

Urban Water Management for Cities of the future

SWRR

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External Pressures make the Situation Worse

• Entire earth system is changing!



Move away from 19th century principles

Conventional systems:

- Linear systems use once and discharge
- Drinking water used for all purposes
- Systems fixed, centralized designs (energy intensive)
- Stormwater viewed as a problem (flooding and pollution)
- Institutional setup not conducive for integrated thinking
- Regulations stall innovation and are inflexible

Education reinforces these principles



Trying harder is not enough We need a paradigm shift

Forecasted Energy Usage in Water Industry in UK





Need to think differently

Adopt a different way of thinking



Integrated Urban Water Management: provides good framework for analysis



Source: CSIRO

By 2030, Florida will need additional 1 bgd

- "Alternative water supplies will need to be identified in order to meet additional demand"
- Brackish water, Reclaimed WW, ASR, Surface water, Sea water, Stormwater





Extended Portfolio of water source options for Nairobi



Conventional Approach

Unit costs US\$ 0.36/m3

IUWM Approach

Unit costs US\$ 0.29/m3

We are moving towards the concept of "One Water"

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That considers:

• Water, wastewater and stormwater together

• Unified management – institutional coordination



Practical steps towards "One Water"

- Water Environment Research Foundation (WERF) and Water Reuse Research Foundation (WRRF) merged to work on ONE WATER = Water Environment & Reuse Foundation (WE&RF)
- Utilities are coordinating operations:
 Example of Louisville and MSD shared operations for efficiency and cost reduction

Take home message

Manage water supply, wastewater & stormwater together (one urban water cycle)...... and think creatively about what could be your water sources (and don't focus on the obvious ones).

(educate future urban leaders on the integrated perspective of the urban water cycle and contextualize each component of the water system within this perspective)

Think about Harvesting

Think about harvesting resources: Integrated treatment



'Designer waters' West Basin, California



Tertiary: Irrigation



Nitrified: Cooling





RO (Single): Refinery



RO(Double): Refinery



MF+RO+AOP: AAR

Innovations taking place in energy harvesting

Biogas

Combined Heat and Power (CHP)







Harvesting heat from sewer e.g. Southeast False Creek, Vancouver

Great ideas to recover nutrient from water cycle



Struvite Recovery Facility (Tigard, Oregon) Clean Water Services

http://www.hdrinc.com/portfolio/durham-advancedwastewater-treatment-plant-struvite-recovery-project Struvite as commercial fertilizer

Some examples of integrated approaches of urban water management

Singapore – Diversifying water sources for water security



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Reasons for success:

- Close coordination among government agencies
- Coordinated land use planning and catchment management
- Integrated water and wastewater management PUB manages the entire water cycle

It's already happening: Battery Park City, New York



- 10,000 inhabitants
- Decentralized wastewater recycling
 - Toilet flushing
 - Cooling towers
 - Laundry
 - Irrigation
- LEED buildings, green roofs, rainwater harvesting





Water reuse scheme Battery Park



Hmmarby Sjöstad, Stockholm



Hammarby Sjöstad, Stockholm

- 35,000 Inhabitants
- Wastewater for district heating and cooling
- Water recycling

Sewer mining – Pennant Hills Golf club -Sydney



- Sewer mining driven by water scarcity
- Frees up 80 to 100 ML per year
- Irrigated water nutrient rich
- Sydney wastewater master plan has several sewer mining facilities



Choices Before Us



Discussion Questions

What are the major challenges for integration?

- Institutional
- Regulatory

How do we transition from the conventional to integrated systems?

What can utilities, DEP, private sector, HOAs and community do?

What is the role of education?