

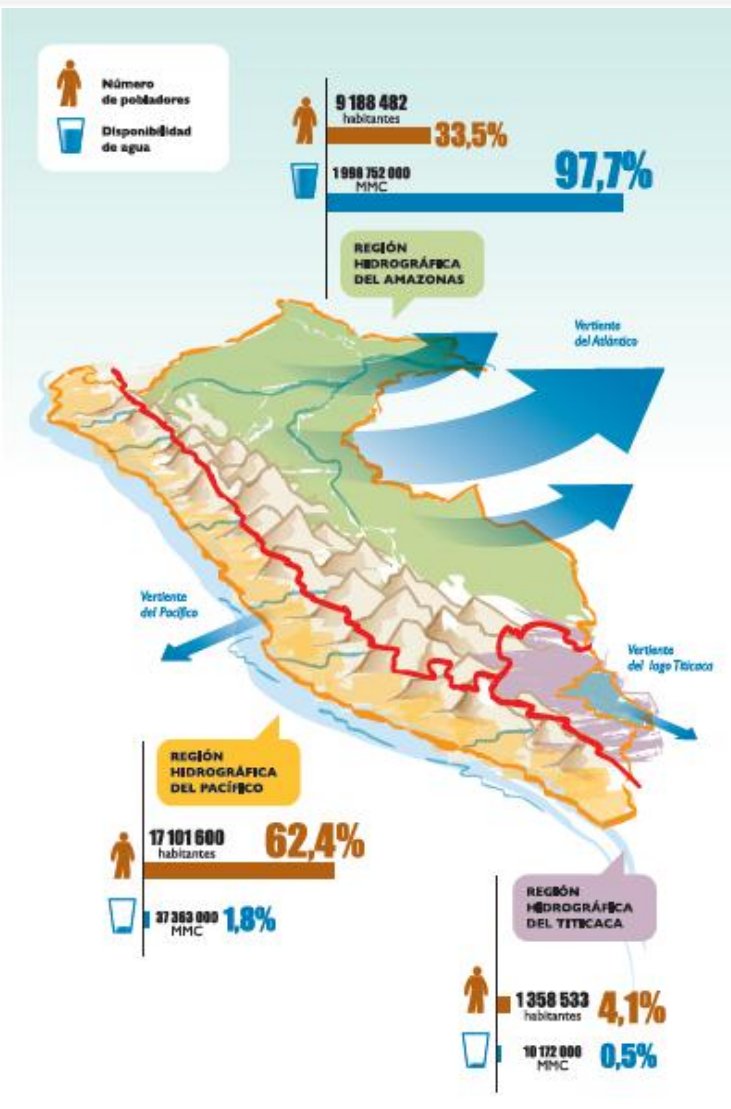
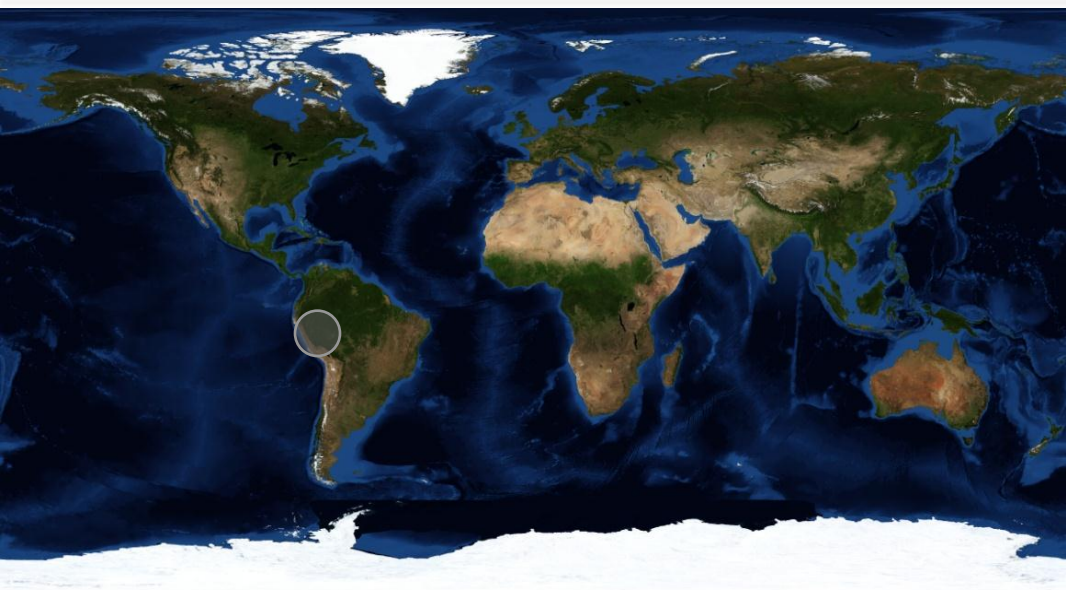
Research for Sustainable Development of Megacities of Tomorrow  
“Future Megacities Program“ - Ministry of Education and Research (BMBF)

# **Sustainable Water and Wastewater Management in Urban Growth Centres Coping with Climate Change Concepts for Metropolitan Lima (Peru) LiWa Project**

## **Integrated urban planning strategies and planning tools-WP9**

## Presentation Outline

- Workpackage Overview
- Lima Ecological Infrastructure Strategy (LEIS)
  - LEIS Principles
  - LEIS Tool
  - LEIS Manual
- Conclusions



CIUDAD	Población (Mill. Hab.)	Capacidad de producción (m3/s)	Reservas (Mill. M3)	Reservas por habitante (M3/hab)	Precipitación (mm/año)
Río de Janeiro	9	52	(*)	0	1170
Sao Paulo	25	90	2073	83	1500
Santiago	5,9	24	900	153	384
Bogotá	6,5	25	800	123	800
Lima	8,0	20	282	35	9

