One Water

The many faces of ‘One Water’ thinking

Steve Moddemeyer, CollinsWoerman, Seattle
Outline

- One Water – US Water Alliance
- Sponge Cities - China
- Cloudburst programs - Europe/USA
- Water Sensitive Cities – Australia
- L'Oréal Cosmetics – Paris
- A new mindset – Everywhere
- Resilient Design Performance Standard - USA
Alliance of water providers, companies, and NGOs

Vision: Integrated and inclusive water management

Challenges
- Too much, too little
- Water quality
- Ecosystem degradation
- Aging and inadequate infrastructure
- Pricing & affordability
- Changing climate

Mindset
- All water has value
- Multiple benefits
- Systems approach

Watershed scale thinking and action
- Right-sized solutions
- Partnerships for progress
- Inclusion and engagement for all

Knowledge
- Share successes
- Pool resources

Implementation
- Regulations
- Finance
- Public Private Partnerships
One Water

- Arenas for action
  1. Reliable & resilient water utilities
  2. Thriving cities
  3. Competitive business & industry
  4. Sustainable agricultural systems
  5. Social & economic inclusion
  6. Healthy waterways

- Implementation
  - Regulations
  - Finance
  - Public Private Partnerships
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<tr>
<th>Case studies</th>
<th>Listening sessions</th>
<th>One Water Webinars</th>
<th>One Water Summit – July 12, 2018</th>
<th>US Water Prize</th>
<th>Seven Ideas for Fixing Water in the US</th>
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<th>#1 Reliable and Resilient Water Utilities</th>
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<td>Utilizing green infrastructure and revitalizing neighborhoods</td>
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<td>Transforming wastewater into a resource</td>
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<td>Louisville: Ohio River Greenway Transformation Program</td>
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<td>One Water Los Angeles: Example of an Approach to Planning</td>
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<td>Emory WaterHub: Shines Students that Real Water is Not Just for Trash</td>
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<th>#2 Thriving Cities</th>
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<td>Integrating onsite water systems</td>
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<td>Spokane: Water’s Above and Below Ground</td>
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<td>Leverage Infrastructure Investments</td>
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<td>Main Breaks in Syracuse</td>
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<th>#3 Competitive Business and Industry</th>
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<td>Deploying advanced technologies to improve decision-making</td>
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<tr>
<td>Managing water to foster climate resilience</td>
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<td>Fully integrating water stewardship into company strategy</td>
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<td>Dow: Tackles Water Efficiency at its Chemical Manufacturing Complex</td>
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<th>#4 Sustainable Agricultural Systems</th>
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<td>Deploying water efficiency, stormwater management, and water reuse at industrial facilities</td>
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<td>Developing upstream and downstream partnerships in priority watersheds</td>
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<td>Using on-farm strategies to reduce water consumption and manage nutrients</td>
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<td>Creating partnerships among upstream and downstream communities</td>
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<td>Cedar Rapids: Multi-Perforated Covered Trench System</td>
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<th>#5 Social and Economic Inclusion</th>
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<td>Leveraging water investments to generate community benefits</td>
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<td>Feeding community resilience in the face of a changing climate</td>
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<td>Enhancing community capacity to engage in water planning and governance</td>
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<td>Maximizing natural infrastructure for healthy ecosystems</td>
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<td>A Good Neighbor: The San Joaquin Valley’s/Vallejo, California’s Community Water Commission’s Community Water’s Community</td>
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Cities of the Future

- Vision: Sustainable Urban Water in Resilient and Livable Cities
- Governance
  - From building to bioregion
  - Transdisciplinary
  - Collaboration and design across departments & authorities
- Planning
  - Asset management
  - General plan/comprehensive plan
- Knowledge
  - Share successes
  - Pool resources
- Implementation
  - Regulations
  - Finance
  - Public Private Partnerships
Sponge Cities integrate

- Green stormwater infrastructure
- Stormwater treatment
- Wastewater treatment
- Non-potable water use
- Rainwater harvesting
- Wetlands
- Natural systems polishing
- Habitat
- Passive recreation and aesthetics
- Urban agriculture
- Ecological restoration
- Blue-green networks
Sponge City
Sponge City
Sponge City Technical Guidebook

Cost of different sponge city components

Unit: RMB/m²

Source: Ministry of Housing and Urban Rural Development (2014)
根据工程前期对场地下渗速率的现场观测，确定雨水下渗速率的设计参数为2.3×10^{-3} m/s（场地表层土为孔隙率较大的人工回填土，下渗速率较大）。活水公园内荷花池工程改造如图F4-7示，采取渗管下渗的方式。下渗管设有盖板，可人工启闭。需要下渗时，盖板打开，荷花池内的水通过下渗管引入碎石层中下渗；如果连续晴天不降雨，为保持荷花池内的景观用水，则将下渗管上部的盖板关闭。
Cloudburst - Copenhagen
REALITY CHECK, 2nd OF JULI 2011
NEW CHALLENGE, CLIMATE CHANGE

