Developing resilient, adaptive water management systems through a bottom-up participatory technology development process - A case study in four Indigenous communities in Canada

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Abstract

Indigenous communities in Canada have faced many challenges over the past century, including socio-economic crises, geographic isolation, a lack of political voice, and failing infrastructure. A lack of synergy between Indigenous ways of knowing and scientific/technical worldviews has been identified as a primary contributing factor to many of these issues. The pronounced dichotomy between these perspectives has resulted in systems that are neither resilient nor meet the unique needs of Indigenous communities. Policies and procedures that exclude Indigenous worldviews have inhibited effective decision-making processes and meaningful community engagement.

Water management systems provide a clear case of inhibited decision-making processes in Indigenous communities. Outdated design and decision-making processes developed and tested in southern, urban environments are imposed on these communities. The resulting infrastructure is prone to frequent failure, marked by routine boil water advisories, jeopardizing the health and safety of Indigenous communities. Indigenous governments and communities must constantly respond to crisis, providing no room to plan for long-term, appropriate, and resilient water management systems. Compounding these crises are the many vulnerabilities, including climate change, energy insecurity, and socio-economic and political uncertainties.

We will be presenting the outcomes of an interdisciplinary (Engineering, Sociology, Anthropology, and Native Studies) research project with four Indigenous partner communities to develop long-term plans for resilient and adaptive water management systems that fit their unique circumstances. The aim is to build adaptive capacity to transition these water management systems from complex to complex adaptive. Embedded in post-normal science, this project has developed appropriate methodologies and tools for community engagement; gathering local knowledge; characterizing local context; understanding the complex system of management; and developing long-term scenarios that are informed by both Indigenous ways of knowing and established scientific and technical knowledge bases.

In particular we will focus on the following aspects:

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• Methodologies and tools for exploring the synergies between differing knowledge systems (Indigenous and Western) and to facilitate community engagement;
• Application of the narrative approach to design and planning in Indigenous communities;
• Application of the adaptive cycle to learning and capacity development; and
• Development of a framework for meaningful interdisciplinary research that is both informed by and informs the community engagement processes.

**Keywords:** Scenario analysis, governance, multiple perspectives, narratives, synergies, ways of knowing, stakeholder engagement, complex adaptive, interdisciplinary, feedback, frameworks, equity, local knowledge, community engagement