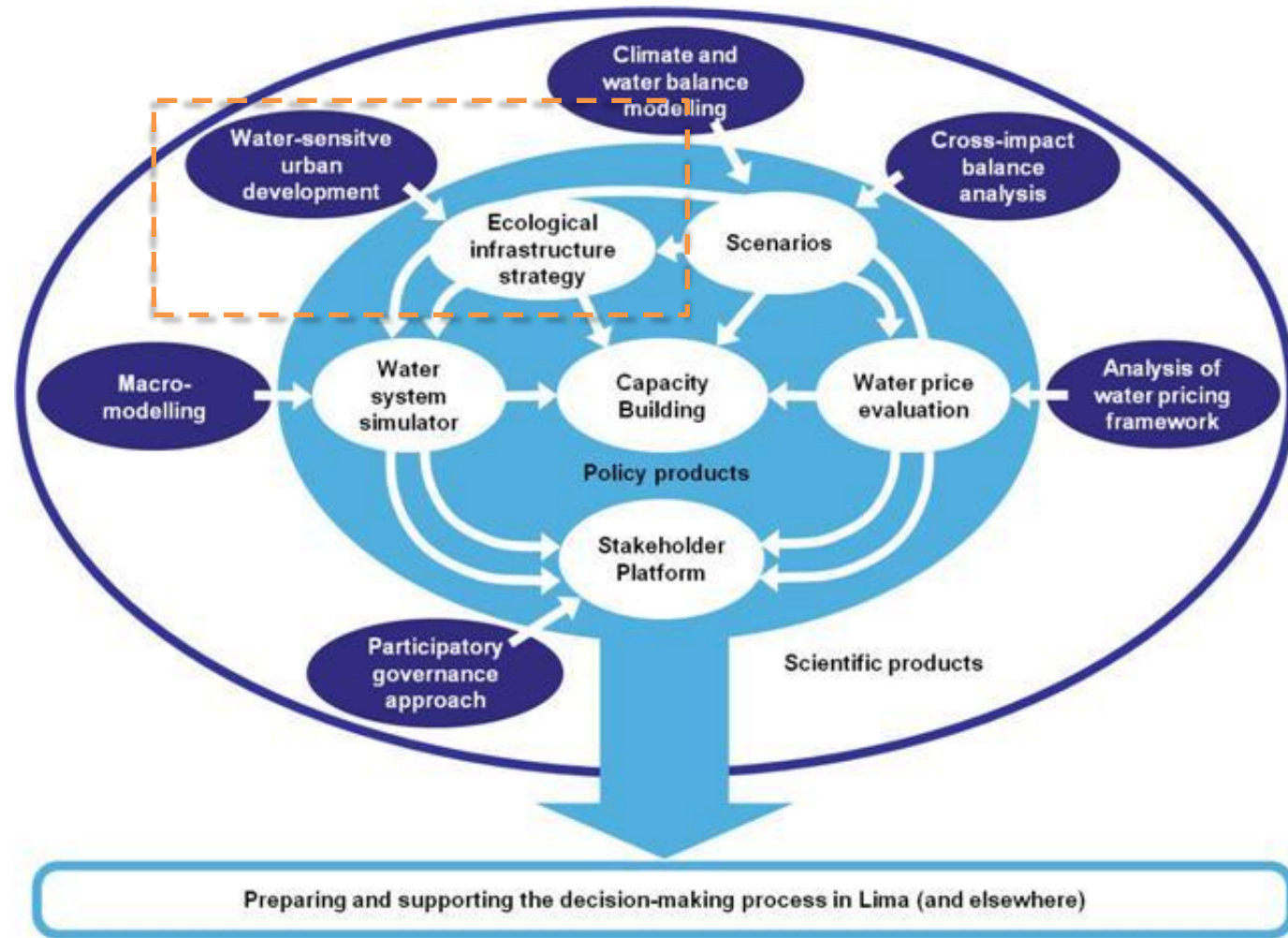
\* No tiene problemas de fuente por el gran caudal del río que abastece la ciudad y por el alto nivel de precipitaciones  
 Fuente: Memorias Anuales Principales Empresas de Saneamiento de Sudamérica

Fuente: Dirección de Conservación y Planeamiento de Recursos Hídricos – Autoridad Nacional del Agua.

## Integrated urban planning strategies and planning tools

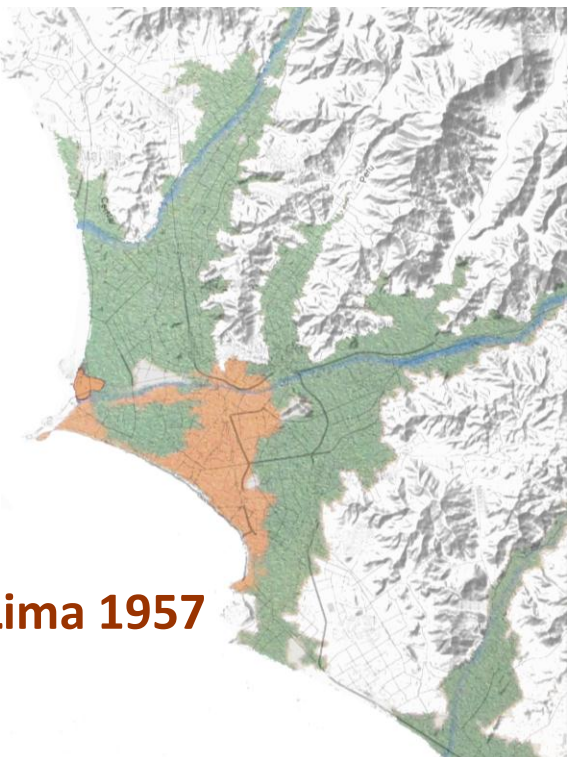
### Objective

Developing urban **planning and design** tools leading to **water sensitive** land use management considering **limited water** resources in Metropolitan Lima

