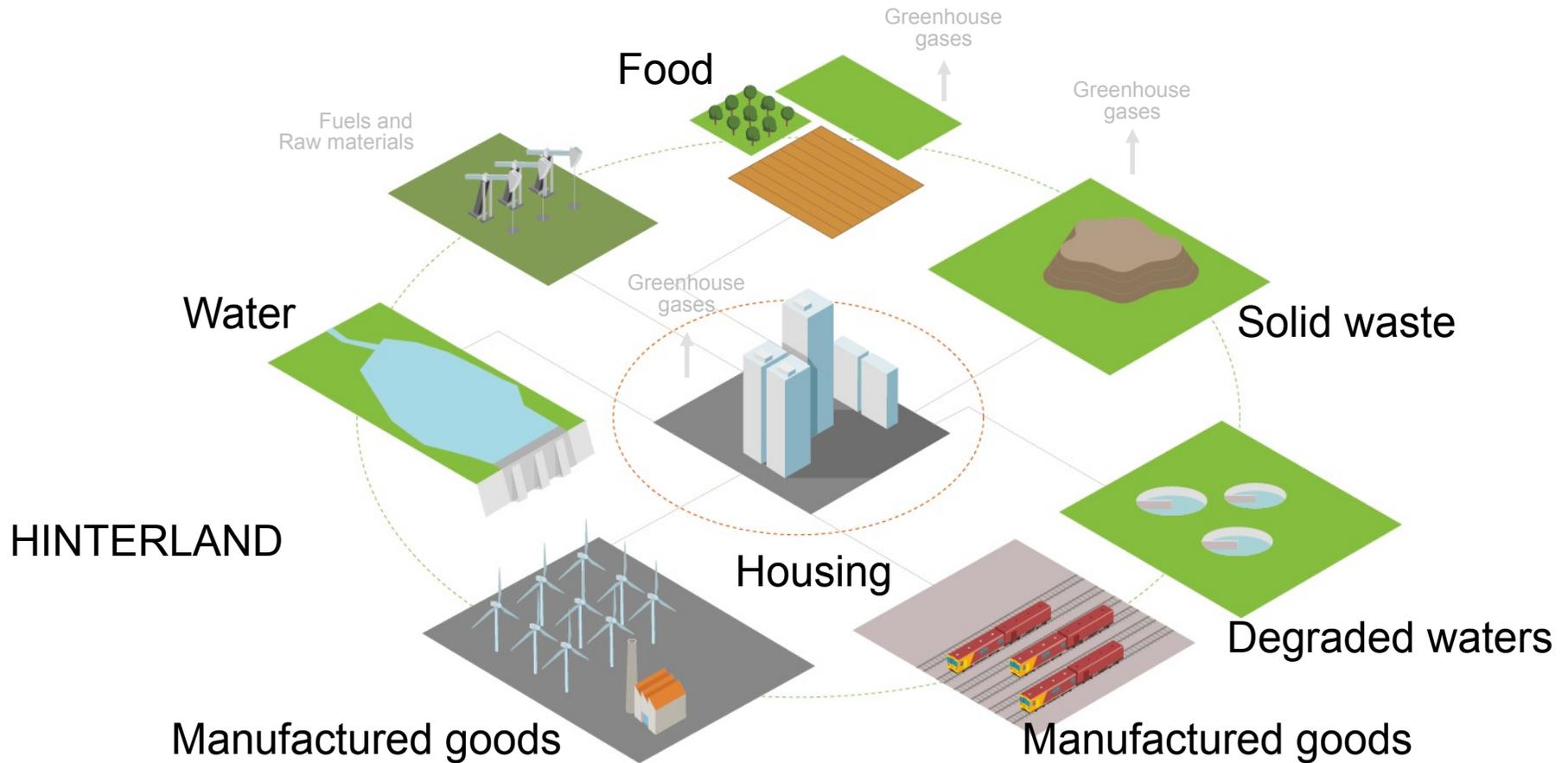


By 2030 world needs 30% more water, 40% more energy & 50% more food

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# Approach to Sustainable Regions

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1. A Regional Approach

2. Gather regional data, develop regional knowledge, embed integrated regional planning, build regional capacity and shared confidence to act

3. Uniting economic, societal and environmental perspectives and shape interventions with a common/credible economic analyses



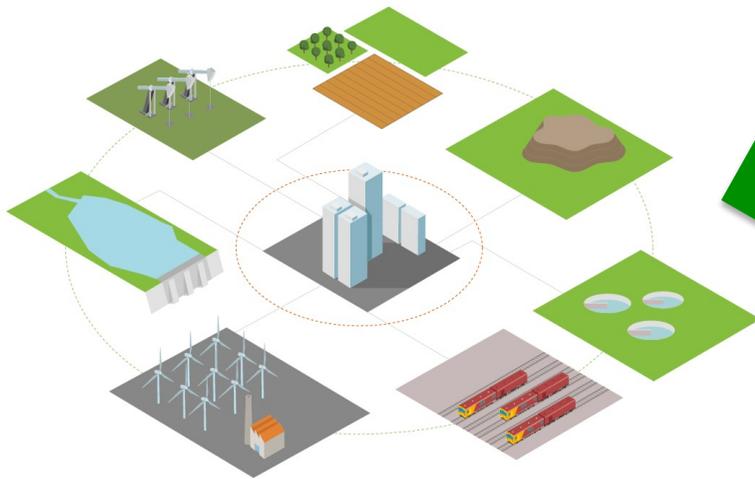
# 3. From observatory to collaboratory





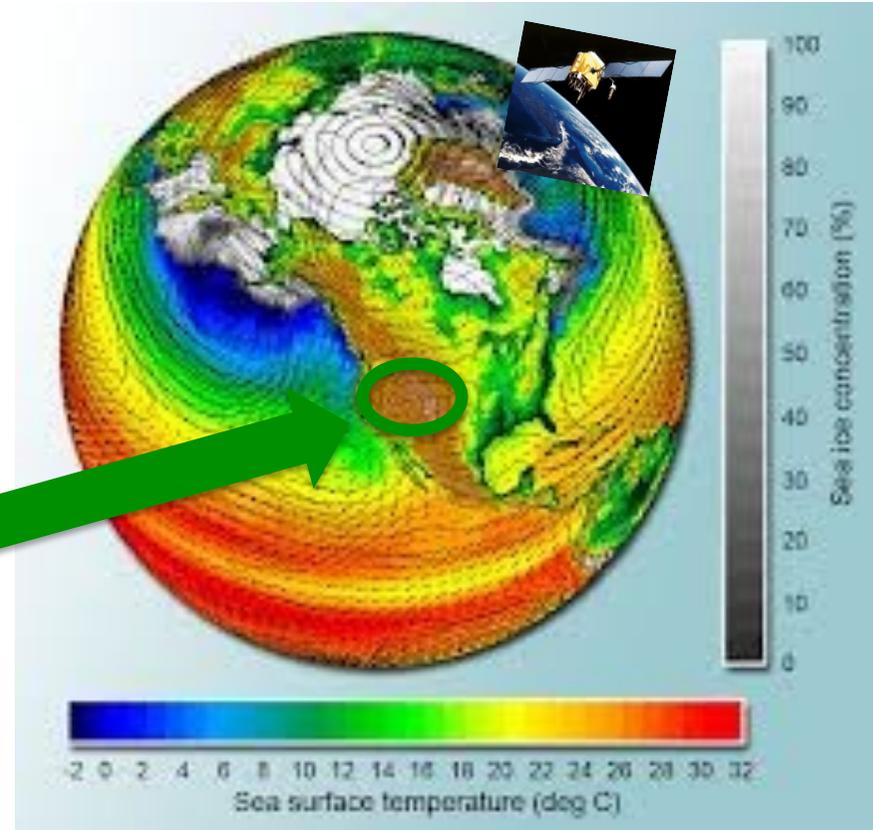
resilience.io

Region Simulator



[www.ecosequestrust.org](http://www.ecosequestrust.org)

