SPONGE CITIES and City Blueprint Approach

Key Figures:
- Kees van Leeuwen
- Stef Koop

Key Topics:
- Water efficiency measures
- Public participation
- Management and action plans
- Climate robust buildings
- Drinking water consumption
- Climate adaptation
- Green space
- Stormwater separation
- Water system leakages
- Operation cost recovery
- Average age sewer
- Atrativeness
- Secondary WWT
- Tertiary WWT
- Groundwater quality
- Solid waste collected
- Solid waste recycled
- Solid waste energy recovered
- Access to drinking water
- Access to sanitation
- Drinking water quality
- Nutrient recovery
- Energy recovery
- Sewage sludge recycling
- Water system leakages
- WWT energy efficiency

Credit: KWR Watercycle Research Institute
Growth predictions (%) in cities for 2010-2025

Source: Dobbs et al., 2012
Currently, 2.5 billion people are without improved sanitation facilities.

Currently, 3.4 million people - mostly children – die from water-borne diseases every year.

Water withdrawals have tripled over the last 50 years. In 2030, there will be a 40% supply shortage of water.

Water-related hazards account for 90% of all natural hazards.

Urbanization
Urban areas are expected to absorb all the population growth in the next four decades. By 2050, urban dwellers will likely account for 86% of the population in the more developed regions and for 64% of that in the less developed regions.

Climate change
Climate change may worsen water services and quality of life in cities.

Source: Van Leeuwen 2013
The Journey of a Thousand Miles Begins with One Step (Lao Tzu)

This is true, however,.....

1) It starts with the orientation where we are (City Blueprint Approach)

2) ...and where we want to go (An Urban Agenda on Sponge Cities)

3) …and how to walk; SMART implementation (Tailor-made roadmap for each city with a focus on win-win’s (co-benefits))
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2. City Blueprint Approach
   2.1. Trends and Pressures Framework
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   2.3. Governance Capacity Framework

3. Water-wise cities

4. Solutions

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City Blueprint Approach

Trends and Pressures Framework (TPF)

What are the city’s main challenges?

City Blueprint Performance Framework (CBF)

How adequate is the city’s water management?

Governance Capacity Framework (GCF)

Where can the city’s water governance be improved?
<table>
<thead>
<tr>
<th>Trends and pressures</th>
<th>Ho Chi Minh City</th>
<th>Melbourne &amp; Amsterdam</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Social</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Urbanization rate</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>2. Burden of disease</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>3. Education rate</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>4. Political instability</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td><strong>Environmental</strong></td>
<td></td>
<td></td>
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<tr>
<td>5. Water scarcity</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>6. Flood risk</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>7. Water quality</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>8. Heat risk</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td><strong>Financial</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Economic pressure</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>10. Unemployment rate</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>11. Poverty rate</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>12. Inflation rate</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>
Trends and Pressures Index (TPI)
City Blueprint

Approach

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# CBF: City Blueprint Framework

<table>
<thead>
<tr>
<th>Goal</th>
<th>Baseline assessment Water Management performance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Indicators</strong></td>
<td>25 indicators divided over 7 categories:</td>
</tr>
<tr>
<td></td>
<td>1. Water quality</td>
</tr>
<tr>
<td></td>
<td>2. Solid waste treatment</td>
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<td></td>
<td>3. Basic water services</td>
</tr>
<tr>
<td></td>
<td>4. Wastewater treatment</td>
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<td></td>
<td>5. Infrastructure</td>
</tr>
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<td></td>
<td>6. Climate robustness</td>
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<td></td>
<td>7. Governance</td>
</tr>
<tr>
<td><strong>Scores</strong></td>
<td>0 (concern) to 10 (no concern) Blue is Fine</td>
</tr>
<tr>
<td><strong>BCI</strong></td>
<td>Blue City Index (geometric mean of 25 indicators) varies from 0 to 10</td>
</tr>
</tbody>
</table>
Ho Chi Minh City (BCI 2.2)
Melbourne (BCI 5.4)
Blue City: best scores for each indicator

- Attractiveness
- Water efficiency measures
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- SPONGE CITIES and City Blueprint Approach
Multi-level Governance Framework: Mind the Gaps, Bridge the Gaps

