

Estimating the Economic Costs of Eutrophication in the Great Lakes Basin

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Outline

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Nitrogen loading in the GLB



Phosphorous loading in the GLB



Source: GLEAM – Great Lakes Environmental Assessment and Mapping Project, 2011

HABs in Lake Erie



Source: Lake Erie Harmful Algal Bloom Forecast, Tides & Currents, NOAA, November 7, 2017

Objective

 Assess the economic costs of eutrophication in the GLB for comparison with the investment costs in surrounding agriculture and wastewater treatment in a CBA-framework





Overall picture economics work in GWF Policy intervention Policy intervention (behavioral change/BMP's) (impact mitigation) uncertainties uncertainties Pressure Water use Impact $(mg PO_4/L)$ (kg P/year) functions - Public health - Agriculture - Recreation/tourism - Wastewater treatment - Commercial fishing - Storm water overflow - Water treatment - Other uncertainties - Biodiversity - Other UNIVERSITY OF TFRI OO



Method

- 1. Identify relevant use functions in GLB
- 2. Estimate their total economic value
- 3. Estimate the value at risk from eutrophication
- 4. Estimate realized loss
- 5. Compare impacts across categories and lakes





Method

- Existing valuation studies ('value transfer')
- Variety of valuation methods, mainly marketbased (treatment costs, Col, sales data)
- Only a few non-market based approached (WTP)
- Data and information from different sources in different years >> converted into annual 2015 \$



Results

Impact categories

- Recreation
- Tourism
- Commercial fishing
- Water treatment
- Public health
- Property values
- Biodiversity





Results

	Canada		USA	
Impact Category	Low estimate	High estimate	Low estimate	High estimate
	(2015 M C\$)	(2015 M C\$)	(2015 M C\$)	(2015 M C\$)
Recreation	3.6	47.5	28.6	217.1
Fishing	2.1	6.2	5.3	19.4
Beach visitation	1.2	10.8	8.6	91.5
Boating	0.4	30.5	14.7	106.2
Tourism	1.4	17.9	238.5	238.5
Commercial Fishing	10.7	99.2	160.5	321.1
Water Treatment	6.6	24.1	2,928.4	2,928.4
Public Health	0.1	0.7	0.4	3.0
Property Value	85.9	8,187.5	364.7	34,763.0
Biodiversity	16.3	189.5	26.5	26.5
Total	128.2	8,614.0	3,776.2	38,714.6
Share of GDP (%)	0.02	1.12	0.06	0.61





Distribution of costs across lakes (%)



Conclusions

- Very first preliminary indication of economic damage costs of eutrophication
- Dose-response (damage) relationships highly uncertain (crucially dependent on assumptions)
- Hence the wide range of values (e.g. 128M-8.6B)
- Costs expected to increase due to economic growth and climate change
- More research needed and underway in GWF