Earth Simulator

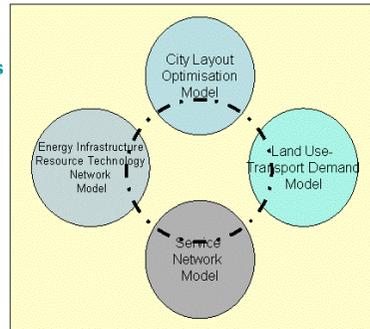
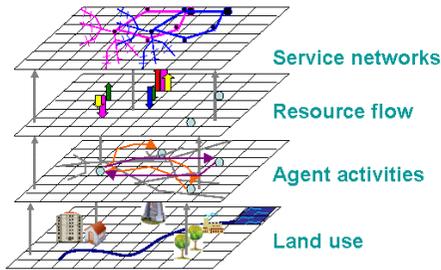


[www.icesfoundation.org](http://www.icesfoundation.org)

# Open-source-agent based modelling

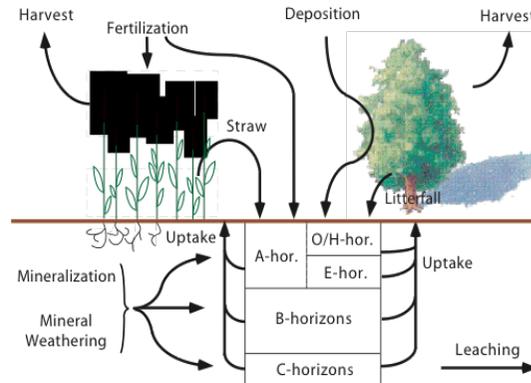
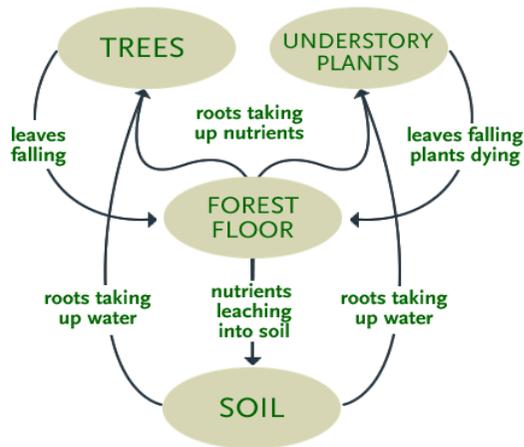
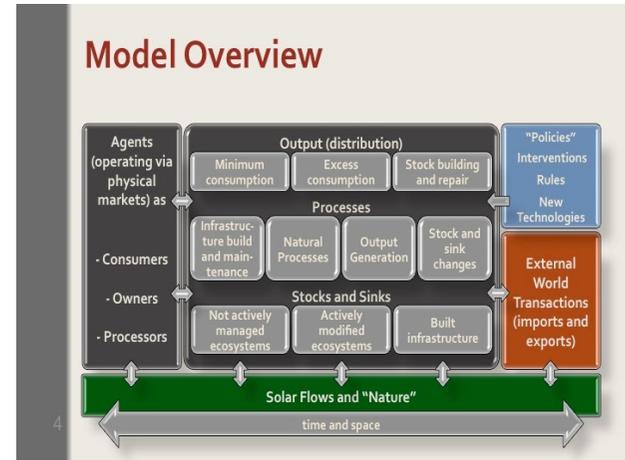
*Syn City*

