Municipal Smart Water Systems: The Promise and Limitations

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Basis for Presentation

- Municipal water infrastructure: drinking water, wastewater, stormwater systems
  - Experience as a manager of municipal water operations
  - K-Water & IWRA - *Smart Water Management Case Study Report*
    - Paris, France – Integrated network for improved real-time water quality in sanitation (wastewater)
    - Toronto, Canada – Stormwater SmartGrid real-time rainwater collection and monitoring for household stormwater management

What is Smart Water Management?

- K-Water & IWRA *Case Study Report*, SWM is:

  Use of Information and Communication Technology (ICT) to provide real-time, automated data in resolving water challenges

  – Integrated water resources management (IWRM)

  – Planning and operational purposes – multiple scales of time and space

- Key assertions of SWM: real-time data and automation will improve efficiency of services; water management will become more reliable; decision-making will be more inclusive; knowledge-sharing and collaboration will improve

These benefits are not automatic with SWM!

Potable Water Infrastructure
Automation is not only for modern/new systems

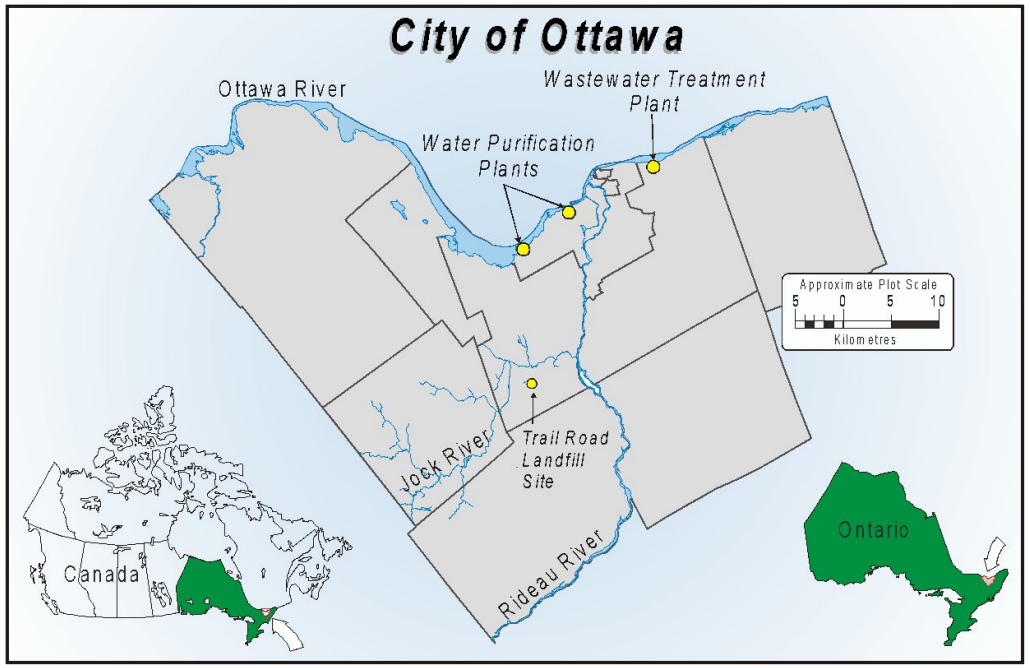


Diagram: City of Ottawa

Fleet Street Pumping Station

- Ottawa's First Water Distribution Infrastructure
- Built in 1874 for Fire Supply
- Six turbines run by water diverted from the Ottawa River
- Fleet Street still used for 'free' pumping energy
- The turbines drive 6 pumps that pressurize drinking water
- Operators present 24/7 to full automation (~1998)

Paris Integrated Smart Water Management

- Sanitation System in the Greater Paris Region: *Case Study*
  - Jean-Pierre Tabuchi, Béatrice Blanchet, Vincent Rocher of the Syndicat Interdépartemental pour l'Assainissement de l'Agglomération Parisienne (SIAAP)
- The public utility's collection area:
  - 1800 km^2 with 9 million people in 284 municipalities
- Greatest challenge for the sanitation system: water quality recovery of the Seine and Marne rivers
- Treatment capacity, technical performance, combined sewer overflows

