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# Climate Change Uncertainty and Water Governance

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## AGWA: A Brief Overview

- The **Alliance for Global Water Adaptation** is a group of regional and global development banks, aid agencies and governments, a diverse set of non-governmental organizations (NGOs), and the private sector focused on how to **manage water resources** in way that is **sustainable** even as **climate change** alters the global hydrological cycle.
- Focused on how to help practitioners, investors, and water planners and managers make systematic, consistent, and resilient decisions

## Outline

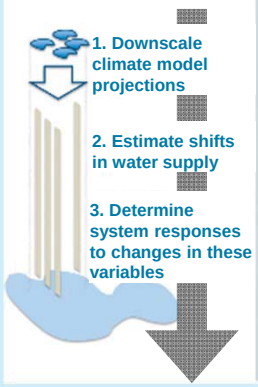
- Water Security
- Climate Change Adaptation
  - Uncertainty of future climate and hydrology
  - Bottom-up approaches to risk management
- Two examples
  - International Upper Great Lakes Study (IUGLS) – United States and Canada
  - Climate Change and Security in the Dniester River Basin – Ukraine and Moldova

## Water security is about:

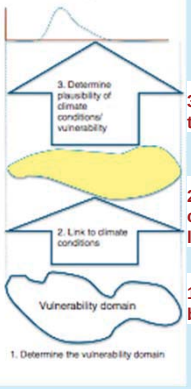
- Reduction of flood and drought disaster damages
- Supporting economic development and poverty reduction
- Securing water as an essential factor of production for industry, energy and agriculture
- Providing reliable services and social well being (clean drinking water; wastewater disposal)
- Supporting natural environment and ecosystem services
- **Water resources management is inherently concerned with water security**

# Top-down vs. bottom-up approaches for climate adaptation decision making

**Top-down** approaches to risk assessment




**Decision-scaling** risk assessment




3. Assess plausibility and test vulnerability

2. Assemble multiple climate data sources and link to breaking points

1. Define your system's breaking points

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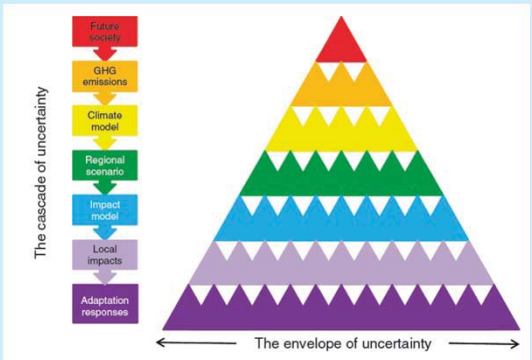
Weaver et al., 2012, *WIREs Climate Change*

# Uncertainty




Source: Wilby & Dessai, 2010, *Weather*

Traditional approaches climate change impact analyses **amplify** or **hide** uncertainty

- Climate models were not developed for adaptation purposes but for testing hypotheses about greenhouse gas mitigation.
- Low confidence in future projections, especially for quantitative purposes
- Stakeholders often feel disempowered by process, which is often experienced as deterministic
- Water governance: how to deal with future uncertainty

Source: AGWA, "Caveat Adaptor," 2013

## International Upper Great Lakes Study (IUGLS)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## International Joint Commission (IJC)

More than a century of cooperation protecting shared waters

- Canada and the United States created the International Joint Commission because they recognized that each country is affected by the other's actions in lake and river systems along the border.
- The IJC is guided by the Boundary Waters Treaty, signed by Canada and the United States in 1909.
- The IJC seeks to prevent and resolve disputes regarding many of the lakes and rivers along the shared border of the two countries. This role includes approving the construction and management of works that affect levels and flows in boundary waters.

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## International Upper Great Lakes Study (IUGLS)

- The International Upper Great Lakes Study (IUGLS) examined a recurring challenge in the upper Great Lakes system: *how to manage fluctuating lake levels in the face of uncertainty over future water supplies to the basin while seeking to balance the needs of those interests served by the system.*

## IUGLS Methods

- Methods to evaluate system performance
  - Observed record
  - Paleo-hydrology
  - Stochastic hydrology
  - Climate change projections: statistical downscaling and regional climate models
- Engagement with stakeholder groups to define coping ranges and failure thresholds
  1. Domestic, municipal and industrial water uses;
  2. Commercial navigation;
  3. Hydroelectric generation;
  4. Ecosystems;
  5. Coastal zone; and,
  6. Recreational boating and tourism.

## IUGLS -Recommendations

- Best approach is to make decisions in such a way as to not overly rely on assumptions of particular future climatic and lake level conditions or specific model projections.
- **Robustness** – the capacity to meet regulation objectives under a broad range of possible future water level conditions – must be a primary attribute of any new regulation plan.
- An **adaptive management** strategy should be applied to address future extreme water levels in the Great Lakes-St. Lawrence River basin

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## International Upper Great Lakes Study (IUGLS)


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## Dniester River Basin


## Climate Change and Security in the Dniester River Basin

- United Nations Economic Commission for Europe (UNECE) and the Organization for Security and Cooperation in Europe (OSCE) are leading the project “Climate Change and Security in the Dniester River Basin.”
- Component of larger program on “Climate Change and Security in Eastern Europe, Central Asia and the Southern Caucasus.”

## TREATY BETWEEN THE GOVERNMENT OF THE REPUBLIC OF MOLDOVA AND THE CABINET OF MINISTERS OF UKRAINE ON COOPERATION IN THE FIELD OF PROTECTION AND SUSTAINABLE DEVELOPMENT OF THE DNIESTER RIVER BASIN

**Article 1**
**Objective of the Treaty**

- The objective of the present Treaty is to establish legal and institutional foundations for **cooperation towards achieving rational and environmentally sound use and protection of water and other natural resources and ecosystems of the Dniester River** basin in the interests of population and sustainable development of the states of the Contracting Parties.
- In particular, the Contracting Parties shall cooperate in implementation of the following tasks:
  - **development of sustainable water use** based on the principles of rational utilization and protection of water and other natural resources and ecosystems of the Dniester River basin;
  - considerable **reduction of pollution** of the Dniester River basin and the Black Sea, accordingly;
  - **prevention of deterioration and rehabilitation of ecosystems** as well as conservation of biodiversity in the Dniester River basin;
  - **prevention and mitigation of adverse water impacts** caused by natural and anthropogenic factors.

## Dniester River Basin

## Climate Adaptation

- Potential reservoir regulation changes for climate adaptation
  - Provide more naturalized flow patterns for ecosystems while maintaining economic benefits
  - Change allocation of storage space to different uses (Example: increase flood storage space to reduce downstream damages, but would result in less hydropower production)
  - "Dynamic rule curves": Shift reservoir storage allocation based on current hydrological conditions in basin
  - Use of forecasts and real-time reservoir management system to improve flood management

## Summary

- Use of bottom-up process for climate adaptation decision making
- Robust strategies – capacity to meet regulation objectives under a broad range of possible future conditions
- Flexible, adaptive management – capacity to make changes as new conditions are observed


# Thank you!

# Questions?

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