BLUE INFRASTRUCTURE: The Living Systems of Water Reuse

SESSION SUMMARY
Water infrastructure in the US is crumbling with projected repair costs exceeding even bank-bailouts. Large, centralized water treatment systems are increasingly being viewed as inefficient, costly, and environmentally disruptive. An emerging decentralized model goes beyond the use of water as purely visual, incorporating new living system applications such as advanced treatment wetlands to maximize the onsite reuse of storm water and waste water. In addition, innovative development standards and corroborating regulatory reforms both encourage and reward these onsite solutions. Integrating ecology, engineering and information technology, the design possibilities and environmental benefits of this new model are opening up new opportunities for landscape architects, engineers and municipal governments to reshape the blue infrastructure of our urban landscapes.

LEARNING OBJECTIVES
- Learn how active living systems such as advanced wetlands take physical form and combine ecosystem processes, engineering and information technologies to minimize our dependency on centralized water infrastructure.
- Hear the advantages of replacing outdated water infrastructure with a decentralized network of living systems and how the benefits are being communicated to support change in water policies.
- See the design potential of making these systems visible and how the legibility of water reuse can educate and engage citizens on an everyday basis.

PRESENTATION OUTLINE

1. Introduction: The Imperative + The Opportunities
   a. Panel introductions
   b. Humanity has co-opted global water and nutrient cycles
   c. Water shortages and rapidly rising costs
   d. Failing infrastructure of centralized systems
   e. Growing acceptance of decentralized water infrastructure
   f. Integration of small scale decentralized systems with large scale centralized systems
   g. Integration of passive and active living systems
   h. Legibility and interaction with living systems for experiential and/or educational value

2. The Standards
   a. The Living Building Challenge as a reference and standard for development
   b. Water conservation and reuse goals
   c. Client and project team education about process and systems
   d. Regulatory landscape for onsite wastewater and stormwater reuse
   e. Integration of individual project solutions with community-scaled opportunities

3. The Mechanics: Active Living Systems Technologies 101
   a. Ecology and microbiology
   b. Processes, components, and information technologies
   c. Physical form and material
   d. Applications, advances, and benefits

a. Water Reuse Tool – Overcome complexity and project specificity of water reuse
   i. Evaluate multiple water sources and applications
   ii. Evaluate multiple reuse opportunities
   iii. Generate water budget and preliminary process design
   iv. Analyze life cycle payback, water savings, LEED
   v. Open source and free
b. Water Reuse Master Plan
   i. Customize and expand analysis
   ii. Integrate design
   iii. Realize multiple benefits

5. The Design Potential: Site Specific Examples
   a. Integration of site specific systems into larger landscape
   b. Legible form to engage and/or educate about water reuse
   c. Project Examples
      1. Port of Portland HQ (OR) > Building Scale/Architectural-Landscape Integration
      2. Marine Corps Recruit Depot (San Diego, CA) > Campus Scale Urban/Sewer Mining
      3. Guilford County Schools (Greensboro NC) > Campus Scale Remote/Educational
      4. San Francisco Public Utilities Commission HQ (CA) > Ecodistrict Scale/Public Space Integration
      5. Mezzaluna Springs Mixed Use Development (FL) > Community Scale/Public Space Creation
      6. Omega Center for Sustainable Living (Rhinebeck, NY) > Campus scale Remote/Project area 141,350 sf