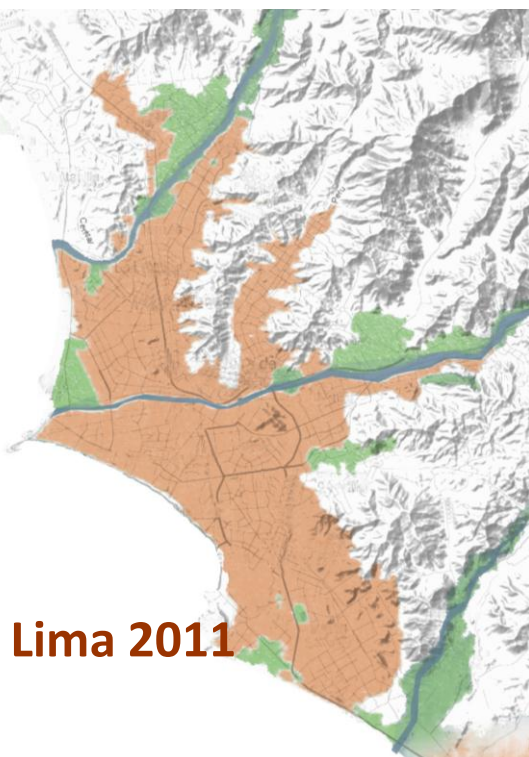




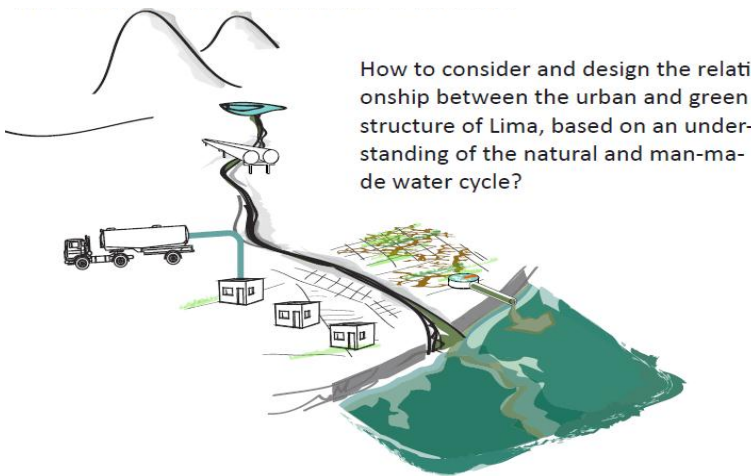
# Unsustainable and inefficient distribution and use of water resources