City resources



*IIER*

Economics



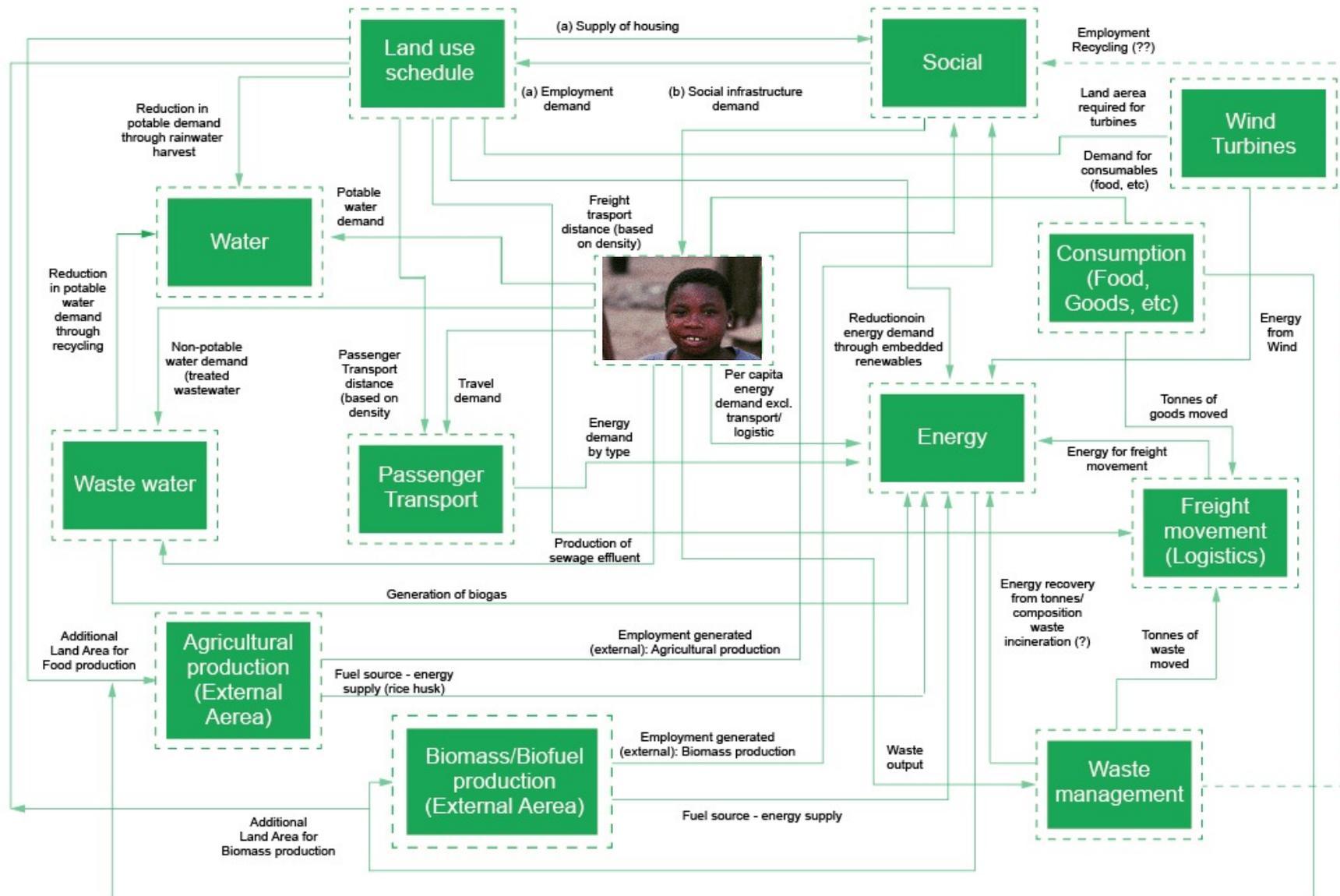
*EFI*

Forestry

*PROFILE*

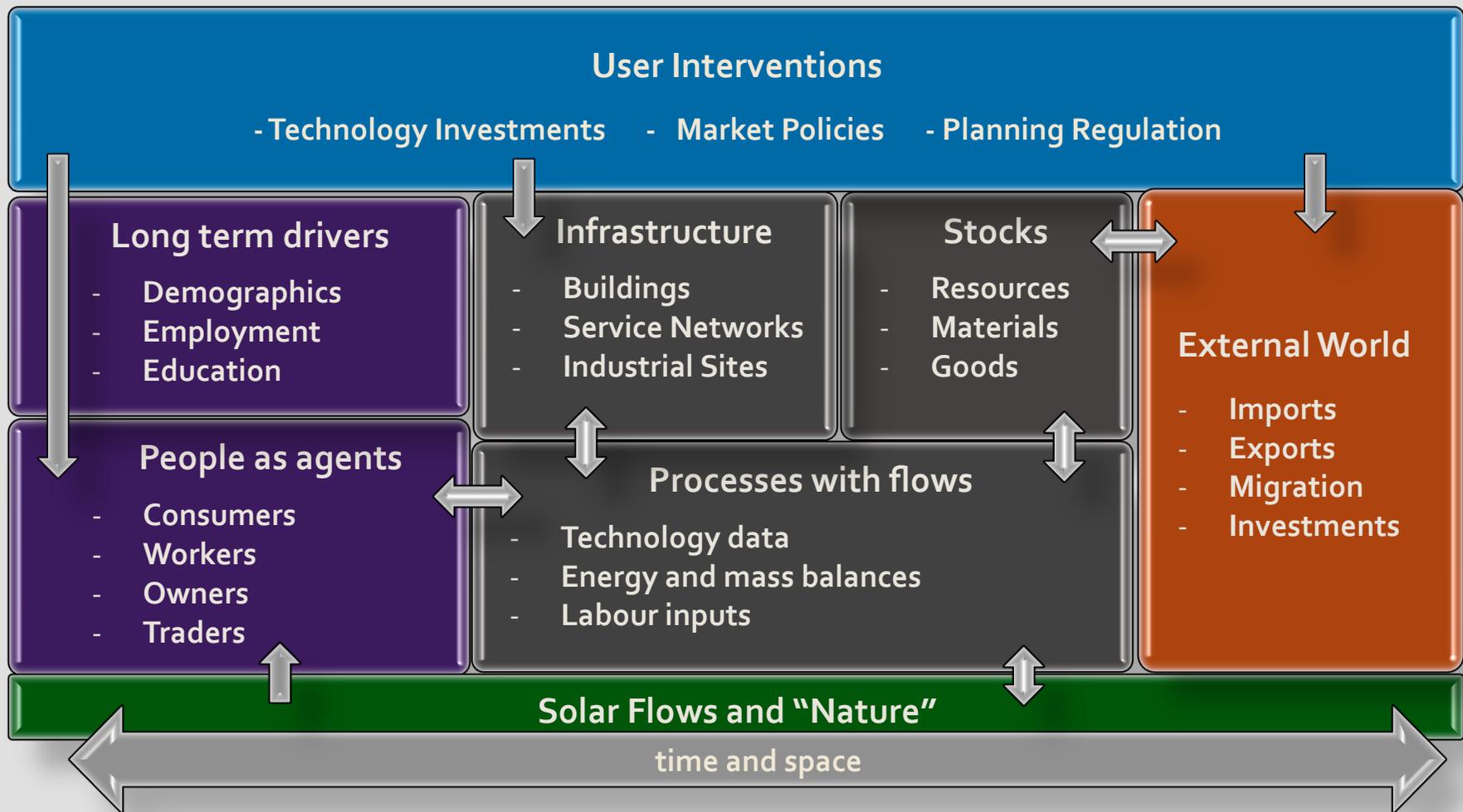
Soil-agriculture

# The system of community life

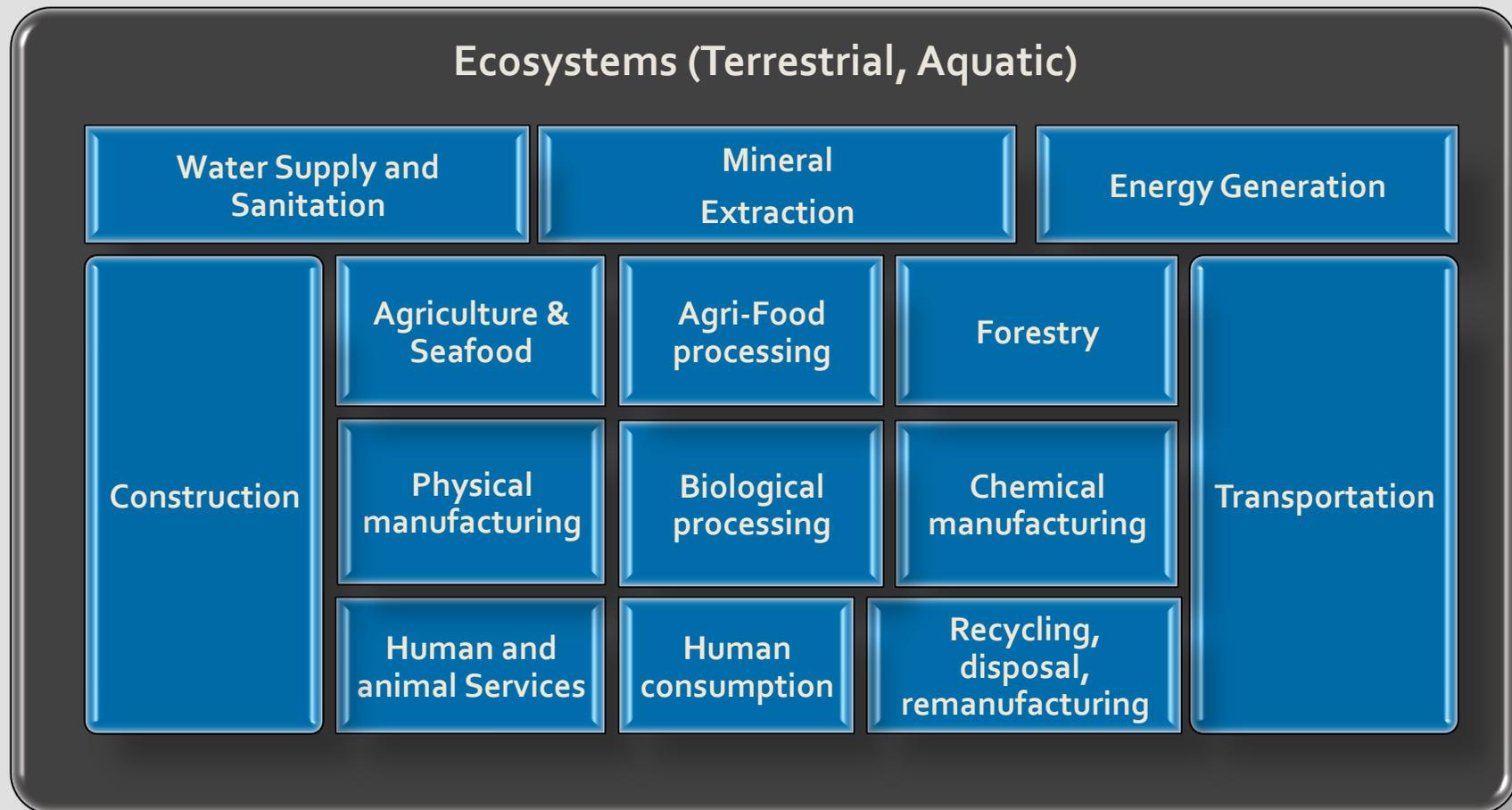




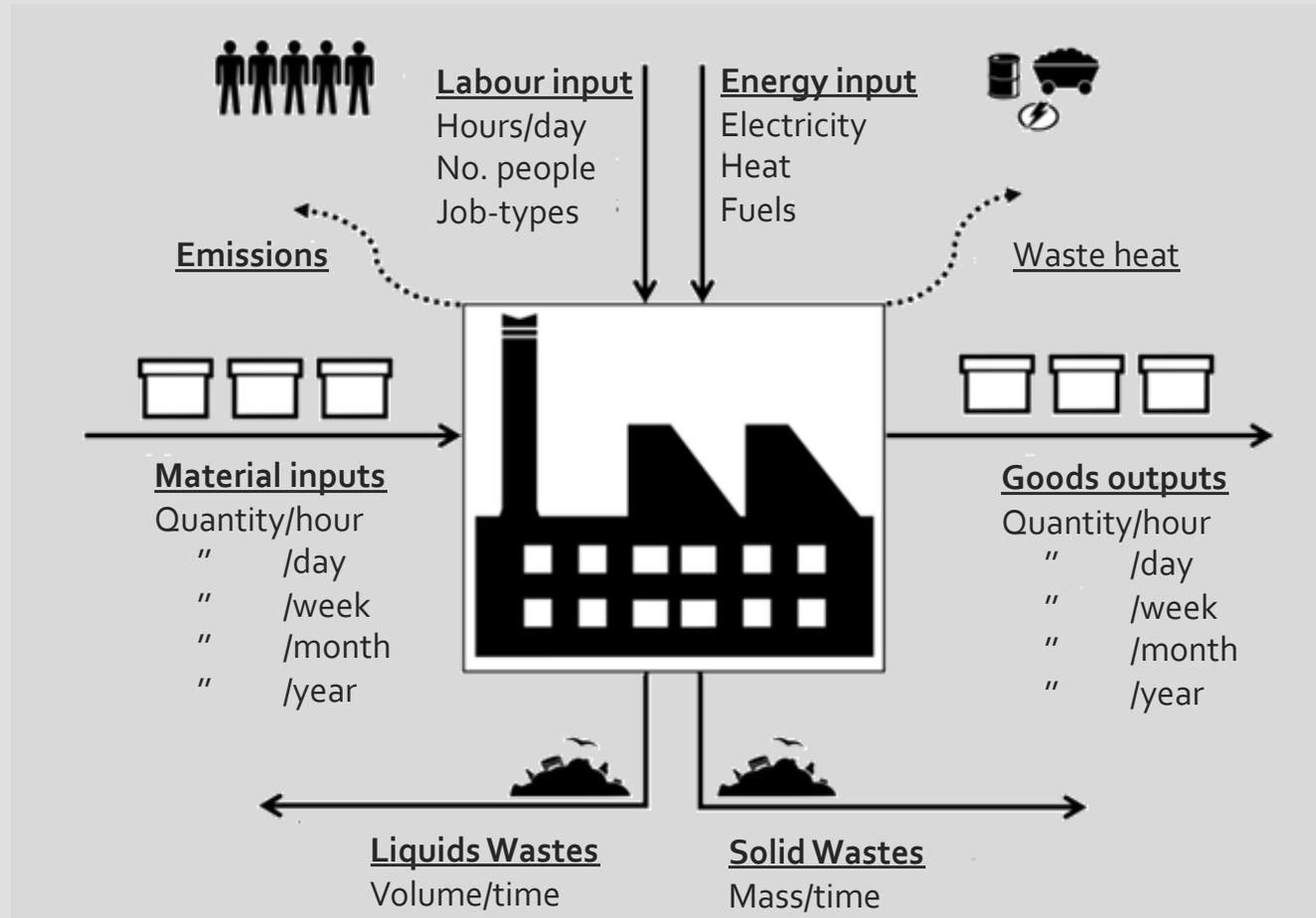
# How – A simplified world in the computer: A Spatial Model of a ‘Human Ecosystem’



# Activities in model grouped by sector type



Within a sector technology/processes are studied to create a resource account of the economy





