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Tough questions, No easy answers: Canada and the Water-Energy-Climate nexus

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Securing Nature's Water Needs



“for any ecosystem function to be sustained, freshwater provides the foundation for the processes involved: a foundation that has largely been neglected in the past.” (Falkenmark, 2003)





Neglecting Nature's Needs

Voice from the past:

“Canadians have tended to undervalue instream uses in water management decisions”

(Federal Water Policy, 1987)

. . . 20 years later

Generally, decisions to expand cities ... apportion water supplies...are made on a project-specific basis ...

Ecological instream flow needs and lake levels are often ignored or underestimated.”

(Schindler & Donahue, 2006)





Need for a strategic approach

Tar Sands

- How much? How long? How fast?
- Water demand, holding ponds, water quality, acid deposition

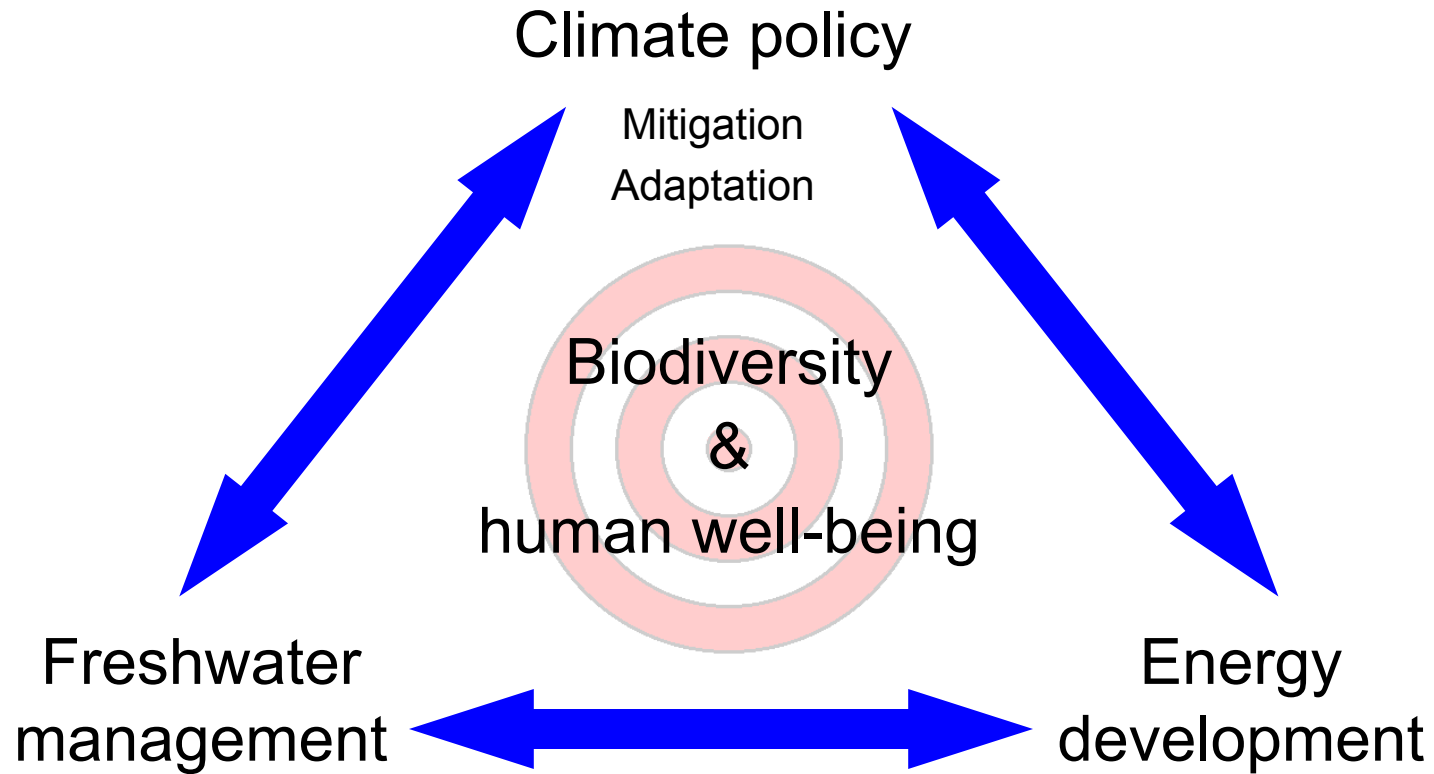
“Responding” to climate change

- Shift toward low/no carbon energy future
- Nuclear, Biofuels, Hydropower



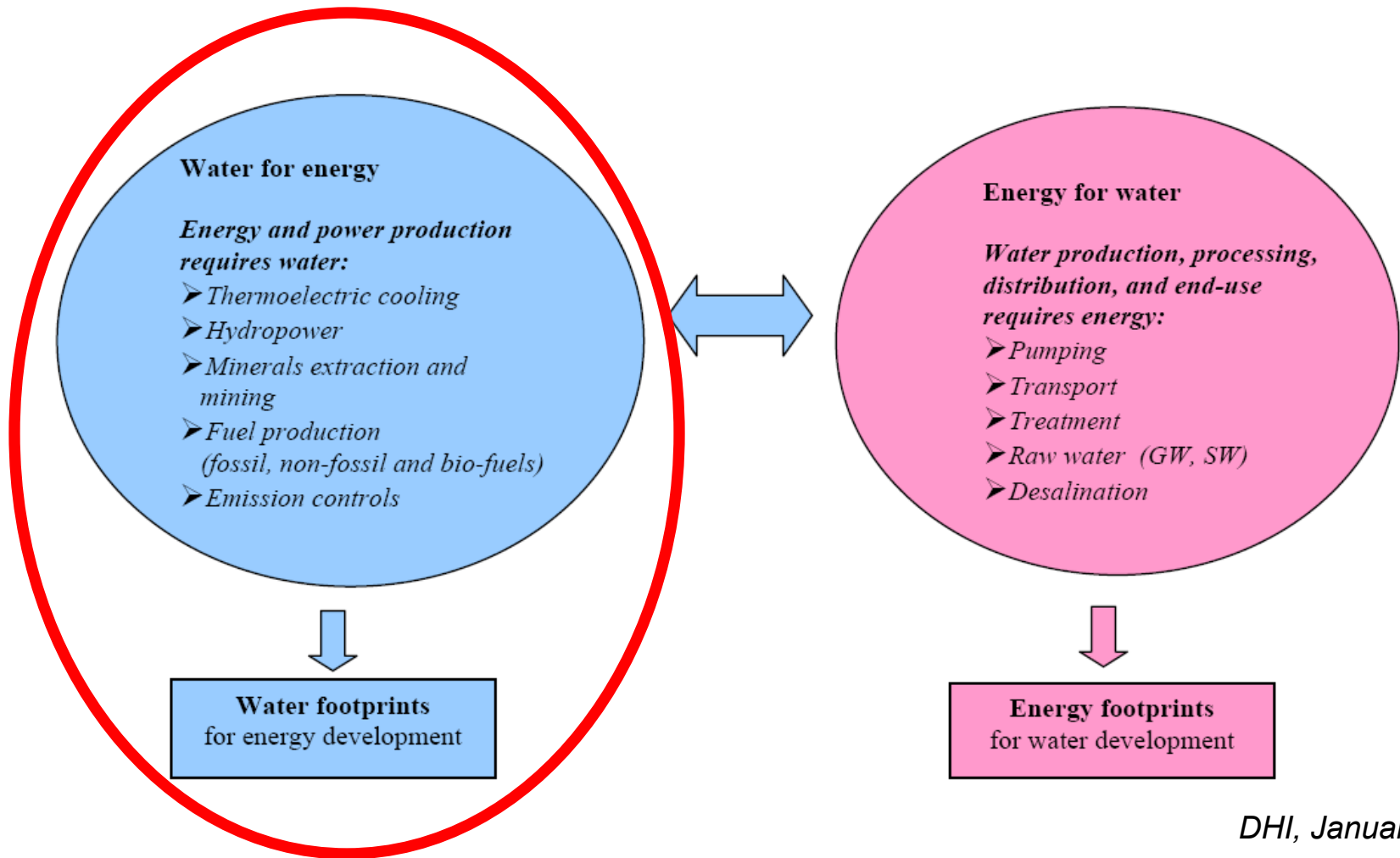


The Water-Energy-Climate Nexus





Two sides of the story



DHI, January 2008





Water footprint

- Total physical and “virtual” water content of a product or service
- Volume-based indicator of water use that captures consumption and pollution
- “Virtual” water amount needed to produce something that is not physically present in the final product

Consumption vs. withdrawal

- Withdrawal - Water removed from a source and used for human needs
- Consumption –part of withdrawals made unavailable for reuse in the same basin





Water footprint of Energy

"Water footprints for energy": Water consumed by energy type - based on the US Example:*

Energy Type	Approximate Total Water Consumed (m ³ /MWh)	Water Consumption for US Daily Energy Production (millions of m ³)**	US Personal Daily Consumption Equivalents*** (people)
Solar****	0.001	0.011	44 thousand
Wind****	0.001	0.011	44 thousand
Gas	1	11	44 million
Coal	2	22	88 million
Nuclear	2.5	27.5	110 million
Oil/Petrol	4	44	176 million
Hydropower	68	748	3 billion
Bio-fuel (1 st gen.)	178	1,958	7.8 billion

*Based on: Water consumed for production/extraction of raw materials; water consumed for refining fuel; water consumed at energy plant; and average totals by plant types.