COPENHAGEN CLIMATE ADAPTATION PLAN

RISK FOR FLOODING

- Sea level
- Rain

COST

YEAR
Cloudburst

- Multi-functional public spaces
- Use of roads as stormwater conveyance
Enghave Park

Cloudburst
- Design for exceedance
- Identify streets for extreme events
- Integrate into the design
TOOLBOX

- Streets turn blue for extreme events
- Systems approach: apply where needed
- Integrate with urban gardens and public places
SØNDERBOULEVARD
Dry

Existing Street Profile

Safety Zone
Flood Pathway

3,300 l/s flow capacity

Copenhagen Strategic Flood Masterplan

Flood Event

@ Atelier Dreiseitl
Nørrebro

SOUL OF NØRREBRO – CLIMATE ADAPTATION, INCREASED URBAN QUALITY AND RESILIENCY

CHRISTIAN NYERUP NIELSEN
INTERNATIONAL DIRECTOR
WATER AND CLIMATE ADAPTATION

HANS TVÆNS PAVILJON & KOERSGADE
NORDIC BUILT CHALLENGE: CLOUDBURST AND CULTURE
ARCHITECTURE, OCTOBER 19, 2016, ALLEN INSTITUTE, NYC
Nørrebro
Nørrebro
Water Sensitive Cities - Australia

- Research the interplay between people and utilities
- Shifting role for utilities from Water for Life to Water for Livability
Water Sensitive Cities - Australia

- Embed ecosystem services into entire public realm
- Utilities must collaborate beyond our authorities to achieve livability
Internal guidance for research and marketing: VUCA

- Volatile
- Uncertain
- Complex
- Ambiguous
We are in a time of complexity (VUCA !)
With multiple right answers and multiple wrong answers
No way to tell which is which
Leaders need to pilot, test, and model possible patterns and allow the best solutions to emerge and reveal themselves
Implementation

- It's not just new information
- It’s a new mindset
Implementation

- It's not just new information
- It’s a new mindset
Transform
Rokstrom: Natural Systems

Snowden & Boone: Leader’s Framework for Decision-making

Milly et al: Stationarity is Dead

Types of Resilience

- Resist
- Complicated
- Stationarity
- Engineered resilience (Probabilities of failure)

- Adapt
- Complex (test-bed for innovation)
- Stationarity is Dead
- Socio-Ecological Resilience -capacity to adapt -attributes of resilience

- Transform
- Chaos (openness to innovation)
it just keeps going...

<table>
<thead>
<tr>
<th>Design Intent</th>
<th>Design only for the front loop of Adaptive Cycle vs. Design for entire Adaptive Cycle vs. Back loop only</th>
<th>Responsibility</th>
<th>Decision-making</th>
<th>Attributes</th>
<th>Regulations &amp; Training</th>
<th>Build vs Emerge</th>
<th>Optimization</th>
<th>Silo-based vs Community based</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design to threshold (1% storm). Don't worry about recovery</td>
<td>cradle to grave</td>
<td>Large-scale top down consultative decision-making</td>
<td>big, heavy, dry, brittle</td>
<td>training and regulations provide predictability and discourage innovation</td>
<td>&quot;build&quot; resilience</td>
<td>resilience is achieved</td>
<td>optimized with finite number of known variables</td>
<td>centralized asset-based system thinking (&quot;what's best for the water system&quot;)</td>
</tr>
<tr>
<td>Design to threshold AND recovery time (set by community)</td>
<td>cradle to cradle</td>
<td>Multi-scale bottom-up consultative decision-making</td>
<td>small, light, wet, flexible</td>
<td>training and regulations anticipate flexibility and adaptation and expect innovation</td>
<td>resilience &quot;emerges&quot;</td>
<td>resilience is an emergent quality of a system</td>
<td>solutions are hypotheses to be tested and adapted</td>
<td>distributed multi-asset systems thinking (&quot;what's best for the water system, the community, the environment&quot;)</td>
</tr>
</tbody>
</table>

- exploratory and experimental
- systemic shifts in institutional underpinning such as mental models, management routines, and resource flows. "(Westley, F.R 2013)
Our natural systems and rivers and native species are already adapting to climate change. We are not.

We are trapped in an engineered resilience mindset that presumes our job is to resist change at the least cost.

With climate change we can no longer reliably predict how and to what extremes our climate will change in the design life of our infrastructure.

That means that it's not the likelihood that infrastructure will fail that should drive design.

Rather it's how long it takes to recover when it fails that is the measure of our resilience.

