Building Knowledge and Capacity with an Indigenous community through participatory watershed modeling

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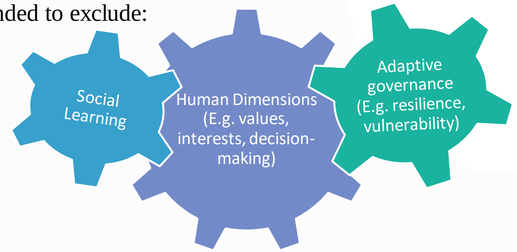
Background

Top-down approaches to managing water resources have tended to exclude:



Need: Incorporate context-based values, local knowledge, and multiple perspectives

Approach: Community-based participatory approaches (CBPA)

For: Good governance, integration of diverse knowledge systems, community empowerment and capacity building

Context: In prairies, CBPAs not yet used to examine watershed-scale assessment tools (E.g. watershed modeling)

Goal: Co-management of water resources and governance decision-making.

Research purpose and objectives

The purpose of this work is to extend the application of CBPAs to watershed-scale modeling efforts, in understanding flood events in a First Nations community.

The objectives of the research include:

1. Evaluating utility of watershed model in promoting social learning and capacity building in the community, and,
2. Analyzing factors influencing community members' acceptance of model-generated information

Study Area

- Mistawasis Nêhiyawak is a Cree First Nation community located in Treaty 6 Territory
- There are concerns about elevated water levels resulting in localized flooding on the reserve and surrounding areas
- Current strategies for coping with flooding are reactive and technical (e.g., water diversion, berms, culvert expansion) (Dawe, 2016).

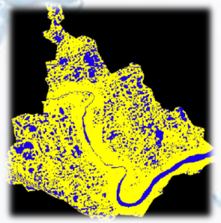
We wanted to explore whether a co-designed, and detailed watershed model, and model-generated information would help to address flood concerns in the community?

The Wetland DEM Ponding Model (WDPM)

In this project we will test the use of the WDPM and its outputs in a CPBA context where users from Mistawasis will direct information production from the model for their use in water resource management.

WDPM was:

- Developed for the Canadian Prairies by Centre of Hydrology, University of Saskatchewan.
- Used to demonstrate the spatial distribution of surface runoff across the landscape (in a DEM).



Example of WDPM image output (Shook et al., 2014)

Participatory Watershed Modeling

Community participation in watershed modeling efforts through data collection, model development, scenario building, or/and providing feedback (Gray et al., 2017).

Qualitative, conceptual, mental models

Quantitative, analytical, computer models

Proposed Methodology

- Mixed-methods CBPA and methodology:

1. Stakeholder Analysis
   - Engage potential users (Chief, councilors, Elders, and interested community members)
   - Introduce model and its potential outputs
2. Workshop 1: Data Collection and setting goals
   - Co-design desired outputs
   - Gather data necessary for the model and as approved by the community
   - Cognitive mapping exercise to gather reference point on understanding of model use
3. Modeling and simulation
   - Run model (WDPM) according to co-designed directives and translate outputs to clear and understandable information for workshop 2 (i.e., flood maps, time series outputs)
4. Workshop 2: Systemic co-inquiry
   - Conduct group discussions and validation of the model-generated information using focus groups
   - Repeat the cognitive mapping exercise to examine social learning

Social Learning

Example of cognitive map using mentalmodeler

"learning together to manage together" in a social context (Pahl-Wostl et al., 2007).

Research Significance

The research will demonstrate blending of knowledge systems (Indigenous, local, scientific) for collaborative learning in dealing with changes in water systems for adaptation and resilience.

The work has potential to reconcile differences between modeling and Indigenous communities, and build trust, community ownership and water management capacity.

The work will contribute to the understanding of how human dimensions can be incorporated into watershed models in water governance, and the users will provide feedback to model developers.

References

- Dawe, M. (2016). *Mistawasis Nêhiyawak Source Water Protection Planning Initiative.* University of Saskatchewan.
- Gray, S., Paolisso, M., Jordan, R., & Gray, S. (2017). *Environmental modeling with stakeholders*. Cham, Switzerland: Springer.
- Pahl-Wostl, C., Craps, M., Dewulf, A., Mostert, E., Tabara, D., & Taillieu, T. (2007). Social learning and water resources management. *Ecology and society*, *12*(2).
- Shook, K., Armstrong, R., Sharomi, O., Spiteri, R., & Pomeroy, J. (2014). The WDPM User's Guide.
- Photo credit: www.mistawasis.ca www.rlacf.org

Acknowledgements

- Mistawasis Nêhiyawak
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