Distributed Water Management

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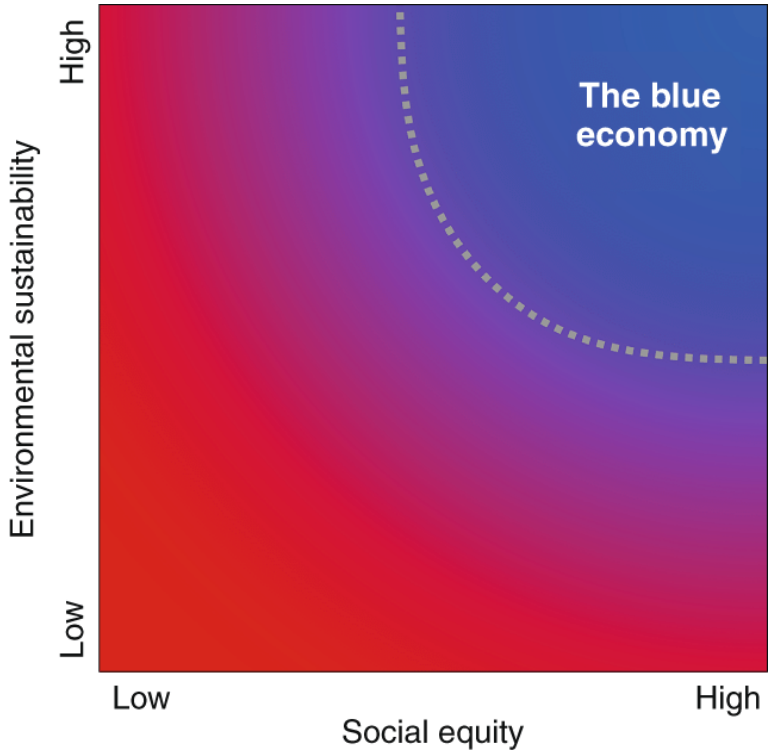

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ELLEN MACARTHUR FOUNDATION
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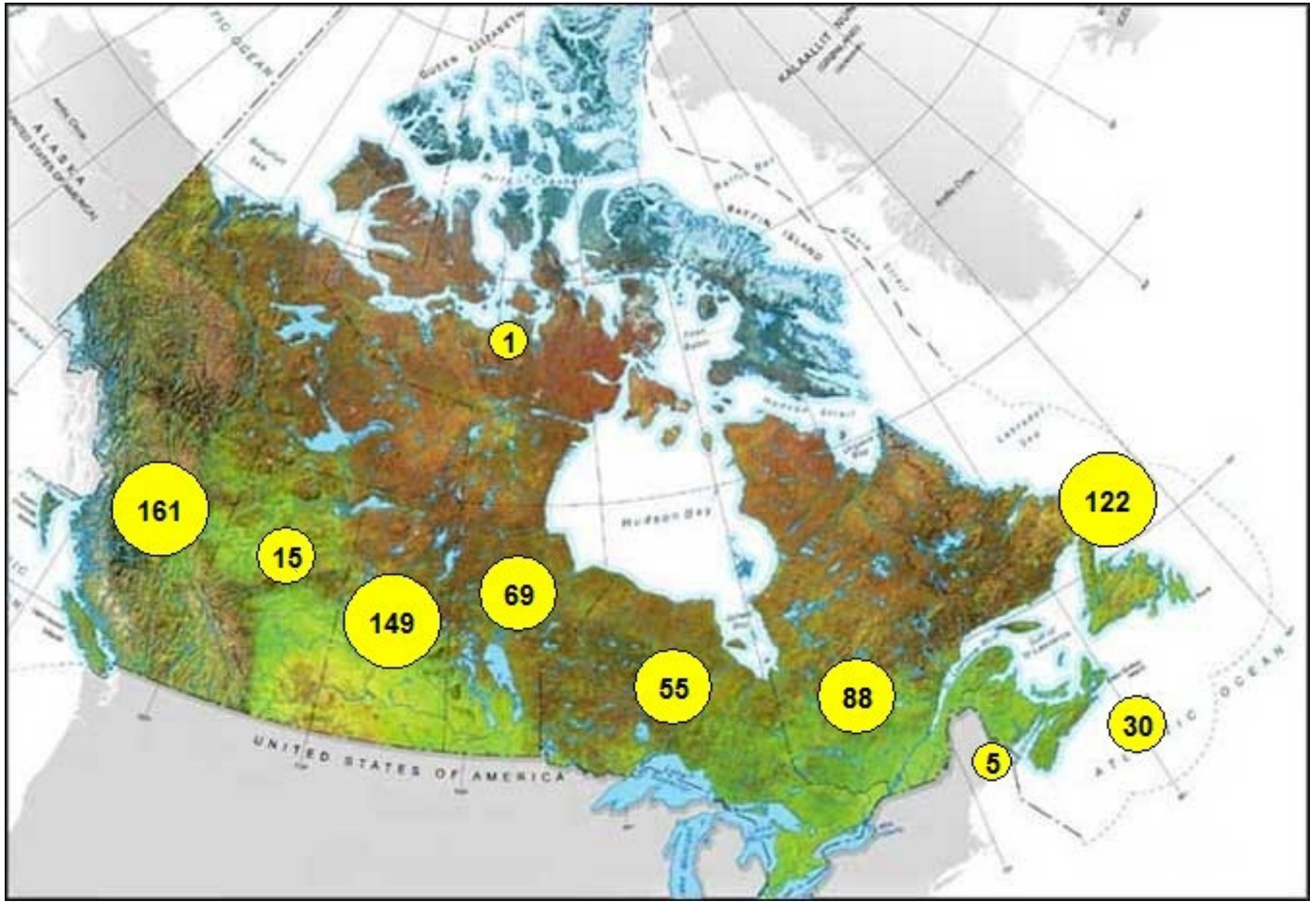
A Variety of Drivers – Framed in National and Global Efforts
UN Sustainable Development Goals, Blue & Circular Economy Initiatives


