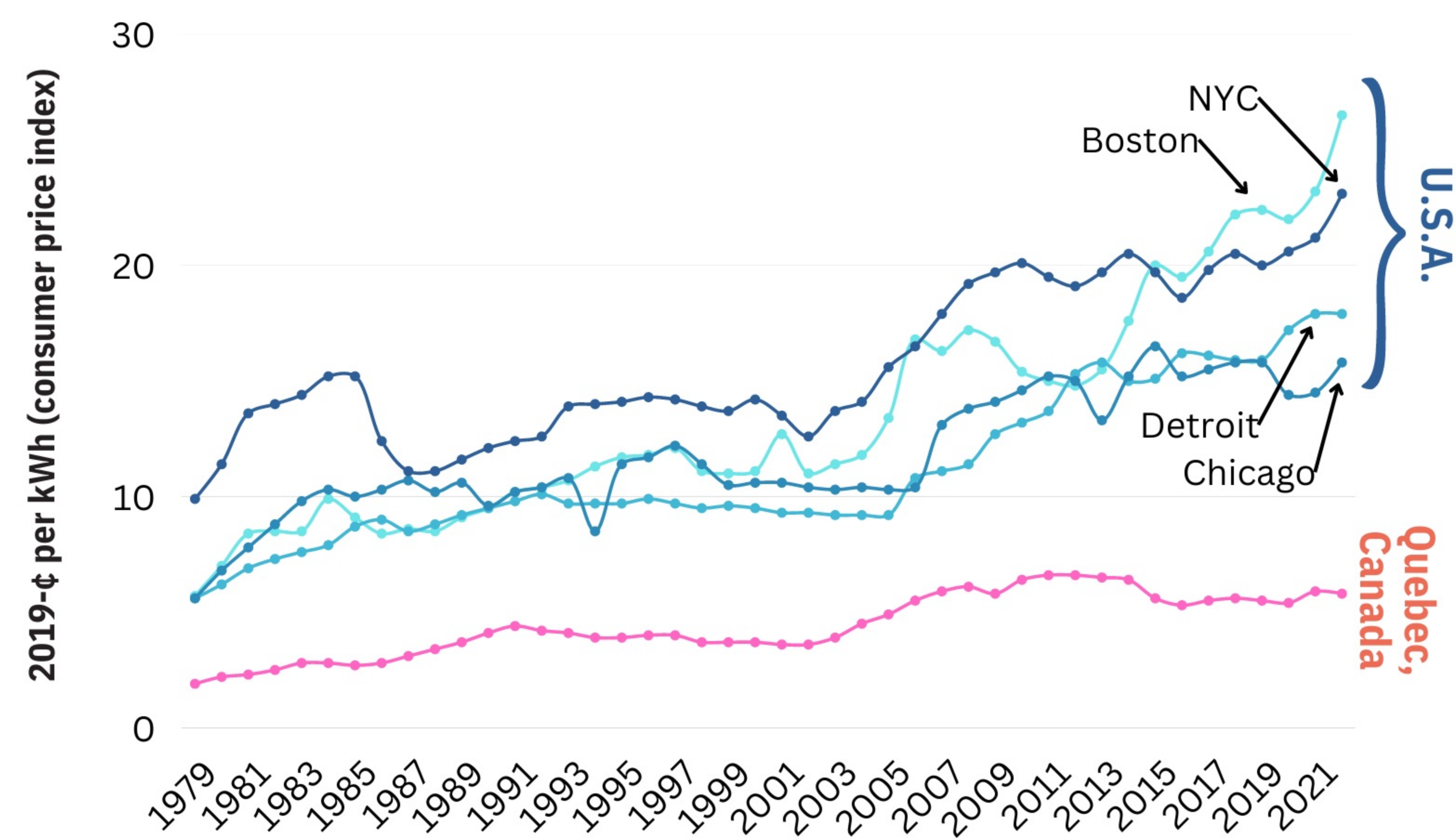


Causal Inference to Scope Environmental Impact Assessment in MultiSector Systems: The Case of Trans-Border Hydropower Exports

