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Data Sources and Methods for the Water Availability Indicator

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1 Introduction

The Water Availability indicator is part of the Canadian Environmental Sustainability Indicators (CESI) program (http://www.ec.gc.ca/indicateurs-indicators/default.asp?lang=En&n=47F48106-1), which provides data and information to track Canada's performance on key environmental sustainability issues.

2 Description and rationale of the Water Availability indicator

2.1 Description

The Water Availability indicator compares the amount of fresh water withdrawn from rivers for human use to the volume of water in Canadian rivers.

2.2 Rationale

Growing urban populations, economic development and weather variability all put pressure on Canada's freshwater supplies, making water availability a concern in some communities. As the proportion of water withdrawn for human activities increases, water availability may be threatened, suggesting future water scarcity. Identifying threatened regions is important to ensuring that an adequate amount of water is available to sustain human populations, economic development and healthy aquatic ecosystems.

This indicator, based on the Organisation for Economic Co-operation and Development's (OECD) Water Stress Indicator (http://www.oecd.org/environment/environmentalindicatorsmodellingandoutlooks/oecdenvironmentaloutlookto2030.htm), estimates how water demand by humans is impacting the water supply in rivers and identifies areas where water demand may be putting too much pressure on these supplies.

3 Data

3.1 Data source

Streamflow data used to calculate water supply were obtained from the Water Survey of Canada's HYDAT database (http://www.ec.gc.ca/rhc-wsc/default.asp?lang=En&n=9018B5EC-1). The HYDAT database includes average daily streamflow in cubic metres per second (m^3/s) for a network of 2792 hydrometric stations across Canada. Water intake data were taken from three surveys: Statistics Canada's Industrial Water Use Survey 2009 (http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=5120&lang=en&db=imdb&adm=8&dis=2) and Agricultural Water Use Survey 2010 (http://www23.statcan.gc.ca:81/imdb/p2SV.pl?Function=getSurvey&SurvId=34636&SurvVer=2&InstaId=34639&InstaVer=2&SDDS=5145&lang=en&db=imdb&adm=8&dis=2) as well as Environment Canada's Municipal Water and Wastewater Survey 2009 (http://www.ec.gc.ca/Publications/default.asp?lang=En&xml=B77CE4D0-80D4-4FEB-AFFA-0201BE6FB37B).

3.2 Spatial coverage
The Water Availability indicator is calculated for Canada's 164 sub-drainage areas (SDAs),[1] excluding 22 sub-drainage areas in northern Canada.

3.3 Temporal coverage
The Water Availability indicator is calculated for 2009.

3.4 Data completeness
The data for some SDAs in Yukon, the Northwest Territories, Nunavut, Labrador and northern portions of British Columbia, Alberta, Saskatchewan, Manitoba and Ontario were merged because of low levels of human activity and the large surface-water supply in the rivers. The Okanagan Valley was evaluated at the sub-sub drainage area level. Northern Quebec was not evaluated due to a lack of available water flow data. The method used to calculate the Water Availability Indicator for some of the Arctic Ocean drainage areas could not be applied because of hydraulic regime (e.g. frozen streams) and extreme climate conditions.

3.5 Data timeliness
There is a time lag between 2009 (the year being reported on) and the publication of this indicator. This delay is due to several intertwining factors, including the time required to collect and verify the raw data; compile the data obtained from all partners at the national level; and analyze, review and report the data.

4 Methods

Environment Canada estimated water demand for 2009 for each SDA as the sum of municipal, industrial and agricultural water withdrawals from all flowing water.

Water supply for 2009 is calculated using streamflow data collected by the Water Survey of Canada's hydrometric stations. The water flow (m^3/s) data is extracted for the hydrometric station located at the basin outlet. Flow values from the outlet station are considered to be approximately equal to the water supply for the entire basin. Any water consumed in the basin was added to the water supply to estimate all water theoretically available for use. Adding water consumed gives the total water supply for the basin. For cases when the most-downstream station's flow did not account for the flow in the entire basin, proportions were used to estimate water supply for the basin.

Environment Canada calculated water availability for 2009 by dividing water demand by water supply for each SDA. All SDAs are assigned one of the OECD's four water availability threat classifications[2] based on the water availability ratio.[3] While not always applicable to Canadian circumstances, the OECD defines these classifications as follows:

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[1] National Resources Canada (2003) Atlas of Canada, 1,000,000 National Frameworks Data, Hydrology – Drainage Areas. Retrieved on 10 September, 2010. Available from: http://geogratis.cgdi.gc.ca/geogratis/en/option/select.do;jsessionid=88E14B25D09C934291775D7204F4D901?id=87B4BE8F-C67C-5545-80B5-AB6FC056149E.

