Smart Cities and Water Reuse

Sixth International Emerging Technology Symposium

Presenter: Dr. Markus J. Lenger
Sponsored by: CleanBlu Innovations Inc.
Smart Cities

WHAT DOES THAT REALLY MEAN?
WATER! The Key to Successful Smart Cities

- Completely Overlooked in Virtually all Smart City Plans
- Most Smart City Concepts are Heavily Focused on Energy, Communications and Local Agriculture
- Smart Water Reuse is Vital for any Successful Smart City Concept
- Most Technology Exists but Needs Meaningful Implementation
- Communication Between Independent Water Reuse Systems is Proprietary and Inadequate
- Standards are Emerging but Require Expansion
Water Classifications | Definitions

**Potable Water**

Water suitable for drinking

**Non-Potable Water**

Water that has not been examined, properly treated, and not approved by authorities as being safe for consumption (on/site/off-site variant)

**Greywater (NSF/ANSI 350)**

Relatively clean wastewater from baths, sinks, washing machines, and other kitchen appliances

**Blackwater**

Wastewater containing feces, urine and flush-water from flush toilets along with anal cleansing water

**Kitchen Effluent (Dark Grey Water)**

As California Bill AB1738 sponsored by Kevin McCarthy
Alternate Water Sources

**Rain Water Harvesting**

Well established technology - should be implemented everywhere

**Greywater**

The most underrated Alternate Water Resource

**Onsite Treatment**

Onsite Wastewater processing for Reuse will be the norm in 10 - 15 years

**DEWATS (Decentralized Waste Water Processing)**

DEWATS is replacing traditional WWTP plants and eliminating costly sewers
Why DEWATS (Decentralized Wastewater Treatment Systems)?

- 2000 year old Roman technology
- Expensive to Build and Maintain
- Expensive to transport Wastewater
- Inefficient use of Energy
- Large Carbon Footprint
- Public Health Hazard
Indoor Water Use

- Toilets: 24%
- Dishwasher: 2%
- Clothes Washer: 16%
- Leaks: 13%
- Faucets: 20%
- Showers: 20%
- Baths: 3%
- Other: 3%
Regulatory Standards - New Standards Needed

- Few standards existing are inadequate
- Specific standards needed depending on type of water reuse
- Multi competency standards needed
- Combination of electrical, mechanical, plumbing, energy, networking (communications) and architectural guidance to be incorporated into guidelines and ultimately into a set of new standards.
- Encourage willingness to beta test publicly providing adequate telemetry and remote supervision (IoT)
- Standards and codes must be flexible and rapidly adaptable to facilitate the pace of innovation and compensate for new scientific findings.
- International effort with stakeholders across economic spectrum
Networking and Communication Challenge

- IoT (Internet of Things)
- Communications and powering the device
- Long range WiFi
- Short Range Bluetooth, Zigbee, Z-Wave
- Cyber and network security
- Remote monitoring and control coupled with AI to ensure safe operation and compliance
- Powering the sensors
- No Batteries - uncritical and unsustainable - reliability issues
- PoE (Power over Ethernet) or Wireless via Scalar Waves (Dr. Meyl)
Wireless Power using Nicola Tesla Technology

ETS 2018 Smart Cities and Water Reuse Markus Lenger- CleanBlu® May 16, 2018
Technologies and Applications
Alternative Water A New Resource

ReNEWW House
Perdue University
Kitchen Water Reuse

Technology Designed to Reuse Commercial Kitchen Water
• Will process FSE effluent to irrigation water quality
• Potentially reclaiming 20,000 to 40,000 gallons a day
Kitchen Water Reuse FOG-DS Technology

- Designed to reuse Commercial Kitchen water
- Commercial kitchens use large amounts of water
- Problem contaminant is FOG – Fats, Oil and Grease
- CleanBlu is the leader in bioremediation of FOG from commercial FSE’s (Food Service Establishments)
- Discharge water from Grease Interceptors can be further treated and rested in a number of applications including irrigation and Laundry
Vertical Farming

Permaculture Garden Produces 7000 Pounds of Organic Food Per Year on a Tenth of an Acre

Family grows 7000 pounds of organic food per year on a tenth of an acre, supplying 90 percent of their vegetarian diet. They spend less than $2 per day per person on other kitchen staples and make over $20,000 a year selling excess produce.

Fifteen minutes from downtown Los Angeles, just 100 feet away from a major freeway, a small city lot was transformed into a mini paradise.

A fifth acre lot, minus the house, garage and driveway, the family has converted the remaining tenth of an acre into a tiny food forest that produces 7000 pounds of food per year with no synthetic fertilizers.
Aerated Water Feature as Storage and Biological Pre-Treatment
Biological Water Treatment / Bio-filtration

Also Cleans Air and Oxidizes Pollutants
CleanBlu Water Reuse Controller

Designed and Built in San Clemente, CA
Conclusions

• Water treatment and reuse needs to be recognized as a major design block for smart cities
• When designing a smart city, always start with efficiency first!
• Water can be treated to any desired quality for reuse.
• Remote monitoring and control coupled with AI to ensure safe operation and compliance
• A new set of multidisciplinary standards are needed
• Standards depending on type of water reuse
Questions?