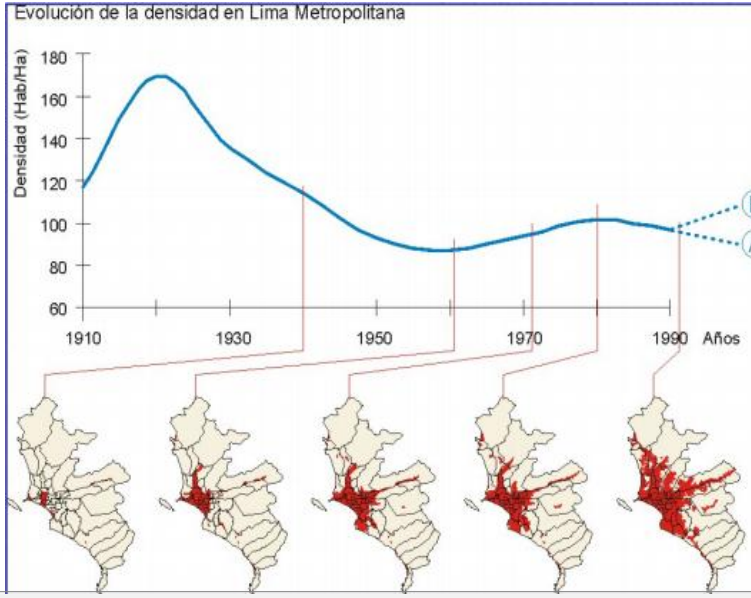
Lima 1957



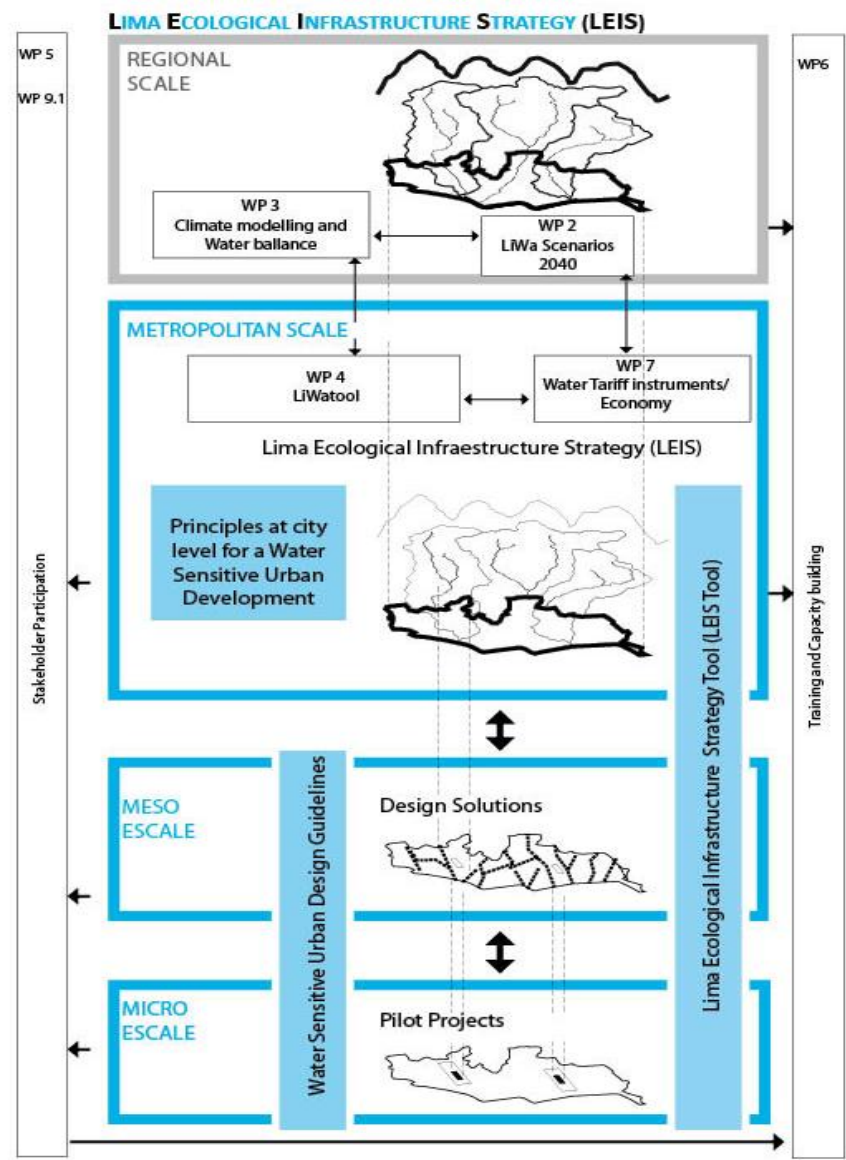
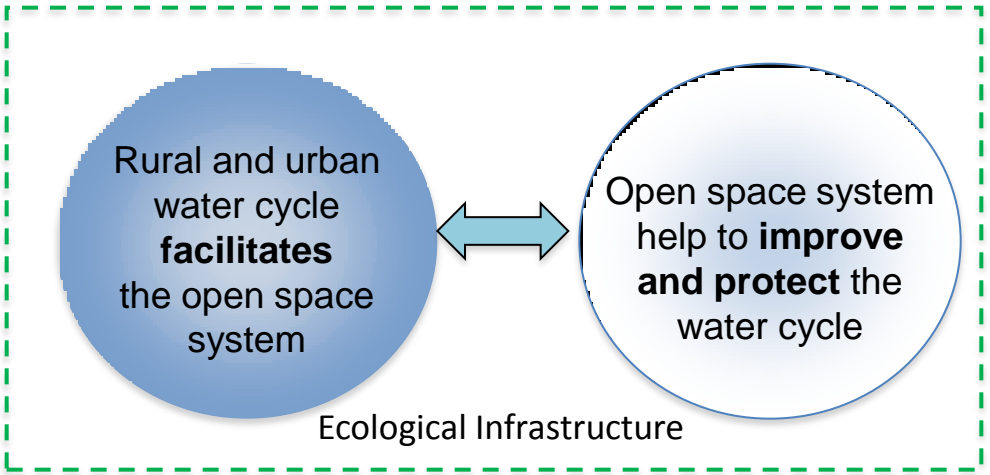
Lima 2011



- one million people without sufficient access to water and sanitation,
- Water cost 10 times more than areas connected,
- Potable water is used for irrigation and only 10% of wastewater is re-used. (SWITCH 2010)

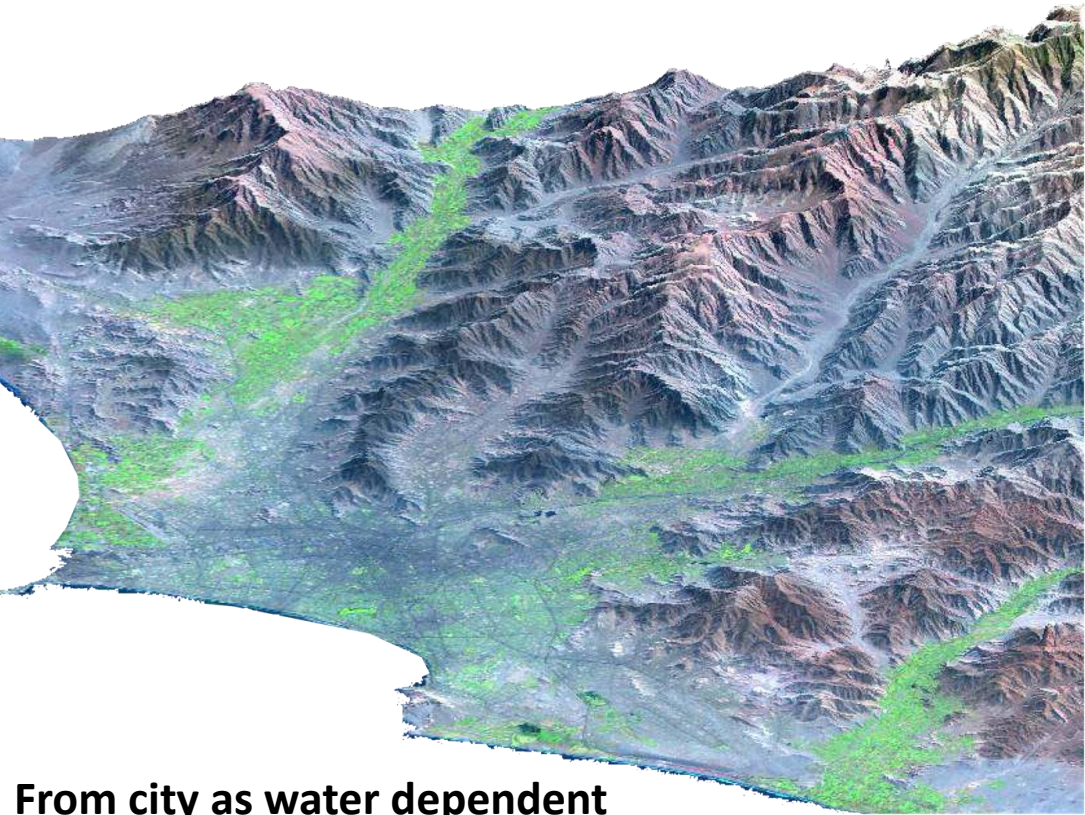


Establish the Lima Ecological Infrastructure Strategy (LEIS) by **integrating** the urban **water cycle** into the **open space** system





