Introduction to Integrated Water Management for Cities

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Presenters

• Moderators:
  • James Irwin, Mayors Innovation Project & Efficiency Cities Network
  • Gary Belan, American Rivers

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Colorado State University One Water Solutions & formerly at WERF

George Hawkins,
General Manager & CEO of DC Water
Crisis – Danger or Opportunity?

*Using existing water challenges as opportunity to improve city livability*
ONE WATER MANAGEMENT TRANSITION FRAMEWORK

Cumulative Socio-Political Drivers

Based on Brown, Keath & Wong, 2008
ONE WATER MANAGEMENT TRANSITION FRAMEWORK

Cumulative Socio-Political Drivers

Service Delivery Functions

Based on Brown, Keath & Wong, 2008
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ONE WATER MANAGEMENT TRANSITION FRAMEWORK

Cumulative Socio-Political Drivers

- Water supply access & security
- Public Health Protection
- Flood Protection
- Social amenity, environmental protection

Service Delivery Functions

- Water Supply City
- Sewered City
- Drainage City
- Waterways City

- Supply hydraulics
- Sewage Schemes
- Drainage, Channelization, some Dams
- Point & diffuse source pollution management

Based on Brown, Keath & Wong, 2008
ONE WATER MANAGEMENT TRANSITION FRAMEWORK

Cumulative Socio-Political Drivers

- Water supply access & security
- Public Health Protection
- Flood Protection
- Social amenity, environmental protection
- Limits on Natural Resources

Service Delivery Functions

- Water Supply City
  - Sewered City
  - Drained City
  - Waterways City
  - Water Cycle City
  - Supply hydraulics
  - Sewage Schemes
  - Drainage, Channelization, some Dams
  - Point & diffuse source pollution management
  - Diverse, fit-for-purpose sources & conservation, promoting waterway protection

Based on Brown, Keath & Wong, 2008
One Water Management Transition Framework

Cumulative Socio-Political Drivers

Water supply access & security

Public Health Protection

Flood Protection

Social amenity, environmental protection

Limits on Natural Resources

Intergenerational equity, resilience to climate change

Water Supply City

Sewered City

Drained City

Waterways City

Water Cycle City

Water Sensitive City

Supply hydraulics

Sewage Schemes

Drainage, Channelization, some Dams

Point & diffuse source pollution management

Diverse, fit-for-purpose sources & conservation, promoting waterway protection

Adaptive, multi-functional infrastructure & urban design reinforcing water sensitive behaviors

Based on Brown, Keath & Wong, 2008
WHAT IS A WATER SENSITIVE CITY?

Discussion leading towards “Urban Water Charter”:

**Figure 1: The Urban Water Charter Framework: three main principles and 5 building blocks for action**

Source: International Water Association, Urban Water Charter, Draft Executive Summary
CRITICAL CHALLENGE = INSTITUTIONAL ISSUES

PATHWAYS TO ONE WATER

A GUIDE FOR INSTITUTIONAL INNOVATION
WHAT IS ONE WATER?

What is One Water?

The One Water approach considers the urban water cycle as a single integrated system, in which all urban water flows are recognized as potential resources, and the interconnectedness of water supply, groundwater, stormwater and wastewater is optimized, and their combined impact on flooding, water quality, wetlands, watercourses, estuaries and coastal waters are recognized.

New Opportunities Include:

- New type of regenerative infrastructure – there is no waste;
- Portfolio of systems from centralized to decentralized;
- A mix of grey and green infrastructure;
- Increased recycling of water, nutrients and resource recovery;
- Implemented at a variety of levels from building to city scale;
- Offer economic opportunities for both the public and private sectors;
- Increased social and environmental value for the community.

Recognizes that water is more than just a service provision – it is a key component of livable cities.
TRANSMITION TO A ONE WATER APPROACH:

Six Key Elements:

- Strong leadership and vision from senior positions at both political and executive levels;
- Partnerships between departments and collaborating organizations;
- Organizational culture that embraces the One Water approach;
- Transparent engagement with the community stakeholders;
- A conducive economic environment for private investment;
- A conducive regulatory and legislative environment for encouraging public and private participation
BOLD LEADERSHIP

Changing our approach: Political leadership is needed to develop and inclusive vision of an urban water environment.

Lessons learned:
• Establish mutually beneficial goals and actions;
• Create a regional leadership committee;
• Encourage community participation and support;
• Reach a common understanding with all stakeholders.
<table>
<thead>
<tr>
<th>Leadership Roles</th>
<th>Role Description</th>
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<tbody>
<tr>
<td>The Champion Leader</td>
<td>Involves initiating process of influence (change) in the water sector.</td>
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<tr>
<td>The Enabling Leader</td>
<td>Involves enabling (rather than directing) others to collectively learn by doing to find solutions to complex water challenges.</td>
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<tr>
<td>The Strategic Leader</td>
<td>Involves working with stakeholders to build a shared vision of the future direction and a strategy to achieve vision.</td>
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<tr>
<td>The Cross-Boundary Team Leader</td>
<td>Involves being the assigned leaders for a team that crosses boundaries relating to geography, professions, etc.</td>
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<tr>
<td>The Thought Leader</td>
<td>Involves using high levels of credibility and expertise to exert influence.</td>
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<tr>
<td>The Trusted Advisor</td>
<td>Involves working as a credible, independent agent to influence the political system.</td>
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<table>
<thead>
<tr>
<th>TRANSITIONS NEEDED:</th>
<th>Planning &amp; Collaboration</th>
<th>Tackle silos, politics, short-term inflexible processes, unclear roles &amp; responsibilities, and access &amp; sharing of data.</th>
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<tr>
<td>Culture, Knowledge &amp; Capacity</td>
<td>Requires changing mindsets at all levels and tackling issues of technical capacity, staff motivation, organizational receptivity and learning mechanisms, as well as freeing up staff time to collaborate across boundaries.</td>
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<tr>
<td>Citizen and Stakeholder Engagement</td>
<td>Getting community support requires trust, a long-term commitment and a willingness to be open minded. Must use meaningful processes at the right scale, better use of social media, and learning to speak in ways that resonate with the public.</td>
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## TRANSITIONS NEEDED:

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<tr>
<th>Economics and Finance</th>
<th>Need to go beyond traditional cost-benefit analysis to more holistic evaluations and <strong>how to provide “value” to the community.</strong></th>
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<tbody>
<tr>
<td>Regulations and Legislation</td>
<td>Current systems designed for centralized water systems. <strong>Need to tackle inconsistent and overlapping regulations, a lack of regulatory frameworks, prescriptive vs performance based regulations, and the assessment of risk.</strong></td>
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Research & Demonstration

Education & Training

Engagement & Capacity Building
## URBAN WATER AND LINKED SYSTEMS

### Urban Water Systems
- Drinking water
- Wastewater
- Stormwater
- Water reuse
- Floodplains
- Streams
- Aquifers

### Socio-political Systems
- Social and Economic Sectors
- Institutions
- Equities

### Linked Urban Systems
- Climate
- Heat Island
- Energy
- Biodiversity
- Health
- Livability
SUSTAINABILITY FRAMEWORK

Pressures
- Aging Infrastructure
- Diminishing Resources
- Water Pollution
- Extreme Events
- Climate Change
- Land Use
- Population

Future
- High
- Low

Present
- Feared
- Desired

Past
- High
- Low

Resilience
- Alternative Futures
- Co-benefits

High

Low

Colorado State University
RESEARCH PLAN – FOUR THRUSTS

Community Learning and Societal Assessment

Assess Effects & Tradeoffs

Identify Institutions & Transitions

Assess Baseline

Identify Technological Solutions

Urban Water Sustainability Framework
URBAN WATER BLUEPRINT

- Define essential characteristics ➔ Data
- Point decision makers toward best practices
- Share experiences ➔ Peer learning
- Stay agile in responding to future needs
LEARNING FROM DIVERSE REGIONS

- Pacific Northwest
- Cascadia
- Phoenix-Tucson Sun Corridor
- Mid-Atlantic
- Southeast Florida
- Southern California
- Colorado Front Range
- Baltimore, MD
- Miami, FL
- Denver, CO
- Portland, OR
- Phoenix, AZ

**Study Region**
- WSC project
- CAP LTER
- FCE LTER

**Study City**
- WSC project
- CAP LTER
- FCE LTER

**SRN Institutions**
- WSC project
- BES LTER
- WSC project

**WSC project**
- Portland, OR
- Los Angeles, CA

**CAP LTER**
- Sun Corridor

**FCE LTER**
- WSC project
- Southeast Florida

**WSC project**
- Front Range Colorado
- Phoenix-Tucson Sun Corridor

**SRN Institutions**
- WSC project
- BES LTER
- WSC project
- FCE LTER

**WSC project**
- Southeast Florida
Thank you.

- Contact: Theresa Connor, PE

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https://erams.com/UWIN/
Provide clean, safe drinking water to our customers.

- 618,000 residents
- 18 million workers and visitors
- 130,000 metered accounts
- 1,300 miles of water pipe
- 1,800 miles of sewer pipe
- World’s largest advanced wastewater treatment plant
Integrated Water Management

- Re-branding
- Public Outreach
- Resource Recovery
- Green Infrastructure
Re-Branding

The old model...

Utilities.
- Reactive.
- Invisible.
- Underground.

Customers.
- Thinking about us when something is wrong.

Tap Water.
- Municipal.
- Not sexy.
Re-Branding

DC Water is transforming an entire industry by changing the way we relate to our customers.
In the new model...

- DC Water provides an essential service that supports every job, business and life
- Tap water connects us to our customers emotionally and physically
May 2015 – EPA/DOJ lodge Consent Decree Modification in District Court

Green Jobs Memorandum of Agreement District of Columbia and DC Water
- 51% of new jobs filled by District residents
- Training and certification opportunities for District residents

DC Clean Rivers:
- $3.5 Billion
- 25 year implementation (2005-2030)
- 96% reduction in CSOs & flood relief
Examples of possible types of GI in DC

- Bioretention along Streets

- Permeable Pavement along Streets and in Alleys

Other potential GI could include: Rain barrels, Cisterns, Green Roofs, etc.
New solids processing equipment: Anaerobic digesters and thermal hydrolysis
Reinventing Biosolids

Reduce biosolids quantities by more than 50%

Improve product quality (Class A and more)

Generate 13 MW of clean, renewable power

Cut GHG emissions dramatically

Save millions of dollars annually
Thank you!
Questions?
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