**“Green, circular, Knowledge economy”**

**Economy**



**Human agents and their well-being**



**Human Health**  
well-being nutrition, life-span, healthcare costs

**Labour**- skill, job availability, salary, productivity

**Training & Education**-skill and knowledge through learning and education

**Asset Value**

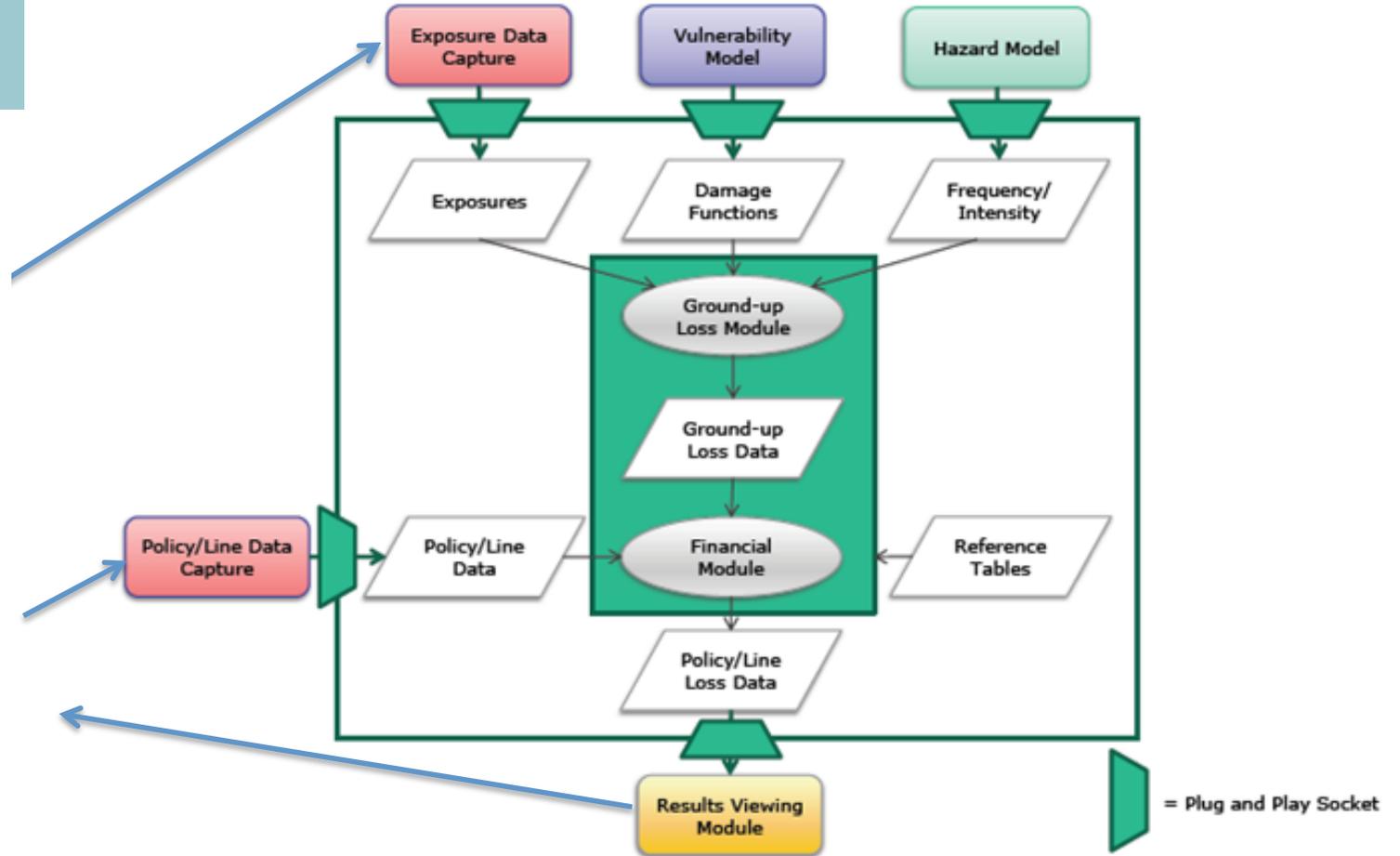
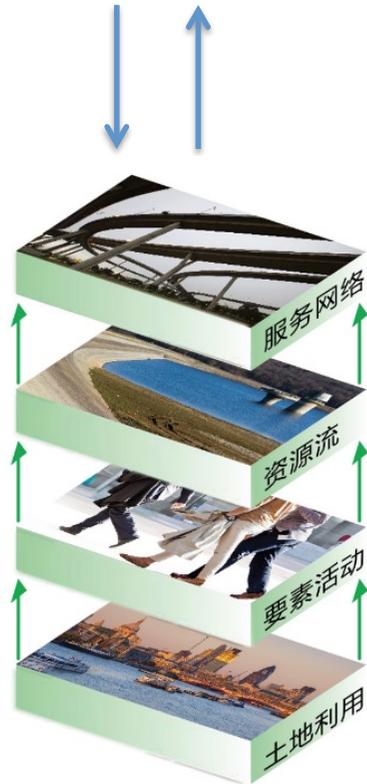
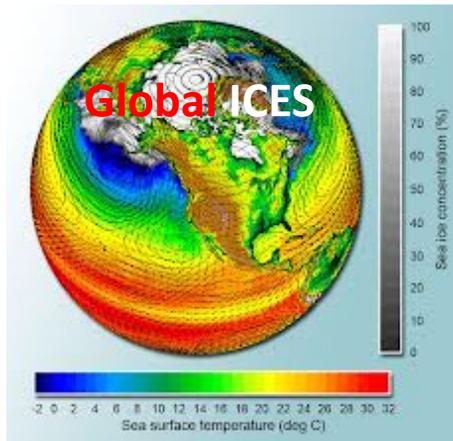
**Goods**