6. Conclusion
   a. Tools toward water reuse
   b. Master plans at site to city scale

REPORT REFERENCES

- **Clean Water, Healthy Sound, Draft**, July 2011 - short link: [http://goo.gl/utM6k](http://goo.gl/utM6k) (pdf): This in-progress study provides insight on the pros and cons of four commonly proposed decentralized and distributed treatment systems and how they relate to conventional practices at different density scales. Overall environmental impacts associated with each wastewater treatment system were compared and analyzed using Life Cycle Assessment (LCA). A separate conveyance analysis looked at how density relates to environmental impacts associated with moving wastewater from its point of generation to a central location, regardless of the treatment technology employed.
- **Towards Net Zero Water**, March 2011 - short link: [http://goo.gl/ybZa4](http://goo.gl/ybZa4) (pdf): This report offers best management practices for designing safe, efficient and effective net zero water systems at the single family, multi-family/commercial and neighborhood scales. It contains an overview of best practices and technologies for decentralized and distributed water systems, with special focus on rainwater harvesting for potable and non-potable uses, greywater reclamation, and onsite wastewater treatment including composting toilets. Case studies illustrate best-in-class examples of innovative water systems used by actual projects from around the globe.
- **City of Seattle Regulatory Pathways to Net Zero Water**, February 2011 - short link: [http://goo.gl/6IVAE](http://goo.gl/6IVAE) (pdf): The purpose of this report is to help to identify obstacles within the current codes and work collaboratively across regulatory agencies to establish policies and
pathways for projects pursuing net zero water strategies. While this project is specific to the City of Seattle, it is intended to serve as a model for other jurisdictions around Washington State.

- **Achieving Water Independence in Buildings**, March 2009 - short link: [http://goo.gl/YnhUq](http://goo.gl/YnhUq) (pdf): In pursuing the Living Building Challenge for a conceptual high-rise affordable housing project, Central City Concern, a non-profit owner of affordable housing in Portland, OR, initiated research to understand the regulatory, technological and behavioral barriers to achieve net-zero water. Central City Concern’s report, Achieving Water Independence in Buildings, explains water reuse strategies and what current Oregon regulations allow. Their approach helped achieve statewide rainwater and greywater allowances in Oregon and may offer guidance for those in other states wishing explore the possibilities of water reuse in buildings and those wishing to reform limiting regulation.

- **Code + Regulatory Barriers to the Living Building Challenge for Sustainable Affordable Residential Development**, November 2008 - June 2009 - short link: [http://goo.gl/MlC5f](http://goo.gl/MlC5f) (webpage - three reports): Six residential projects built or under development in the region with Living Building Challenge criteria overlaid served as case studies for this report. Each case study project was thoroughly reviewed against the City and County’s land use, development and building codes to highlight the potential obstacles that similar projects may encounter. By engaging public and private stakeholders, regulatory and institutional barriers within the code framework were discussed and strategies to overcome barriers were identified and prioritized. Finally, agencies within the City and County were queried to estimate the costs and benefits of implementing these strategies.

**SPEAKER BIOS**

**Julie Bargmann, Founding Principal, D.I.R.T. studio; Associate Professor, University of Virginia**

Julie Bargmann is internationally recognized as an innovative designer in building regenerative landscapes. Founding principal of D.I.R.T. studio, Bargmann has collaborated with architects, engineers and artists to deploy emerging ecological technologies revitalizing post-industrial and urban sites. D.I.R.T. projects directly engage communities, giving strong simple form to complex social issues and ecological processes. TIME, CNN and Newsweek have all recognized Bargmann as leading the next generation in making a difference for design and the environment.

**Eden Brukman, Vice President, International Living Building Institute**

Eden Brukman is the Vice President of the International Living Building Institute and co-author of Living Building Challenge 2.0. A licensed architect, she has focused her professional career on incorporating socially and environmentally responsible strategies into the design and construction of human habitat. Since 1996, her work has included both research and implementation of sustainable policies, particularly related to the specification of appropriate building materials. Eden has consulted on dozens of "green" projects nationally and internationally, authored articles for periodicals and lectured at conferences, universities and professional development programs. She now dedicates her time to the ongoing development and global deployment of the Living Building Challenge.

**Will Kirksey, Senior Vice President, Living Machine Systems**

Will Kirksey has over 30 years of experience in sustainable infrastructure and ecological engineering. His career includes senior management roles in the private, non-profit, and government sectors, and extensive international work experience in Africa, Asia, and Europe. He is an experienced author, inventor, and speaker. He has presented recommendations and testimony to federal, state, and local government executive and legislative organizations. He has an MS in Environmental Systems Design and a BS in Civil Engineering.