**Water sources** includes surface water, underground water, wastewater and fog considering that some of these water sources are seasonal

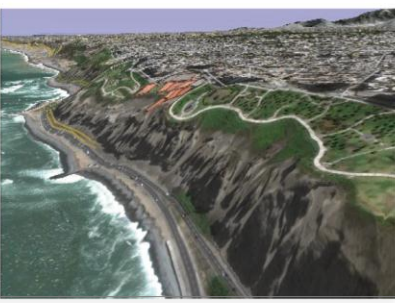
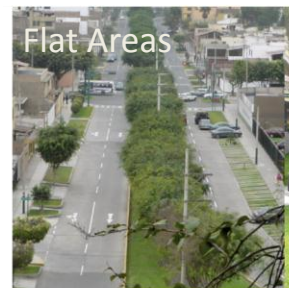
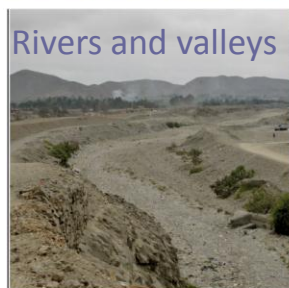
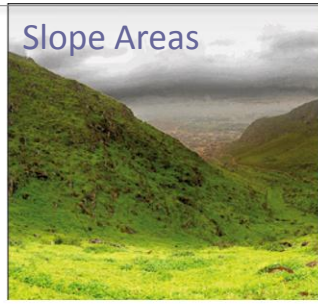
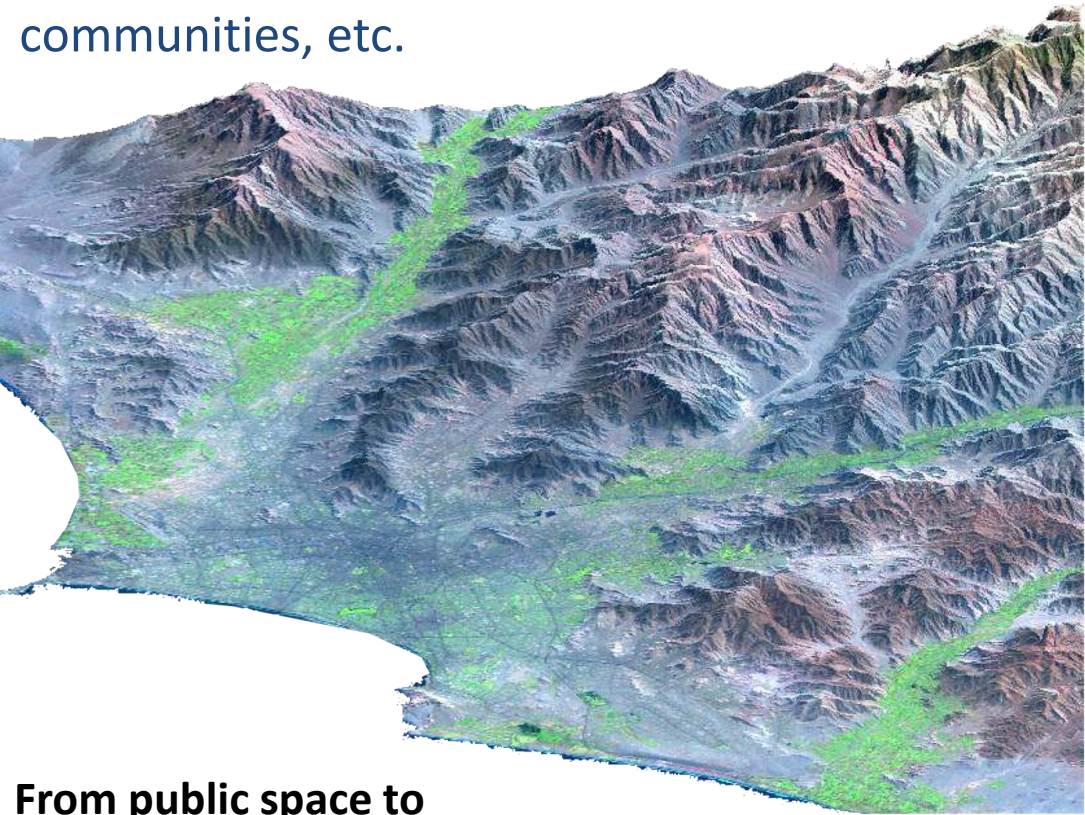


**From city as water dependent to city as water source**





**Open spaces** includes natural areas and man-made features, as for example agricultural land, greenways, wetlands, parks, forest reserves, roofs, native plant communities, etc.

