IMPC

The Integrated Modelling Program
for Prediction and Management of Change
in Canada's Major River Basins
'Remarks' from Howard Wheater

UNIVERSITY OF SASKATCHEWAN
Global Institute for
Water Security
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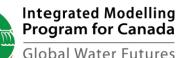
Global Water Futures aims:

a) to **place Canada as a global leader in water science for cold regions** such as Canada where snow, ice and frozen soils are major controls (such regions deliver water resources to half the world), and

b) to **address the strategic needs of the Canadian economy** in adapting to change and managing the risks of uncertain water futures and extreme events.

*Is IMPC and is **your** work meeting these goals?*

Global Water Futures - Mission

- **Improve disaster warning** – develop scientific knowledge, monitoring and modelling technologies, and national forecasting capacity to predict the risk and severity of extreme events

- **Predict water futures** – use Big Data to make informed decisions, better models to assess change in human/natural land and water systems

- **Inform adaptation to change and risk management** – propose governance mechanisms, management strategies, and policy tools to reduce the risk of water threats, design adaptive strategies, and enhance economic opportunities

Modelling is at the heart of the GWF programme

We have an unique opportunity:

- unprecedented resources based on IMPC, the core modelling team, and other related projects

- unprecedented opportunities for integration of expertise – bringing the Canadian community together, and taking a pan-Canadian perspective.
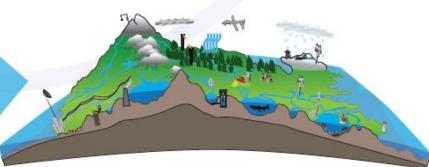
New opportunities of Big Data

Integrated Modelling Program for Canada
IMPC
Global Water Futures

User Engagement & Information Sharing

Cloud Computing
Data Modelling

Data Sensing

But we also face unprecedented challenges:

- understanding the complexity of our human/natural environment (especially cold region processes and the human controls on land and water management)

- understanding the response of land and water systems to rapid climate warming, including human dimensions

- providing the tools for society to manage water resources and water-related risks under current and future climates

Challenges - continued

- The challenges of cold region hydrology mean that much modelling science remains to be developed – because of data sparsity and complex interactions of the energy and water cycles – particularly around model regionalization and uncertainty analysis

- The challenges of water quality modelling are global – particularly for nutrients, but include the need to better represent the cold region process controls on contaminant fate and transport, and to span scales from local to regional to understand the impacts of management practices

Challenges - continued

The challenges for water resources management include

1) how to synthesize all of the relevant dimensions of water management – quantity, quality, ecosystems, legal constraints and value systems, and

2) how to frame problems based on user need -using appropriate metrics, including economics, recognizing uncertainty, and using new techniques for robust decision making under deep uncertainty.

Challenges - continued

And in looking to the future, the challenges of disciplinary synthesis are great:

What will a future landscape look like post glacier retreat, post permafrost thaw, post greening of the sub-arctic, and with changing human management of land and water resources?

How do we integrate scientific expertise to move forward?

Some strategic questions:

- How do we assess the uncertainty in our modelling outcomes, and how to we move forward to reduce that uncertainty?

- How do we work with stakeholders to embrace uncertainty and frame appropriate decision support tools?

- In the face of limited data, how do we trade-off model complexity with model and parameter identifiability?

IMPC will deliver:

- A pan-Canadian perspective

- New integrated and regionalized modelling tools

- User-engagement and co-development of user-focused decision support systems to address the pressing needs of communities, governments and industry

- Progress in asking and answering the difficult questions: for a complex, data-sparse modelling environment, how to improve our modelling science, assimilate new data sources, address non-stationarity, represent our uncertainties, and provide useful decision support.

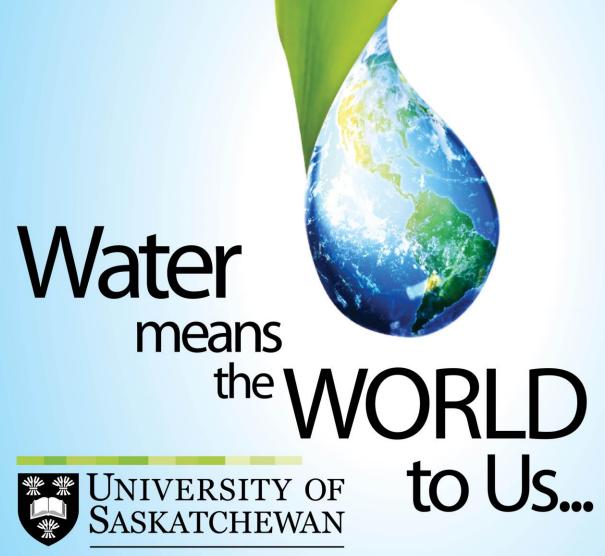**Global Water Futures**

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