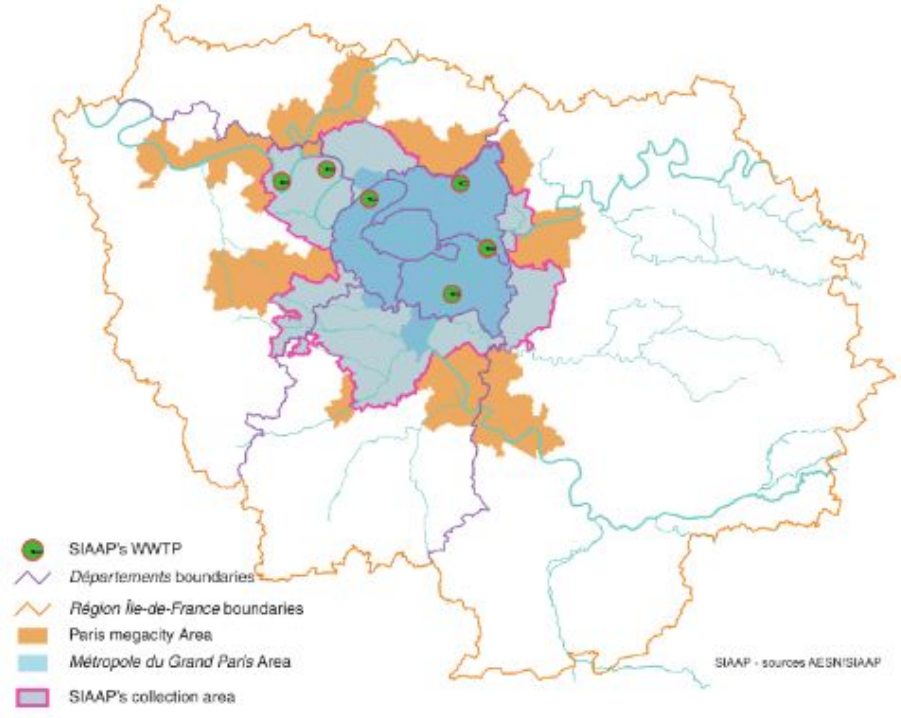


Figure 3. Map of the boundaries of the Greater Paris metropolis and the megacity of Paris (SIAAP - Source: INSEE, MGP)

Diagram: Case Study in IWRA & K-Water Report

Paris Integrated Smart Water Management (2) Vision and continuous improvement

- System evolution:
  - Real-time control system began with a 1997 sanitation master plan study
  - Infrastructure built to store and pump wastewater to treatment plants with available capacity, based on weather (i.e. precipitation) data and modelling
  - Control and forecast system with hydraulic & hydrologic numeric models fed by continuous monitoring of sewage network and weather radar images
  - Non-real time mode for scenarios, learning from past conditions, training
- Success factors:
  - Shared vision; integrating not merging the various systems; leadership committed to the vision; development of a common technical culture
  - Overcame slight resistance of operators to perceived loss of autonomy; access to information beyond their management scope; regular meetings of plant and network operators
- Future plans: preparing the transition from a system based on flow management to a system which also takes into account pollutant loads

Toronto Stormwater SmartGrid

Figure 8. Stormwater Smartgrid cistern

Figure from IWRA & K-Water *Case Study Report*

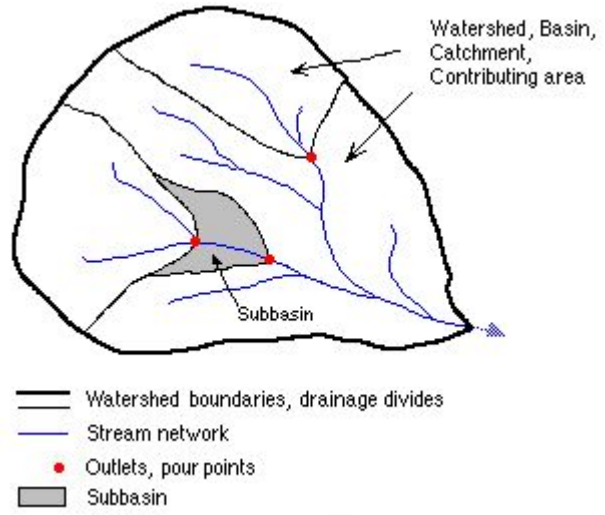
- Community-based Stormwater Smartgrids: Distributed Artificial Intelligence/ Internet of Things (AI/IoT) Rain Harvesting Networks for Flood and Drought Resilience
  - Kevin Mercer, Cristina Cholkan, RainGrid Inc. Toronto, Canada
- Real-time weather intelligence determines rainfall runoff from household roofs given predicted rainfall and rooftop area.
- Water available for household and garden or timed discharge into the sewerage system with automated valves

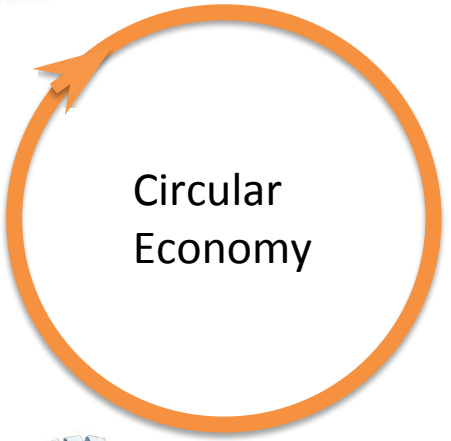
Smart Water Management Implementation Type:

- Combination of individual and institutional users
  - Private property systems – rain barrels and associated technologies
  - Public property system – municipal stormwater infrastructure
- Challenge: not the technology but the business model and achieving economies of scale to gain participating households

Lessons and Limitations

- Smart Water Systems do not begin with technology
  - Vision and planning
  - Long-term commitment (including budgets), building through continuous improvement, flexibility
  - Human resources are essential – engagement, capacity development, training, acceptance, relationships, knowledge sharing
  - Context – natural conditions (e.g. water quality and quantity) and governance (e.g. policy drivers); infrastructure conditions
- Technology will only get us so far when it comes to managing water resources
  - Technology will not create water
  - Watershed and aquifer management; IWRM
  - Match quality to use; greater emphasis on circular economy
  - Climate change - need to respect the water cycle and acknowledge that it is changing (attitudinal shift)





Thank you!

The IWRA & K-Water *Smart Water Case Study Report* can be found at:
https://www.iwra.org/swmreport/