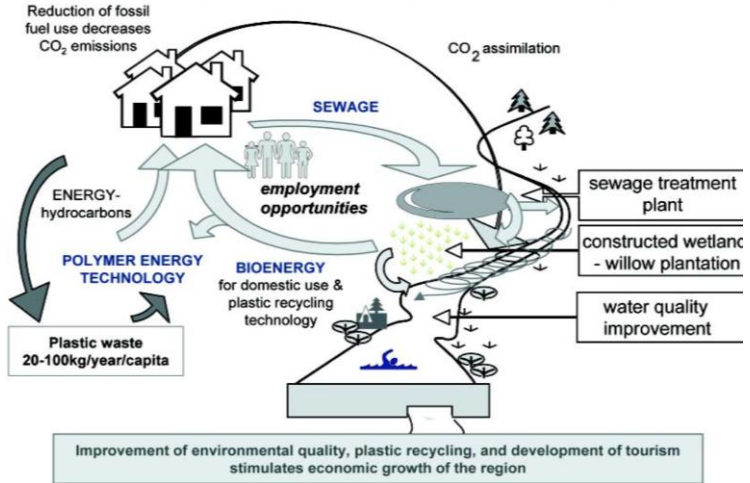


**From public space to Open Space approach**



# What are the **benefits** of the Ecological Infrastructure (EI)?

- Helps to build a coherent **open space system** composed by natural, semi-natural and artificial areas
- Create **new ecosystems** over abandoned and under used areas
- Add **new functions** improving environmental services



Source: Integrated Watershed Management, Ecohydrology and Phototechnology, Manual, UNEP

- Support **adaptation and mitigation** processes, etc

# Conditions needed

**POLITICAL WILL  
(GOVERNANCE)**

**STRONG CITY  
VISION**

**COMPREHENSIVE  
URBAN PLANNING  
INSTRUMENTS**

**MULTIDISCIPLINARY  
APPROACH**

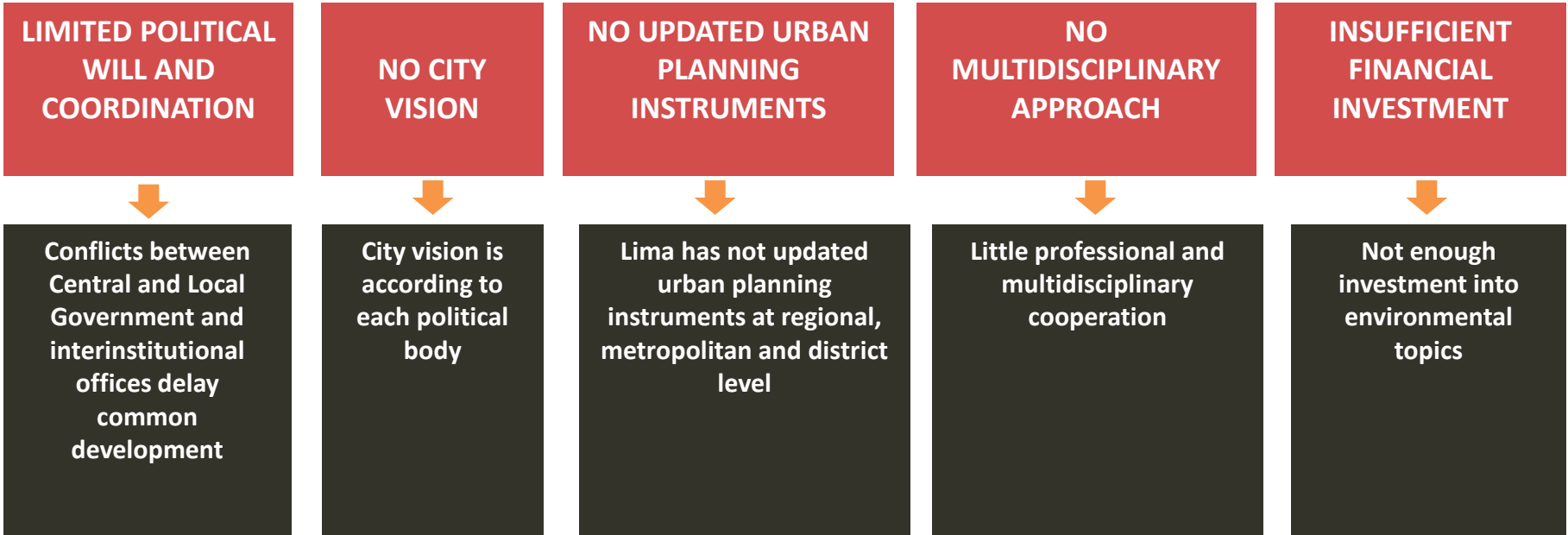
**PUBLIC AND  
PRIVATE  
INVESTMENT**



# Conditions needed



# Conditions found



# Current situation

**GOVERNANCE**



Different **political agendas** stop cooperation and coordination



**STRONG CITY VISION**



**"...LIMA is a healthy city, environmentally sustainable and ecologically balanced..." (PRDC)**

**COMPREHENSIVE URBAN PLANNING INSTRUMENTS**



**On progress:**  
 -Regional Concerted Development Plan (PRDC)  
 -Climate Change Metropolitan Strategy consider the EI as part of the adaptation and mitigation components (EMCC)  
 -Watershed studies of Chillon and Lurin  
 -Land Zoning Plan (POT)  
**Still pending:**  
 - Metropolitan Urban Development Plan, etc

**MULTIDISCIPLINARY APPROACH**



Limited number of projects takes into account a multidisciplinary approach

**PUBLIC AND PRIVATE INVESTMENT**





## Process for LEIS integration into Lima needs

- PRDC follows five dimensions (environmental, urban, social, economical and governance) and identified around 30 processes happening in the city
- Seven processes related to urban-environmental topics
- Four processes related to LEIS (ecosystems, vulnerability, water, governance)