1
161
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5
UNITED STATES OF AMERICA
North
Northern
Remote
Isolated
Rural
Small
Indigenous
South

- **One Water** [Water Research Foundation] is the “integrated planning and implementation approach to managing finite water resources for **long-term resilience and reliability, meeting both community and ecosystem needs**”.

- ***innovative, integrated, inclusive, and sustainable management*** across otherwise siloed areas including drinking water and wastewater treatment, storm-water design and management, watershed planning, and water market economics and policy.

- The Conference Board of Canada places Canada 9th of 16 peer countries in proportion of wastewater receiving treatment. “Cleaning up the nation’s largest source of water pollution is a priority. In Canada **over 150 billion litres of untreated and undertreated wastewater (sewage) enters our waterways every year.** This is an environmental, human health and economic issue”.

- The federal Wastewater System Effluent Regulations (WSER) 2012 set standards for wastewater treatment. The Federation of Canadian Municipalities have suggested that these **regulations will require communities to substantially upgrade about one out of every four wastewater treatment systems (850 – 1000 across Canada) at a cost predicted in excess of $18 billion if legacy, centralized treatment technologies are to be considered.**

- **Remote, northern and Indigenous communities** lack effective community engagement, capacity, resources and support to address inadequate infrastructure. In our **largest and growing urban centres large** and aging centralized infrastructure operate (>40 years) at or over capacity, and are subject to sewer overflow and pressures from extreme weather.

- A **framework is required for both urban and small communities** that incorporates modular systems and distributed wastewater treatment approaches that occupy much smaller footprints than conventional wastewater treatment plants.

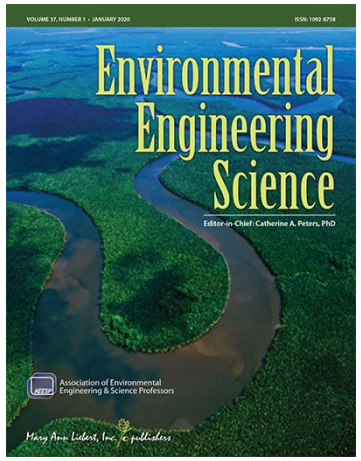
- A distributed approaches offer more **agility, flexibility, and scalability** than traditional centralized treatment and applicable in urban communities, rural, remote or Northern communities, and industrial settings.

- A networked distributed approach can provide the benefits of a centralized facility in terms of monitoring and diagnostics. Indeed, a **network of distributed treatment systems could greatly aid our surveillance of water quality and our response to challenges it faces**.

- Distributed approaches present an **opportunity for innovation, sustainability, adaptability and flexibility consistent with a "One Water" approach in Canada**, and globally.

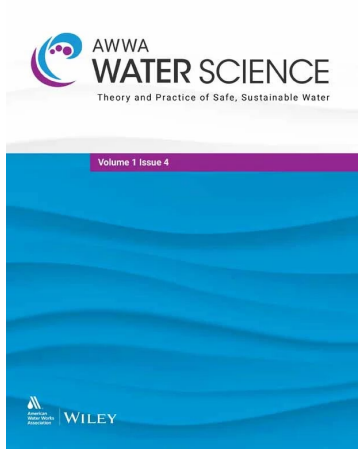
- **Placing treatment closer to the source of wastewater**, potentially offers substantial economic and environmental benefits over centralized approaches.

