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

• Introduction
• Project Overview
• Lima Ecological Infrastructure Strategy (LEIS)
• Opportunities and challenges to introduce LEIS approach
• “Lima Beyond the Park” academic experience
• Conclusions
Sustainable Water and Wastewater Management in Urban Growth Centres Coping with Climate Change Concepts for Lima Metropolitana (Peru) - Integrated urban planning strategies and planning tools - WP9

Concepts for Lima Metropolitana (Peru) - Integrated urban planning strategies and planning tools - WP9

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

* 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
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

- 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

Rural and urban water cycle facilitates the open space system.

Open space system help to **improve and protect** the water cycle.

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

Conditions needed

- POLITICAL WILL (GOVERNANCE)
- STRONG CITY VISION
- COMPREHENSIVE URBAN PLANNING INSTRUMENTS
- MULTIDISCIPLINARY APPROACH
- PUBLIC AND PRIVATE INVESTMENT
Sustainable Water and Wastewater Management in Urban Growth Centres Coping with Climate Change Concepts for Lima Metropolitana (Peru) - Integrated urban planning strategies and planning tools-WP9

**Conditions needed**

- **Political Will (Governance)**
- **Strong City Vision**
- **Comprehensive Urban Planning Instruments**
- **Multidisciplinary Approach**
- **Public and Private Investment**

**Conditions found**

- **Limited Political Will and Coordination**
  - Conflicts between Central and Local Government and interinstitutional offices delay common development

- **No City Vision**
  - City vision is according to each political body

- **No Updated Urban Planning Instruments**
  - Lima has not updated urban planning instruments at regional, metropolitan and district level

- **No Multidisciplinary Approach**
  - Little professional and multidisciplinary cooperation

- **Insufficient Financial Investment**
  - Not enough investment into environmental topics

Institute of Landscape Planning and Ecology (ILPE) - University of Stuttgart, Germany
Institut für Landschaftsplanung und Ökologie (ILPÖ) - Universität Stuttgart, Deutschland
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 Plan (Concerted Development Regional Plan)
- 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)
<table>
<thead>
<tr>
<th>Environmental Process (Diagnostic-PRDC)</th>
<th>Topic</th>
<th>Content</th>
<th>Development approach</th>
<th>SCALE</th>
<th>Metropolitan Development Plan (PDM)</th>
<th>District Development Plan (PUD)</th>
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</thead>
<tbody>
<tr>
<td>Permanent lost of water sources (superficial, underground, and treated wastewater)</td>
<td>INTEGRAL WATER MANAGEMENT</td>
<td>Approach / Principles</td>
<td>Ciudad Región Sostenible</td>
<td>Territorio sostenible y ecoeficiente de los recursos hídricos</td>
<td>Ciudad como fuente de agua</td>
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<td>Ecoeficiencia en la gestión del agua (4 Rs)</td>
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<td>Reducir el consumo de agua para fines distintos al consumo humano</td>
<td>Maximizar el reuso de aguas residuales sobre los espacios abiertos multifuncionales sensibles al ciclo urbano del agua (Infraestructura Ecológica)</td>
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<td>Desarrollo e implementación de fuentes alternativas de agua como complemento a sistemas convencionales</td>
<td>Promoción de sistemas alternativos en áreas con servicios de agua potable y/o alcantarillado</td>
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<td>Promover la cosecha de agua de neblina en áreas convenientes</td>
<td>Promoción de sistemas de atrapanieblas en la ciudad</td>
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<td>Promover el tratamiento separado de acuerdo al agua residual (doméstico, industrial, etc)</td>
<td>Desarrollar sistemas de reuso ecológico en los espacios abiertos multifuncionales (IE)</td>
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<td>Definición de alternativas de tratamiento de agua bajo una lógica de Oferta-Demanda, Costo-Beneficio</td>
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**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 al ciclo urbano del agua (Infraestructura Ecológica)
- Desarrollo e implementación de fuentes alternativas de agua como complemento a sistemas convencionales
- Promover la cosecha de agua de neblina en áreas convenientes
- Promover el tratamiento separado de acuerdo al agua residual (doméstico, industrial, etc)
- Definición de alternativas de tratamiento de agua bajo una lógica de Oferta-Demanda, Costo-Beneficio

**Institute of Landscape Planning and Ecology (ILPE) - University of Stuttgart, Germany**

**Institut für Landschaftsplanung und Ökologie (ILPÖ) - Universität Stuttgart, Deutschland**
Agreed city Principles for a water sensitive urban development

• Protect, develop an 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-Hydro-Typology Tool

Modelling and Simulation Tool

Limited water resources

Reuse of wastewater

Urban Agriculture

River corridor

Green corridor

Urban agriculture

Greywater

Ecological Park
Design Solutions

Cerro Santa Cruz (Hill)

Río Chillon (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
THANK YOU | GRACIAS | DANKE

Lima Water
http://www.lima-water.de

Institut für Landschaftsplanung und Ökologie
http://www.ilpoе.uni-stuttgart.de

Lima Beyond the Park
http://limabeyondthepark.wordpress.com/

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