Environmental Process (Diagnostic-PRDC)	Topic	Content	Development approach	SCALE		
			Lima Regional Plan (PRDC)	Land Zoning Plan (POT)	Metropolitan Development Plan (PDM)	District Development Plan (PUD)
Permanent lost of water sources (superficial, underground, and treated wastewater)	INTEGRAL WATER MANAGEMENT	Approach / Principles	Ciudad Región Sostenible	Territorio sostenible y ecoeficiente de los recursos hídricos	Ciudad como fuente de agua	Ciudad como fuente de agua
					Ecoeficiencia en la gestión del agua (4 Rs)	Ecoeficiencia en la gestión del agua (4 Rs)
					Ecosistémico	Ecosistémico
		Objectives / Policies	Promote urban development that consider catchment, saving, treatment and reuse of water in the city	Gestión integral y ecoeficiente de los recursos hídricos del territorio	Reducir el consumo de agua para fines distintos al consumo humano	Maximizar el reuso de aguas residuales sobre los espacios abiertos multifuncionales sensibles a ciclo urbano del agua (Infraestructura Ecológica)
					Maximizar el reuso de aguas residuales	Maximizar el reuso de aguas residuales sobre los espacios abiertos multifuncionales sensibles a ciclo urbano del agua (Infraestructura Ecológica)
					Desarrollo e implementación de fuentes alternativas de agua como complemento a sistemas convencionales	Promoción de sistemas alternativos en áreas con/sin servicios de agua potable y/o alcantarillado
					Promover la cosecha de agua de neblina en áreas conveniente	Promoción de sistemas de atrapanieblas en la ciudad
					Promover el tratamiento separado de acuerdo al agua residual (domestico, industrial, etc)	Desarrollar sistemas de reuso ecológico en los espacios abiertos multifuncionales (IE)
					Definición de alternativas de tratamiento de agua bajo una lógica de Oferta-Demanda, Costo-Beneficio	Definición de alternativas de tratamiento de agua bajo una lógica de Oferta-Demanda, Costo-Beneficio



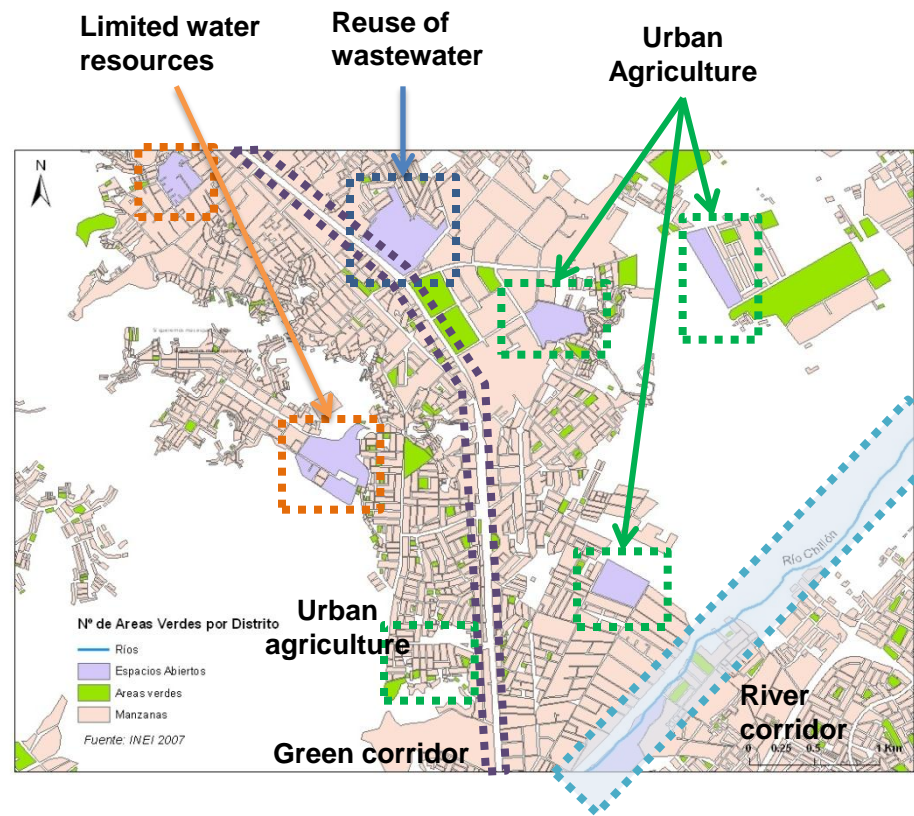
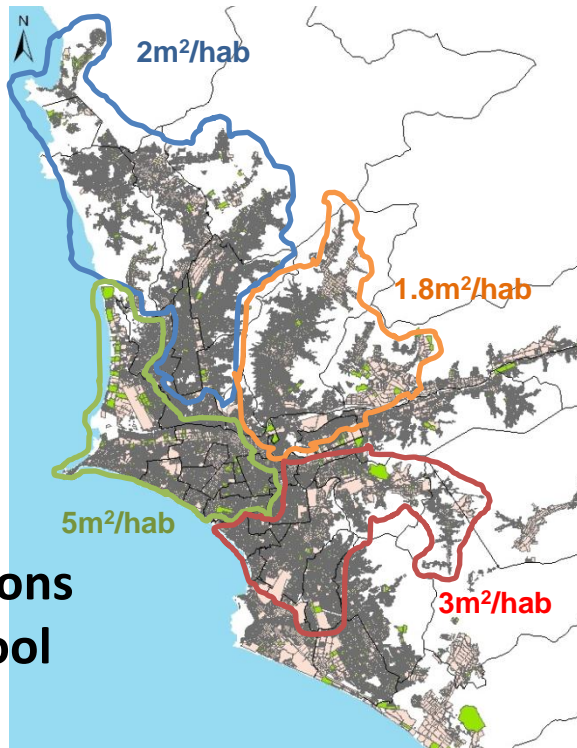
## Agreed city Principles for a water sensitive urban development

- Protect, develop and implement a **water sensitive and multifunctional open space system** (EI) considering **availability** and integral management of water resources
- Protect and consolidate **agricultural land** and add value to improve **ecosystem** performance
- Transform **high risk** areas as part of the **ecological infrastructure**
- Promote water sensitive urban development that considers water **catchment, saving, treatment and reuse** of water in the city
- Coordinated, integral and **sustainable city management** for a water sensitive urban development with a sustainable and resilient approach