DHI, January 2008





From footprint to impacts

Footprint metric only of limited value:

- Gives idea of water 'intensity' of goods and services (like energy)
- Connects where something is produced and where it is used or consumed

BUT.... must to be related to impacts on biodiversity and human well-being, including:

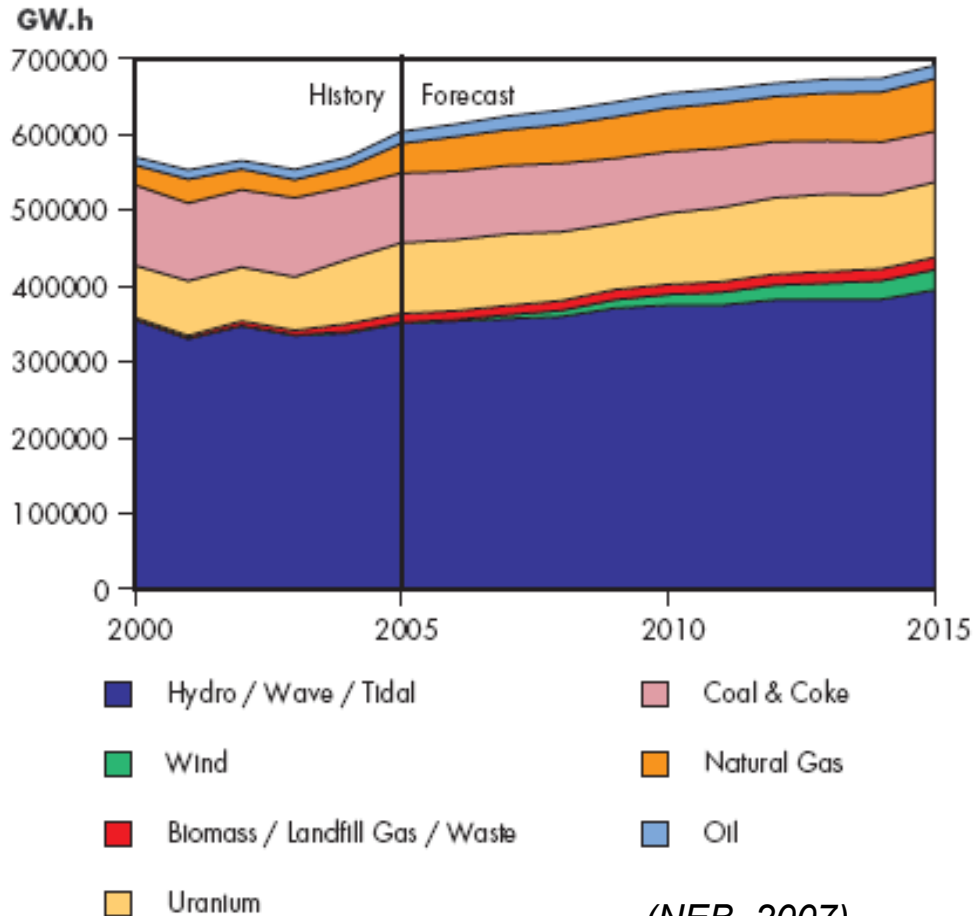
- Disruption of natural flow regimes
- Fragmentation of freshwater ecosystems
- Pollution / Water quality





Footprint impacts

Canadian Generation – Reference Case



(NEB, 2007)

Pollution

- Chemical
- Physical

Flow timing & volume

- Surface water
- Groundwater

Fragmentation

- Species migration
- Population dynamics





NEB Energy Scenarios to 2030

1. Continuing Trends Scenario

- Reference case trends projected forward

2. Triple E Scenario

- balancing of economic, environmental and energy objectives
- most rigorous energy demand management of the three scenarios

3. Fortified Islands Scenario

- Security concerns dominate this scenario
- Geopolitical unrest, lack of international cooperation and trust, and protectionist government policies





Assessment – Answering tough questions

- Water footprint of current energy demands
- Water footprints of energy future(s)
- Current and future footprint impact on biodiversity and ecological integrity
- Spatial analysis of footprint impact intensity:
 - To identify current hot spots
 - To compare energy scenarios to water availability & ecosystem carrying capacity in context of climate change
- Benefits of energy (and water) conservation





Toward answers – Policy framework

Coordination

- Among orders and agencies of government
- From policy level to project assessment and implementation
- Cumulative impacts & problem displacement

Integrated decision-making

- Exposing and addressing trade-offs among ecological integrity, energy demand, water availability and climate change

Internalizing external costs

Aggressive energy conservation across all sectors





Questions & Comments

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