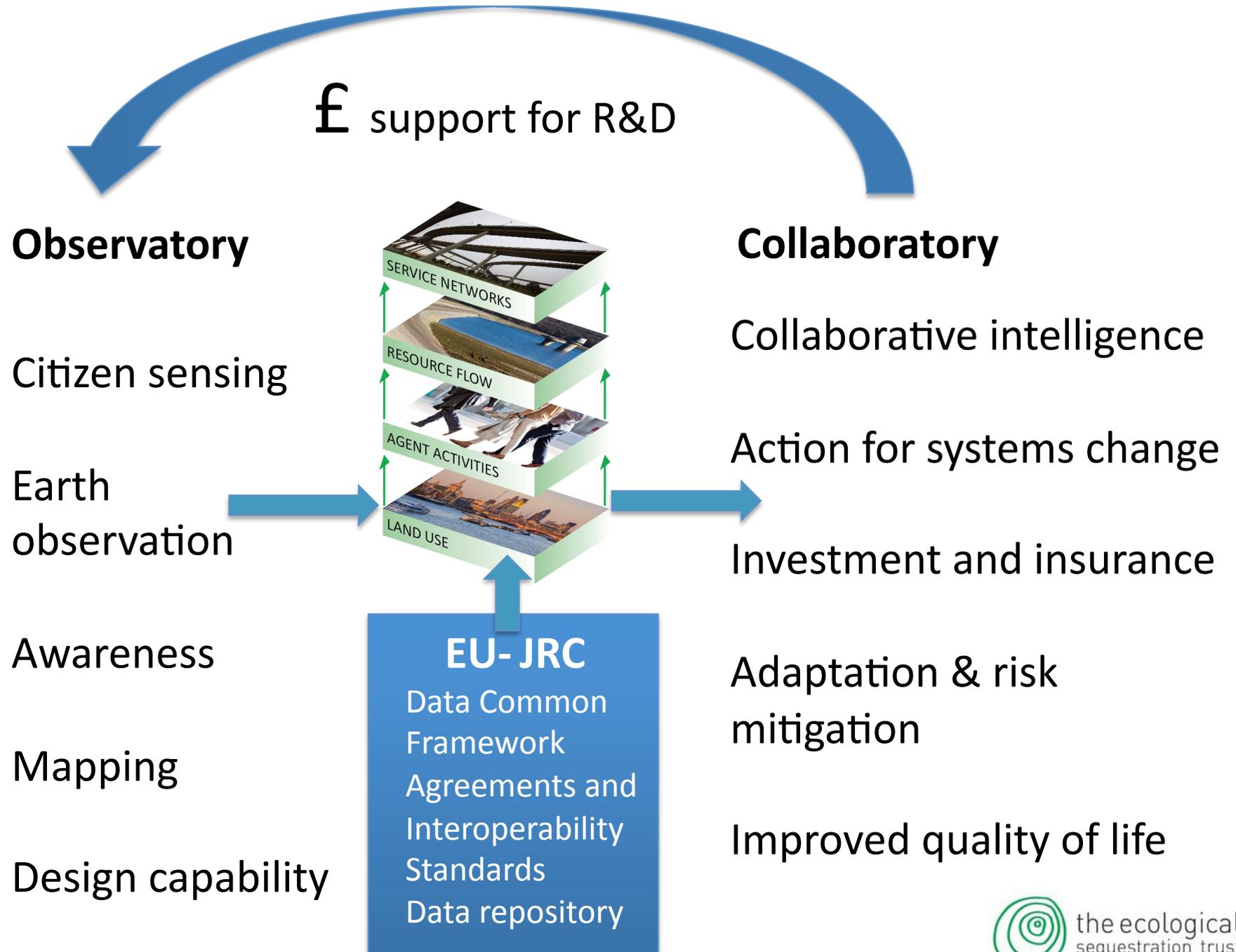
**High quality Inclusive resilient growth**