**PRINCIPLES** → **LEIS TOOL** → **RECOMENDATIONS** → **DESIGN MANUAL**

**Demonstration Areas**

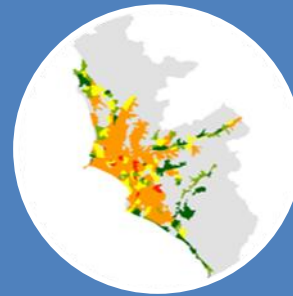
# Analysis and recommendations through LEIS Tool



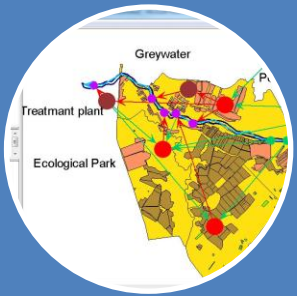
Catalogue Tool



Planning Tool



Analyses and Eco-Hdro-Typology Tool

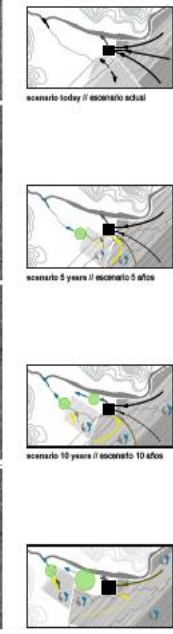
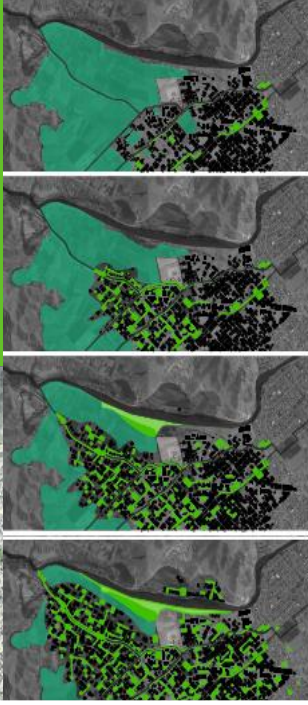


Modelling and Simulation Tool





# TREATED TOPICS



# Waste Water Management

## Phase 1 - School

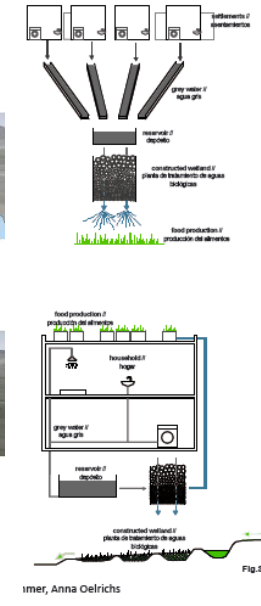


## Phase 2 - Park



created by: Max Mehlich, Lisa Gänsbauer

# Strategic Planning



lmer, Anna Oelrichs Fig.3

# River Design

# Irrigation channels



created by: Leonie Wipf, Anna Kübler



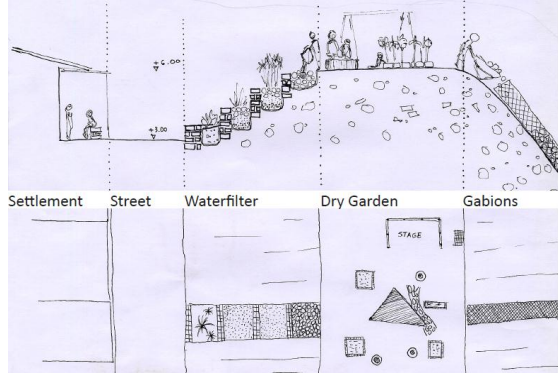
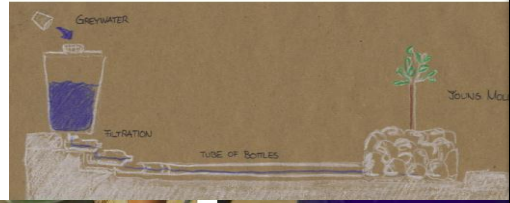
# Urban Farming/ Gardening



created by: Christos Antoniou, Nefeli Kaltsouni



# Design Solutions



Cerro Santa Cruz (Hill)



Río Chillón (River)



## And how to effectively integrate water management into urban decision making process?

- Creating strategic alliances with institutions that look for a change
- Supporting local stakeholders to find sustainable and ecological solutions
- Addressing the need for political will and effective governance
- Linking research with the needs of local government
- Creating academic alliances and involving students
- Combining research with real practical cases
- Working with communities
- Sensibilising about the topic

.....and never losing the energy!

Main challenge: Effective governance to introduce changes and look for possible solutions



### **Team Members**

**Bernd Eisenberg** | **Eva Nemcova** | **Rossana Poblet** | **Antje Stokman**

### **Contact**

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### **Links**

**Lima Water (LiWa):** <http://www.lima-water.de>

**Institut für Landschaftsplanung und Ökologie (ILPÖ):** <http://www.ilpoe.uni-stuttgart.de>

**„Lima Beyond the Park“ Design Studio:** <http://limabeyondthepark.wordpress.com/>

### **Group Session**

**G1. Effectively integrating water management into urban decision making processes**

<http://resilient-cities.iclei.org/bonn2012/program/download-presentations/g1/>

### **Final presentation**

[http://resilient-cities.iclei.org/fileadmin/sites/resilient-cities/files/Resilient\\_Cities\\_2012/LiWa\\_WP9\\_ILPOE\\_Workshop\\_15052012\\_rp\\_final\\_presentation.pdf](http://resilient-cities.iclei.org/fileadmin/sites/resilient-cities/files/Resilient_Cities_2012/LiWa_WP9_ILPOE_Workshop_15052012_rp_final_presentation.pdf)

# **THANK YOU | GRACIAS | DANKE**