Planners and decision-makers must challenge their staff and design consultants, “We want the most cost-effective design that can be repaired in the time frame that is acceptable to us and that meets our needs.”
Resilient Design Performance Standard - USA

NIST Special Publication 1190
Community Resilience Planning Guide for Buildings and Infrastructure Systems
Volume I
Resilient Design Performance Standard - USA
## RESILIENT DESIGN PERFORMANCE STANDARD

### Score Sheet

<table>
<thead>
<tr>
<th>BOULDER COUNTY INDICATOR</th>
<th>POINTS</th>
<th>ENTER SCORE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Co-Benefits. Provide solutions that address problems across multiple sectors creating maximum benefit.</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Indicator 1.1.</strong> Apply a business case format that includes consideration of alternatives and robust analysis of those alternatives across the triple bottom line of economics, community, and the environment.</td>
<td>Required</td>
<td>Required</td>
<td>Prepare a business case that takes an analytical look at the project element alternatives, the costs, and the return on investment both in terms of the economy and in value creation to the community and the environment.</td>
</tr>
<tr>
<td><strong>Indicator 1.2.</strong> Use multi-disciplinary design team to develop and consider a range of integrated solutions that provide enhanced value across the triple bottom line.</td>
<td>2</td>
<td></td>
<td>Document the project design charrette process, integrated design team in Business Case.</td>
</tr>
<tr>
<td><strong>2. High Risk and Vulnerability. Ensure that strategies directly address the reduction of risk to human well-being, physical infrastructure, and natural systems.</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Indicator 2.1.</strong> Satisfy the time-to-recovery performance goal.</td>
<td>Required</td>
<td>Required</td>
<td>Refer to Time-to-Recovery Performance Goals Matrix (Design team estimate the damage from hazard and the time-to-repair.)</td>
</tr>
<tr>
<td><strong>Indicator 2.2.</strong> Identify gaps and find solutions for moving forward.</td>
<td>Required</td>
<td>Required</td>
<td>If the project cannot meet the performance goals, then the project team must develop temporary work-arounds or programmatic strategies to meet the required Operational time-to-performance goal.</td>
</tr>
<tr>
<td><strong>Indicator 2.3.</strong> Consider project alternatives that augment services from high risk locations such as wildfire</td>
<td>Required</td>
<td>Required</td>
<td>Provide business case that documents consideration and analysis of alternatives considered for the project. (Can include temporary repairs to meet the minimal or operational phase.)</td>
</tr>
</tbody>
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*Note: Enter the potential for economic benefit to the investor and the broader community benefits line analysis in the Business Case that quantifies total impacts of the project.*
40

**Semi-autonomous systems**

Semi-autonomous systems provide new insights into command and control and are the source of novel adaptations to variability. This innovation provides capability for all systems to adapt to fast and slow change. Apply the consideration of semi-autonomous systems in the project design process and document results in the Business Case.

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**Indicator 7.7. Evaluate potential of creating semi-autonomous systems at the building, neighborhood, and district scale.**

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**Indicator 8.1. Identify project design solutions that leverage and enhance the function of existing natural, social, and infrastructure systems.**

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**Indicator 9.1. Account for value of benefit to future generations when identifying preferred project designs.**

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**Total Possible Points**

23

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A project that can provide multiple benefits to community will be more highly ranked than one that serves only a single objective. Reviewing existing plans can identify opportunities for mutual support. Cost effectiveness can increase if multiple objectives can create synergies.

To better reflect the multi-generational investments OMB Circular A-4 recommends applying a 1% discount rate in the economic analysis for future generations, 3% for a consumption perspective, and 7% discount rates to model an investment perspective. Document findings in the Business Case.
Resilient Design Performance Standard - USA

1. Uses time-to-recovery
2. Accounts for increased variability from climate change
3. Reveals interdependencies between infrastructure systems
4. Reflects the nexus between built and natural systems
5. Identifies community-based priorities
6. Avoids “scale blindness”
7. Rewards flexibility and adaptability
8. Incorporates social equity and capacity to adapt
Review

- One Water – US Water Alliance
- Cities of the Future – Global
- Sponge Cities – China
- Cloudburst programs – Europe/USA
- Water Sensitive Cities – Australia
- L'Oréal Cosmetics – Paris
- A new mindset – Everywhere
- Resilient Design Performance Standard – USA
Thank you!

Steve Moddemeyer
smoddemeyer@collinswoerman.com

Hvar, Croatia
6/16/2017
Climate change undermines a basic assumption that historically has facilitated management of water supplies, demands, and risks.

Why now? That anthropogenic climate change affects the water cycle (9) and water supply (10) is not a new finding. Nevertheless, sensitive objections to discarding stationarity have been raised. For a time, hydroclimatologists had not demonstrably exceeded the envelope of natural variability and/or the effective range of optimally operated infrastructure (11, 12). Accounting for the substantial uncertainties of climatic parameters estimated from short records (13) effectively hedged against small climate changes. Additionally, climate projections were not considered credible (12, 14).

Recent developments have led us to the opinion that the time has come to move beyond the wait-and-see approach. Projections of runoff changes are bolstered by the recently demonstrated retrodictive skill of climate models. The global pattern of observed annual streamflow trends is unlikely to have arisen from unforced variability and is consistent with modeled response to climate forcing (15). Paleohydrologic studies suggest that small changes in mean climate might produce large changes in global extremes (16), although the nature of those changes is highly uncertain.