# Insurance Catastrophic Risk Modelling

## OASIS



# Citizen science and smart communities



# **Governance?**

**Managed by a social enterprise**

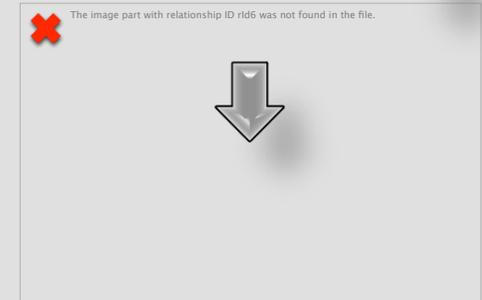
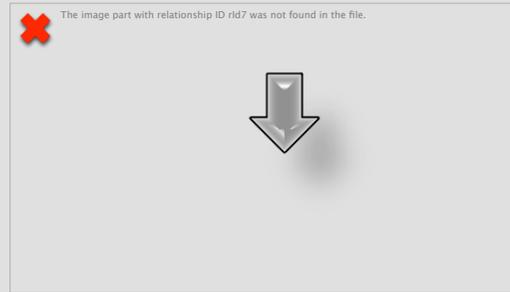
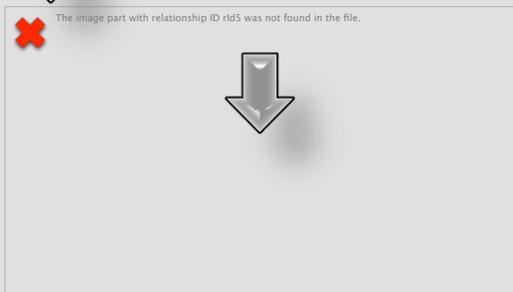
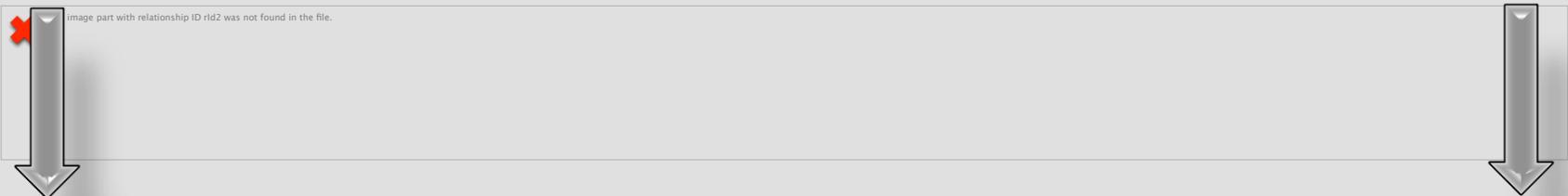
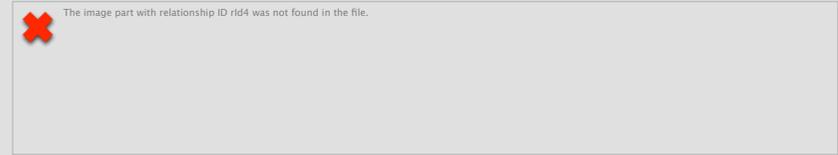
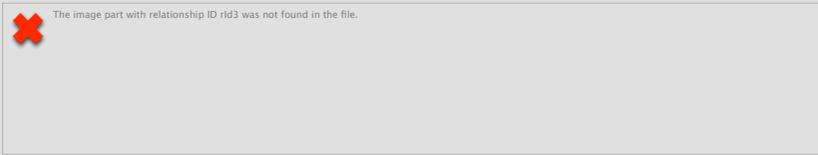
**Funded from the regional investment fund**

**Fund management by a community regional bank**

**Used free by public, private sectors, communities and NGO's**

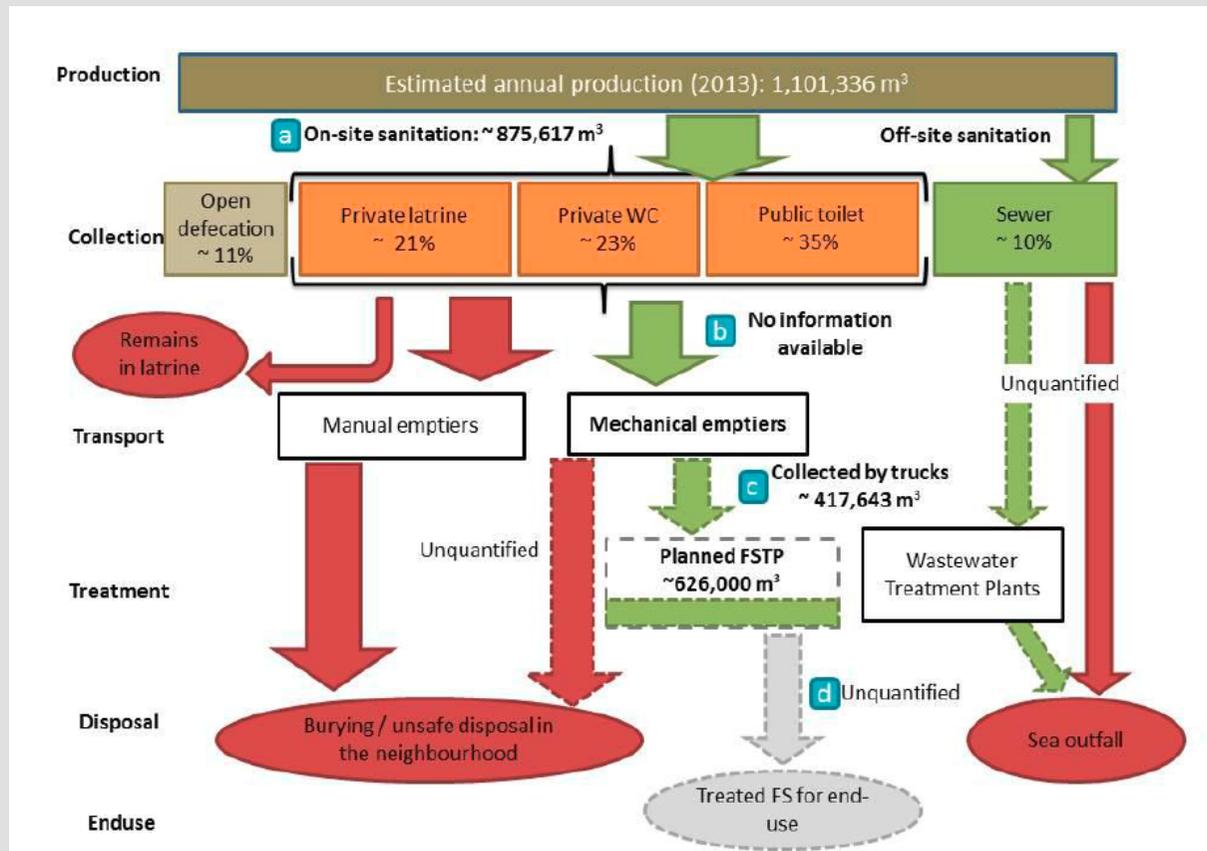


# Source Water Overview GWCL Pipe-network



**GWCL Collection of Revenue Water**  
± % in 2014

# Sewage flow overview



Estimated volume of liquid waste generated:  
875,617 m<sup>3</sup>/year

Estimated volume of liquid waste collection needs:  
706,129 m<sup>3</sup>/year

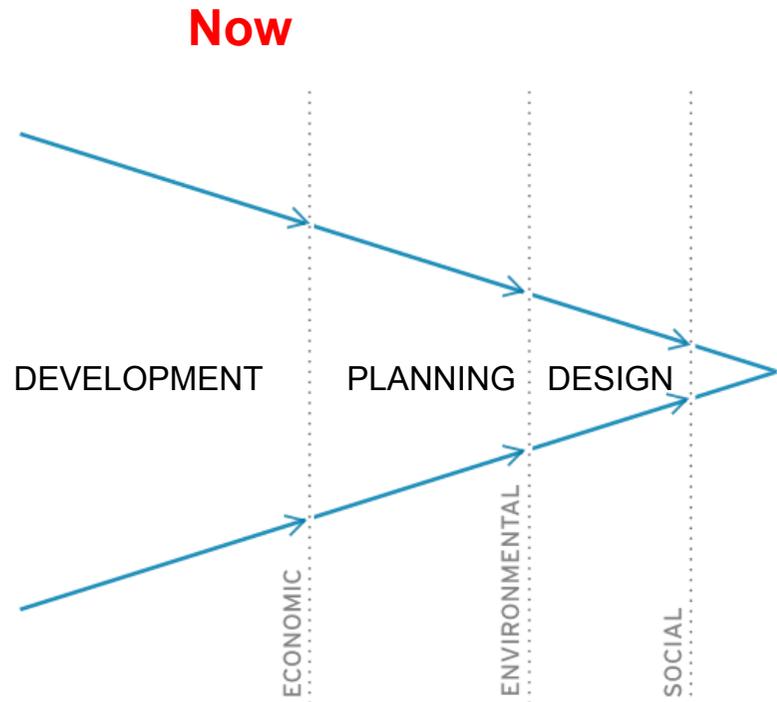
Assumptions:

- 0.20 liter cap/day pit latrines
- 1.00 liter cap/day septic tanks / private toilets
- 2.00 liter cap/day public toilets

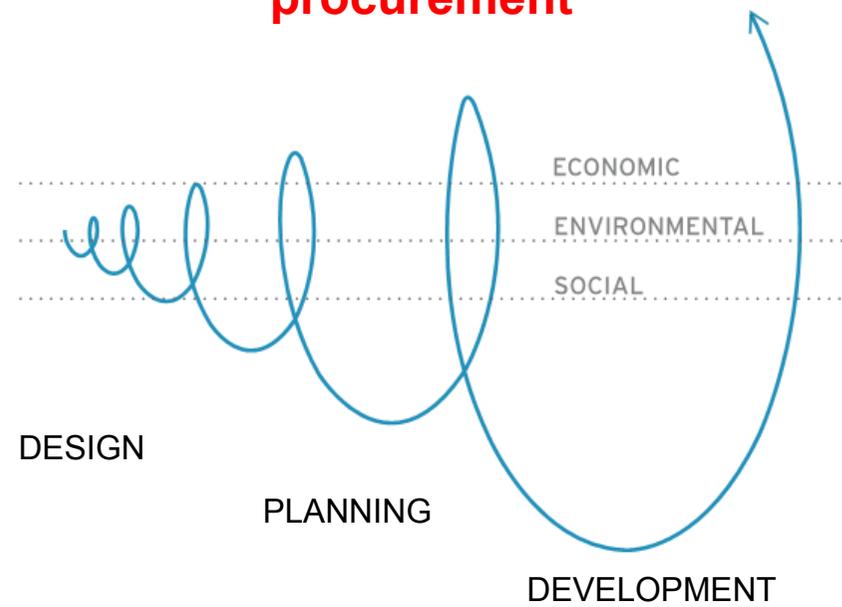
Average for GAMA 1.23 l cap/day

Source: hydrophil iC GmbH, 2014. Work Package 4: Financial Strategy for FS End-Use: Report on the Financial viability of faecal sludge end-use in Dakar, Kampala and Accra. Swiss Agency for Development and Cooperation

# Integrated urban systems design/planning and procurement for sustainability and resilience



## Where we could be with systems thinking and performance based procurement



- Sequential and silo approach – conventional economic assessment dominates how we design (cities, policies, technology interventions etc)
- Short term political and finance cycles dominate economics
- Environment is looked at separately (i.e. water-food-energy, urban and rural viewed separately)
- Social benefit at the end of the line .

- INTEGRATED DESIGN
- INTEGRATED PLANNING
- ACCELERATED DEVELOPMENT

# Standards for energy efficient higher quality buildings and training to design and build them



Investing 1% GDP per year (\$40m) in public transport rather than just building roads including dedicated walking and cycling routes





“In order to implement the strategy, **collaboration** with a wide range of actors will be needed; to that end the Ulaanbaatar City Municipality looks forward to working together with all stakeholders willing to contribute to make Ulaanbaatar a prosperous city with a thriving economy and a pleasant living environment for its residents”



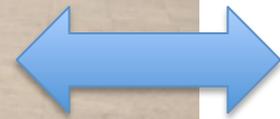




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**Collaborative urban design and planning**

Annual audit of future skill needs of public and private sector labour market can be input into resilience.io using “International Labour Organisation” ILO standards and used to adjust the education sector objectives. Eg Norway does this annually  
World leading approach to attract overseas students back.



# Public participation through the “Ger Areas Redevelopment Process Ordinance” will be facilitated and supported with visualisations

