FOOD AND VIRTUAL WATER IN THE GREAT LAKES STATES

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Water Scarcity

- Water scarcity: one of the greatest challenges of the 21st century, particularly related to food security

- Agriculture is the largest water-user worldwide.

- Agriculture uses 70% of all water used for human consumption.

  - water rights
  - trade offs between water uses
Purpose of Presentation

- Identify hidden export of Great Lakes water:
  - water is exported in the form of food products.

  - Data suggest Great Lakes region is a net exporter of virtual water through its agricultural exports.

- We analyze these data in light of the existing legal framework for managing the waters of the Great Lakes Basin and discuss the potential for existing laws to address the net water loss.
Virtual water is not just water *embedded* in the agricultural or manufactured goods, but also the water used in production and lost through evapotranspiration.

- **Examples:**
  - 1 gallon of water $\rightarrow$ 1 California almond
  - 119 gallons of water $\rightarrow$ 1 ear of corn
  - 500 liters of water $\rightarrow$ 1 cup of rice
  - 4,500 liters of water $\rightarrow$ serving of beef
Virtual Water Measurements

- VW content = influenced by regional climate, evapotranspiration, soil conditions, production methods, technology, and other variables of hydrology.

- VW content = most commonly reported as meters per ton ($m^3/ton$).
Table 1: *Virtual Water Content Per Product* presents estimates for several of the most commonly produced and traded food crops, in m$^3$/ton.

Data from Hoekstra and Hung 2003, Chapagain and Hoekstra 2003.
2003-2012: Six of the eight Great Lakes states are net virtual water exporters, meaning there is a net water loss from the region.

- Illinois  net exporter of vw
- Indiana  net exporter of vw
- Michigan  net exporter of vw
- Minnesota  net exporter of vw
- New York  net importer*
- Ohio  net exporter of vw
- Pennsylvania  net importer*
- Wisconsin  net exporter of vw

*Only when including highly populated parts of the state that are outside the Great Lakes Basin.
**Existing Legal Framework for Addressing Net Virtual Water Exports**

- Considering the water losses to the region, do the policies in place to govern the public trust adequately address virtual water losses?
  - Public Trust Doctrine
  - Great Lakes – St. Lawrence River Basin Water Resources Compact
Public Trust Doctrine

- **Core**
  - All states received navigable waters and lands beneath them from Federal government when they entered the union.
  - The public trust doctrine describes the state as holding these navigable and tidal waters in trust for the use and enjoyment of the public for navigation, commerce, and fishing. Some states expand this to include all recreational, ecology, natural beauty, and access.

- Great Lakes waters are to be protected as a trust: shared, recycling system of interconnected private and public rights.
Illinois Central (1892)

- “ownership of the navigable waters . . . is a subject of public concern to the whole people of the state.”

- “The sovereign power itself, therefore, cannot . . . make a direct and absolute grant of the waters of the state, divesting all the citizens of their common right.”

- State power to make lakebed grants = extremely limited

- States have never made outright grants of the water
Can the state make grants of water?

- The new tool of calculating the virtual water removed from the basin in agricultural products, presents a conceptual challenge to managing waters as a public trust.

- While research remains to be done to more accurately understand the volume and impact of Great Lakes waters being removed and not returned to the Basin, the trustees have a duty to ensure that research is underway.
Great Lakes – St. Lawrence River Basin Water Resources Compact

- Based on the need to create a comprehensive basin-wide approach to managing water, the Compact makes it clear that diversions outside the basin are generally prohibited.

- As virtual water exports through agricultural products create a net water loss from the Great Lakes region, is this a diversion under the compact? Prohibited?
  - Is it regulated? Is it accounted for in any way?
Compact and Virtual Water in Agr

- Water used for agricultural production and not returned to the Basin is by definition in the Compact:
  - not a prohibited diversion

Instead it is:
  - a withdrawal and consumptive use
Compact: How is VW in agr regulated?

- Uniform minimum standard applied to all regulated withdrawals and consumptive uses of waters within the Basin.
- Only applies to new or increased withdrawals and consumptive uses.
  - Uniform Standard S. 4.11: no significant indv or cum. Impacts, incorporate conservation, comply with all state laws (i.e., public trust related laws), reasonable use factors
  - Applies to irrigated agriculture (not rainfall)
  - Each state sets regulatory trigger
State regulation of consumptive uses

- Uniform standard only applies:
  - Wisconsin: “water loss” averages >5 million GPD in 90 day period
  - Indiana: withdrawals from L.Michigan averages > 5 million GPD in 90 day period
  - New York: all agricultural uses of water in existence and registered on 2/15/12 are EXEMPT
  - Ohio, Minnesota, Illinois: consumptive uses of 2 million GPD averaged over specified time periods
  - Michigan: seasonal withdrawals > 2 million GPD averaged over 90 day period
  - Pennsylvania: unclear. Appears to not implement water permit program for this uniform standard
Conclusions

- The concept of virtual water is changing the way we understand water exports.

- Preliminary calculations show the Great Lakes states have a net water loss from exporting virtual water contained in agricultural products.

- The legal framework of the Great Lakes protects against water diversions, but this does not currently include virtual water in agricultural products.

- Compact Council should review and recommend strengthening state programs.

- Data on virtual water exports and net water loss will become more important as water scarcity increases, and we need to support additional research in this area.
QUESTIONS, OBSERVATIONS, IDEAS?

THANK YOU.

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