[2] Organisation for Economic Co-operation and Development (2009) Managing Water for All: An OECD perspective on pricing and financing. Retrieved on 31 August, 2012. Available from: http://www.oecd.org/env/biodiversitywaterandnaturalresourcemanagement/managingwaterforallanoecdperspectiveonpricingandfinancing.htm.

[3] United Nations World Meteorological Organization (1997) Comprehensive Assessment of the Freshwater Resources of the World (overview document). Geneva. Retrieved on 6 November, 2012. Available from: http://www.un.org/esa/documents/ecosoc/cn17/1997/ecn171997-9.htm.

- Low (less than 10% of available water is withdrawn): low water stress.
- Moderate (between 10% and 20% of available water is withdrawn): water availability becomes a constraint on development and investment is needed to increase water supply and reduce demand.
- Medium (between 20% and 40% of available water is withdrawn): both water supply and water demand need to be managed and conflicts among competing uses will need to be resolved. Aquatic ecosystems may require special attention to ensure they have adequate water flows.
- High (more than 40% of available water is withdrawn): severe water stress. At this level of consumption there is an increasing dependence on desalination and groundwater is being used faster than it is replenished. Water use patterns and withdrawals may not be sustainable and water scarcity can become a limiting factor to economic growth.

5 Caveats and limitations

This indicator does not account for the water stock in lakes and groundwater aquifers. As a result, water availability may be underestimated and the threat to water availability overestimated for areas relying primarily on lakes, oceans or other water sources to satisfy human water demand. Where the threat is high, there are longer-term risks that withdrawal exceeds recharge for these water bodies.

This indicator uses total water withdrawal by municipal, industrial and agricultural sectors to calculate water demand. While it provides a measure of the amount of water removed from rivers, the indicator does not report how much water is consumed (water not released directly back into the river system).

6 References and further reading

6.1 References

Environment Canada (2011) 2011 Municipal Water Use Report: Municipal Water Use 2009 Statistics. Retrieved on 31 August, 2012.
Available from: http://www.ec.gc.ca/Publications/default.asp?lang=En&xml=B77CE4D0-80D4-4FEB-AFFA-0201BE6FB37B.

Organisation for Economic Co-operation and Development (2007) Environmental Outlook to 2030. Retrieved on 31 August, 2012. Available from:
http://www.oecd.org/environment/environmentalindicatorsmodellingandoutlooks/oecdenvironmentaloutlookto2030.htm.

Organisation for Economic Co-operation and Development (2009) Managing Water for All: An OECD perspective on pricing and financing. Retrieved on 31 August, 2012. Available from:
http://www.oecd.org/env/biodiversitywaterandnaturalresourcemanagement/managingwaterforallanoecdperspectiveonpricingandfinancing.htm.

Statistics Canada (2011) Agricultural Water Use Survey 2010. Retrieved on 18 July, 2012. Available from:
http://www23.statcan.gc.ca:81/imdb/p2SV.pl?Function=getSurvey&SurvId=34636&SurvVer=2&InstaId=34639&InstaVer=2&SDDS=5145&lang=en&db=imdb&adm=8&dis=2.

Statistics Canada (2012) Industrial Water Use Chronological Index. Retrieved on 18 July 2012. Available from: http://www5.statcan.gc.ca/bsolc/olc-cel/olc-cel?catno=16-401-X&chropg=1&lang=eng.

United Nations World Meteorological Organization (1997) Comprehensive Assessment of the Freshwater Resources of the World (overview document). Geneva. Retrieved on 6 November 2012. Available from: http://www.un.org/esa/documents/ecosoc/cn17/1997/ecn171997-9.htm.

6.2 Further reading

Statistics Canada (2010) Human Activity and the Environment: Freshwater Supply and Demand in Canada 2010. Retrieved on 31 August 2012. Available from: http://www5.statcan.gc.ca/bsolc/olc-cel/olc-cel?catno=16-201-X201000011295&lang=eng.

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Additional information can be obtained at:
Environment Canada
Inquiry Centre
10 Wellington Street, 23rd Floor
Gatineau, QC K1A 0H3
Telephone: 1-800-668-6767 (in Canada only) or 819-997-2800
Fax: 819-994-1412
TTY: 819-994-0736
Email: Enviroinfo@ec.gc.ca