- **Digital technologies, data collection and curation, and informatics will be crucial** to the success of an adaptive, integrated and networked system.



Biofouling of an Aerated Membrane Reactor: Four Distinct Microbial Communities

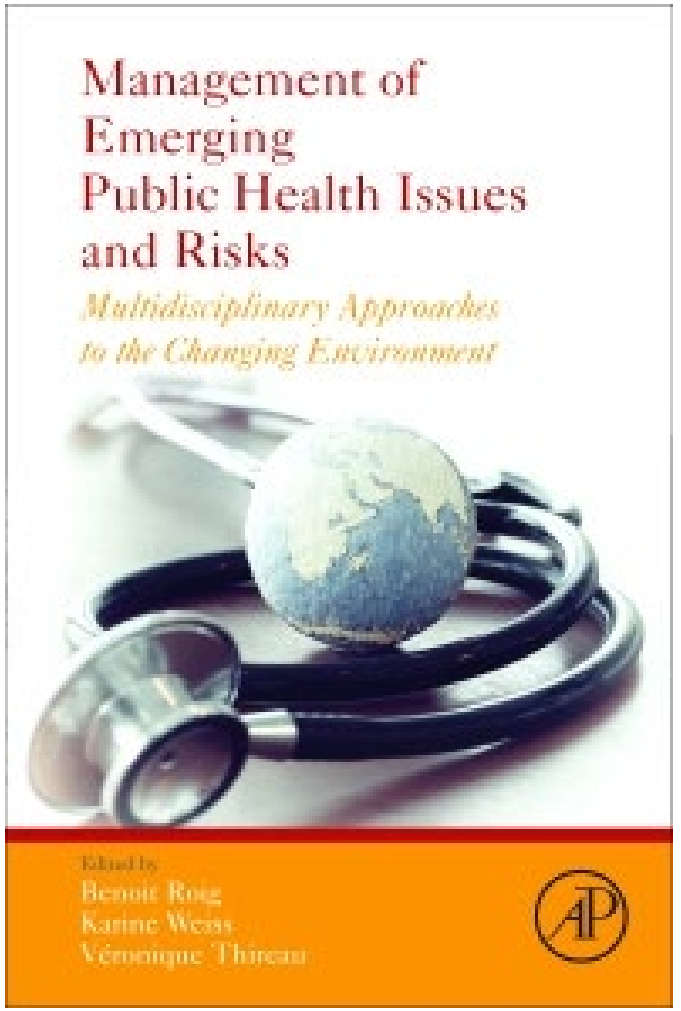
Lori Lishman, Hussain Aqeel, Mahendran Basuvaraj, Baoqiang Liao, Rongchang Wang, and Steven N. Liss. Environmental Engineering Science. Jan 2020.3-12.http://doi.org/10.1089/ees.2019.0209



A multiple-site field study of stabilized hydrogen peroxide for drinking water disinfection

Yamuna S. Vadasarukkai Xinhai (August) Guo Robert Tyssen Joanna El Hares Ludo Feyen Steven N. Liss Jim Shubat Robert Abernethy
Volume1, Issue4, July/August 2019. http://doi.org/10.1002/aws2.1150

Drivers of bioaggregation from flocs to biofilms and granular sludge
Hussain Aqeel, David G. Weissbrodt, Marta Cerruti, Gideon M. Wolfaardt, Britt-Marie Wilén and Steven N. Liss Environ. Sci.: Water Res. Technol., 2019,5, 2072-2089



Chapter 7 - **Antimicrobial Resistant Genes and Organisms as Environmental Contaminants of Emerging Concern**:
Addressing Global Public Health Risks
Haley Sanderson, R. Stephen Brown, Anna Majury, Patricia Hania, Tim McAllister, and Steven N. Liss, 147-187 (2019)

Research Approach

DWT-SOS utilizes an integrative and collaborative approach.

Developing fit-for-purpose, small-scale, decentralized wastewater treatment systems.

Three *Research Themes* drive multi-disciplinary research and development spanning *Technology Development (Theme 1)*; *Systems Integration (Theme 2)*; and *Politics, Enviro-Economics, and Community Engagement (Theme 3)* with specific *Application Scenarios* in mind and acting as testing/demonstration platforms.

THEME 1

Technology Development

Eco-Engineered

Chemical/Physical

Biological

THEME 2

Technology Integration

Monitoring & Diagnostics

Data

THEME 3

Community Relations

Enviro-Economics

Policy & Regulation

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