Төвийн бүсийн гэр хороолол



Өндөр, дунд давхарын орон сууцны хороолол



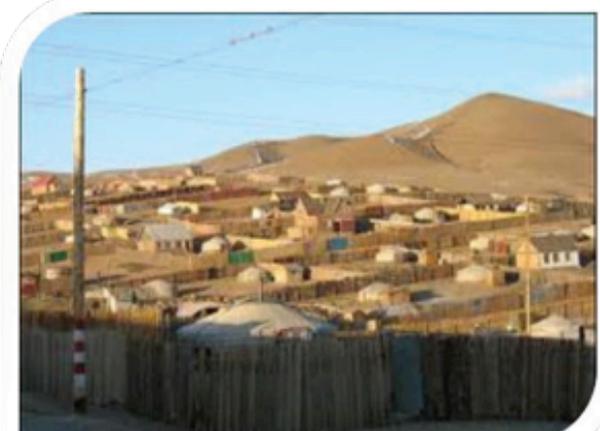
Дундын бүсийн гэр хороолол



Дунд, нам давхарын орон сууцны хороолол



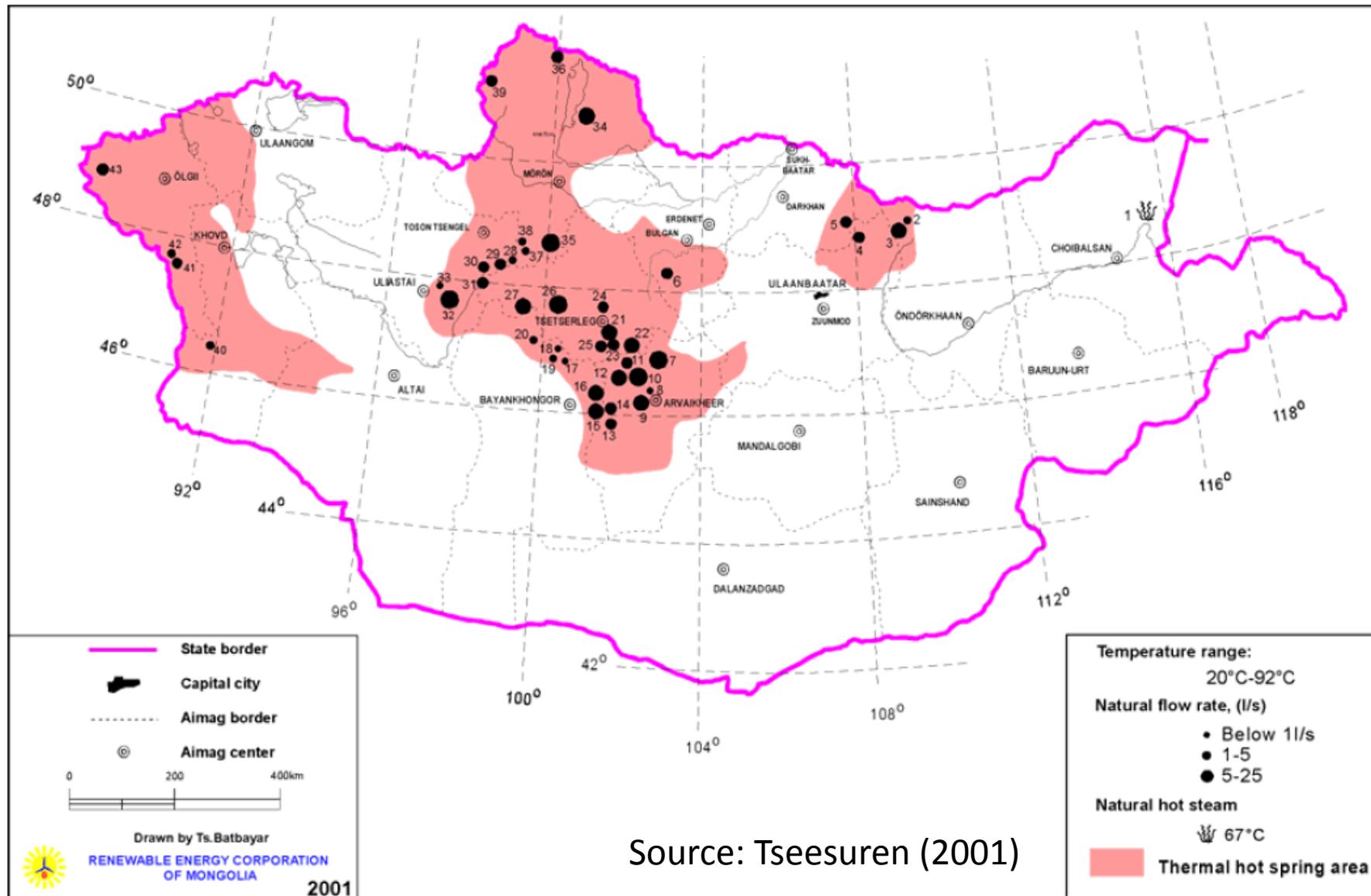
Захын бүсийн гэр хороолол



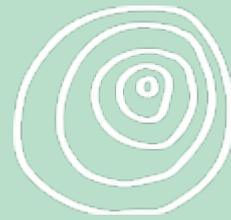
Сайжруулсан гэр сууцны хороолол



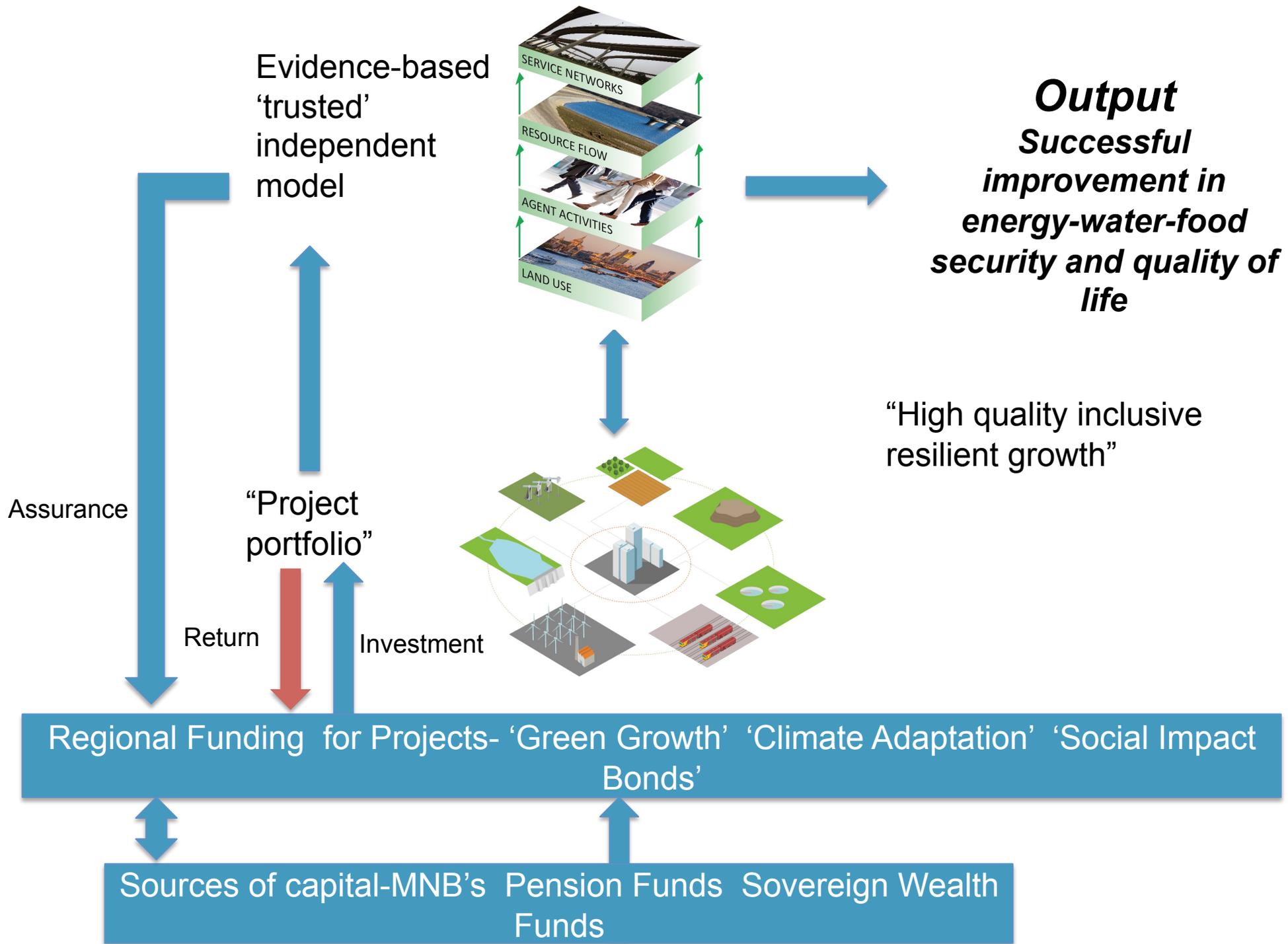
# Hot Spring Regions



Source: Tseesuren (2001)



# 4. Innovation in financing of inclusive, resilient development



Evidence-based  
'trusted'  
independent  
model



**Output**  
*Successful  
improvement in  
energy-water-food  
security and quality of  
life*

"High quality inclusive  
resilient growth"

Assurance

"Project  
portfolio"

Return

Investment

Regional Funding for Projects- 'Green Growth' 'Climate Adaptation' 'Social Impact Bonds'

Sources of capital-MNB's Pension Funds Sovereign Wealth Funds

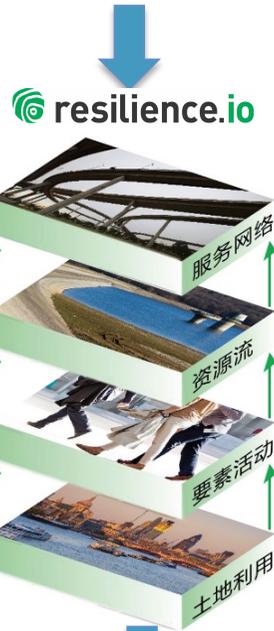
# TEST supporting city of UlaanBaatar in accessing Green Climate Fund finance



**May  
2015**

# Funding Future Research & Value Creation towards Habitat III (Bellagio 2)

Regional  
Financing  
区域融资

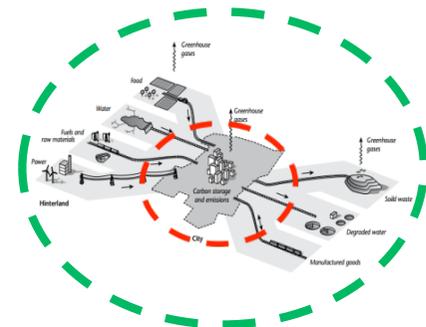


20% -40%  
Savings in planning and  
design costs

“Project  
portfolio”  
项目组合

Research  
Value

*“The Ecological  
Civilization”*  
Quality, inclusive,  
resilient growth  
生态文明，品质  
包容性，弹性增  
长





Thank you

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[@PeterHeadCBE](https://twitter.com/PeterHeadCBE)