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1 Cheap Canadian hydropower is an attractive option for decarbonization in the United States



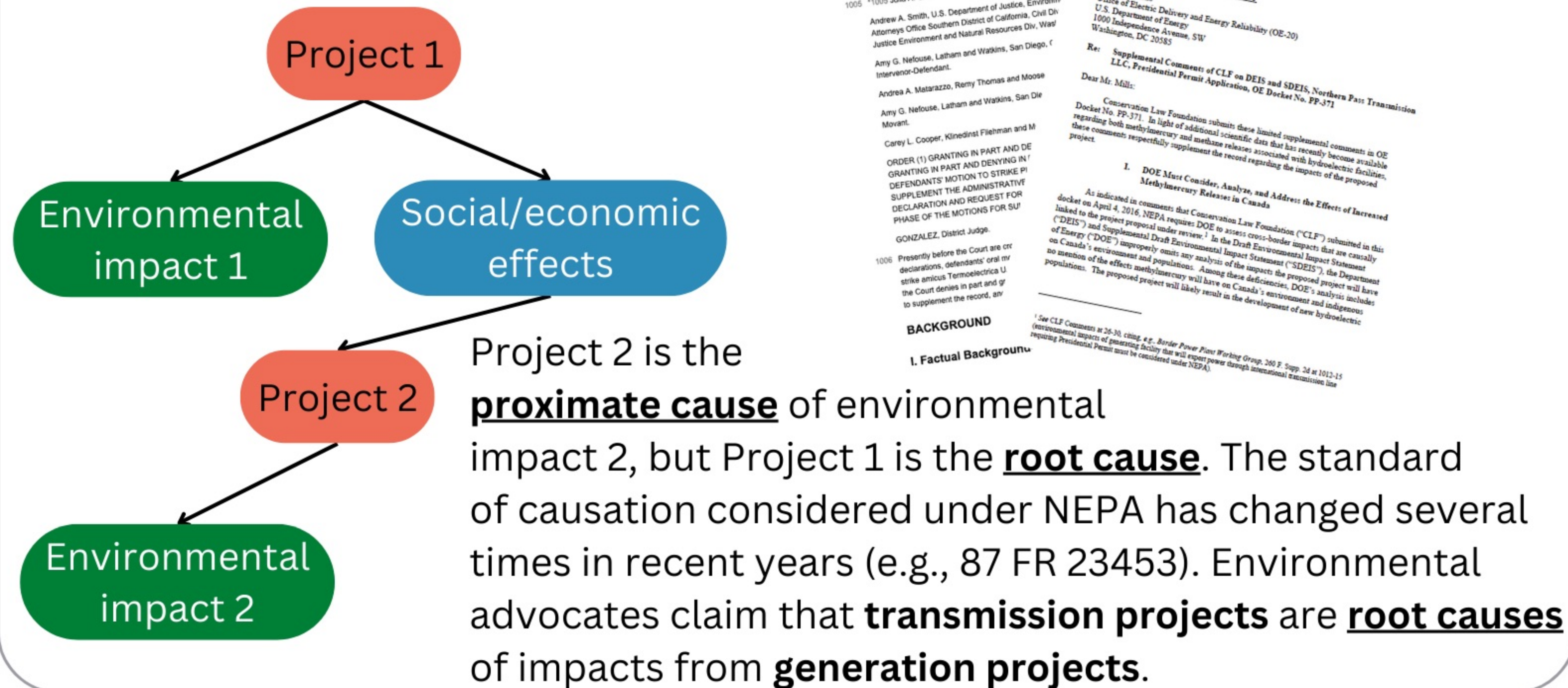
Hydropower accounts for >90% of generation in Quebec, Canada and is associated with low marginal costs. A higher price for electricity in northern U.S. markets (illustrated in figure) drives exports, which are increasing by 1.3 TWh per year. In New England, Canadian hydropower accounted for 21% of electricity sold in 2020.¹