City Blueprint Approach

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<th>Dimensions</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Knowing</strong></td>
<td></td>
</tr>
</tbody>
</table>
| 1 Awareness | 1.1 Community knowledge  
              | 1.2 Local support  
              | 1.3 Behavioural internalization |
| 2 Useful knowledge | 2.1 Information availability  
                          | 2.2 Information transparency  
                          | 2.3 Knowledge cohesion |
| 3 Continuous learning | 3.1 Smart monitoring  
                            | 3.2 Evaluation  
                            | 3.3 Cross-stakeholder capacity building |
| **Wanting** |            |
| 4 Stakeholder engagement process | 4.1 Stakeholder inclusiveness  
                                     | 4.2 Protection of core values  
                                     | 4.3 Progress and choice variety |
| 5 Policy ambition | 5.1 Ambitious and realistic goals  
                           | 5.2 Discourse embedding  
                           | 5.3 Policy cohesion |
| 6 Agents of change | 6.1 Entrepreneurial agents  
                           | 6.2 Collaborative agents  
                           | 6.3 Visionary agents |
| **Enabling** |            |
| 7 Multi-level network potential | 7.1 Room to maneuver  
                                     | 7.2 Clear division of responsibilities  
                                     | 7.3 Authority |
| 8 Financial viability | 8.1 Affordability  
                           | 8.2 Consumer willingness to pay  
                           | 8.3 Financial continuation |
| 9 Implementing capacity | 9.1 Policy instruments  
                           | 9.2 Legal compliance  
                           | 9.3 Preparedness |
Water-related challenges

- Flooding
- Urban Heat Islands
- Water Scarcity
- Wastewater disposal and treatment
- Solid Waste collection, disposal and treatment
GCF Amsterdam (five challenges)

- ++ Very encouraging
- + Encouraging
- 0 Indifferent
- - Limiting
- -- Very Limiting
GCF Flood Risk Amsterdam
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INTERACTIONS ARE OPPORTUNITIES

Number of interactions in ‘Smart’ cities
n=3 (Energy, Transport and ICT)
Total number of interactions = 3

Number of interactions in ‘smarter’ cities
n = 9 (number of topics in cities):
Total interactions: \( \frac{1}{2}n \times (n-1) = (9/2) \times (9-1) = 36 \)

Result: currently 36-3 = 33 interactions (potential win-win’s) are not explored. This is >>90%!!!

Koop and Van Leeuwen, 2016
The seven C’s of Water Wise Cities

1. Citizen-centered: create healthy and livable cities for people
2. Children and grandchildren: focus on a long-term strategy for your city
3. Collaboration: involve stakeholders right from the start
4. Comprehensive: not only water
5. Coherent: combine sectorial agenda’s in integrated city planning
6. Co-benefits or win-win’s must be explored. This leads to:
7. Cost-effective & cost-efficient solutions
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Options to create SPONGE CITIES


2. Watershare: Watershare is the international knowledge management model for the water sector. In Watershare experts from leading knowledge institutes share their knowledge and expertise. [https://www.watershare.eu/](https://www.watershare.eu/)

Aquifer Storage and Recovery (ASR)

1. Design
   1. Temporary storage of intense rainfall at surface level
   2. Treatment
   3. Infiltration / recovery well (‘ASR-well’)

2. Economics
   1. CAPEX and OPEX
   2. Comparison to costs of inaction / other measures

3. Impact assessment
   1. Monitoring
   2. Hydrological impacts
   3. Chemical impacts
Examples (1): Museumpark, Rotterdam

- 3000 m² pond surrounding museum
  - Overflows in during rainstorms
  - Dries up during droughts

- 2017:
  - 16.000 m² of roofs and streets to discharge on pond
  - Infiltration to prevent overflow
  - Recovery to maintain water level
Examples (2): Soccer Stadium ‘Het Kasteel’, Rotterdam

- Up to 20,000 m² will be harvested, treated and infiltrated
  - Prevents pluvial floodings in surrounding residential area

- Recovery to irrigate soccer pitch and parks
  - Reduces use of drinking water for irrigation
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Conclusions

1. Water: **LT agenda** needs focus on our children and grandchildren
2. Water: **most expensive infrastructure (UN)**
3. Water (climate-adaptation): **business-case!**
4. **Linking sectoral agendas** in cities: enhances liveability and reduces cost!
5. **Water-wise cities focus on win-win’s**
6. **Involve citizens and companies:** creates acceptance and better investment climate
7. Water: is a **governance challenge!**
8. **City-to-City learning:** fast track to exchange best practices
9. **Become member of Watershare**
CITY BLUEPRINTS

Improving Implementation Capacities of Cities and Regions by sharing best practices on Urban Water Cycle Services

FURTHER INFORMATION

1. City Blueprint website of EIP Water: http://www.eip-water.eu/City_Blueprints
2. City Blueprint website of Watershare®: http://www.watershare.eu/
   And: Netwerc h2o: http://www.netwerch2o.eu/, BlueSCities: http://www.bluescities.eu/

FOR AN ASSESSMENT OF CITIES IN CHINA? Please contact us:
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Stef Koop        stef.koop@kwrwater.nl
Watershare

Connecting global knowledge to local challenges

Theo van den Hoven