2 Critics claim that new transborder transmission capacity drives new generation in Canada

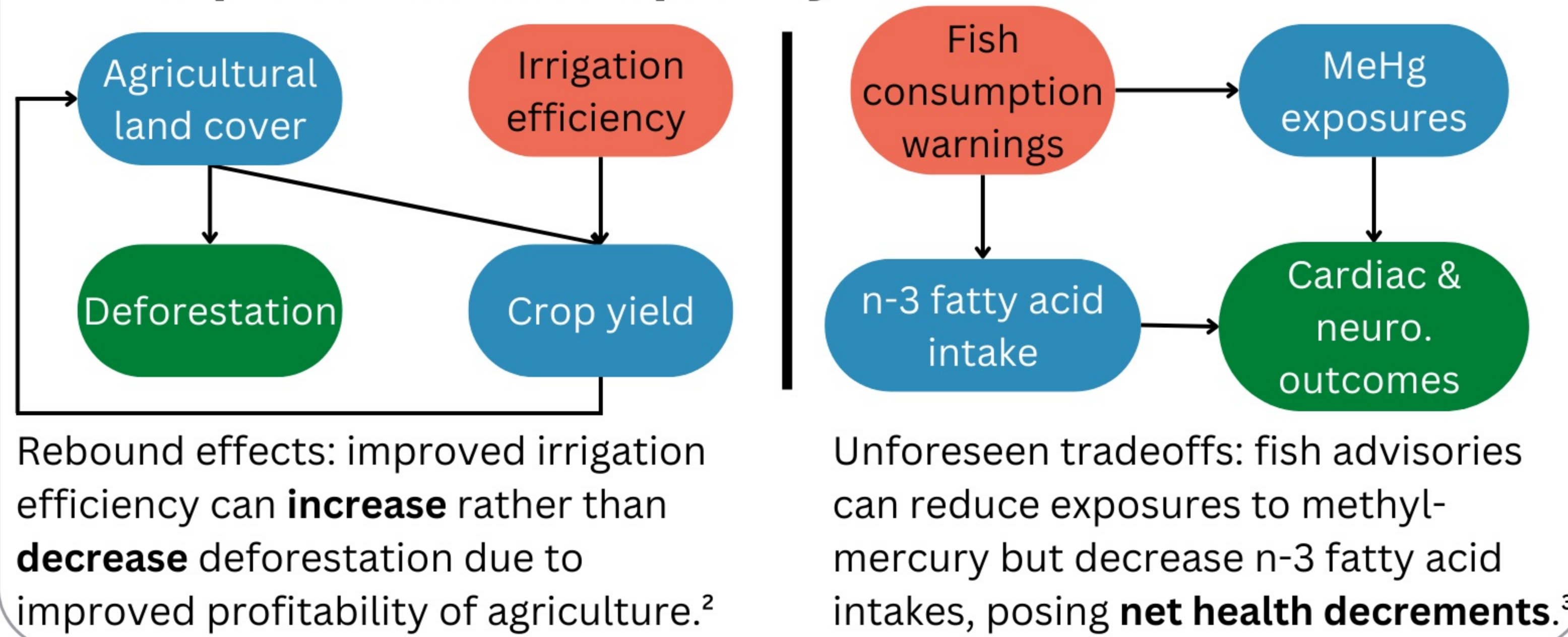
Recently proposed projects such as the Champlain Hudson Power Express (1,250 MW) and the New England Clean Energy Connect (1,200 MW) would deliver hydropower from existing generators in Canada to U.S. population centers.

However, critics claim that enhanced interconnection capacity would trigger new generation in Canada with impacts (e.g., disruption of aquatic systems, impacts on Indigenous people, etc.) should be considered when approving new transmission.

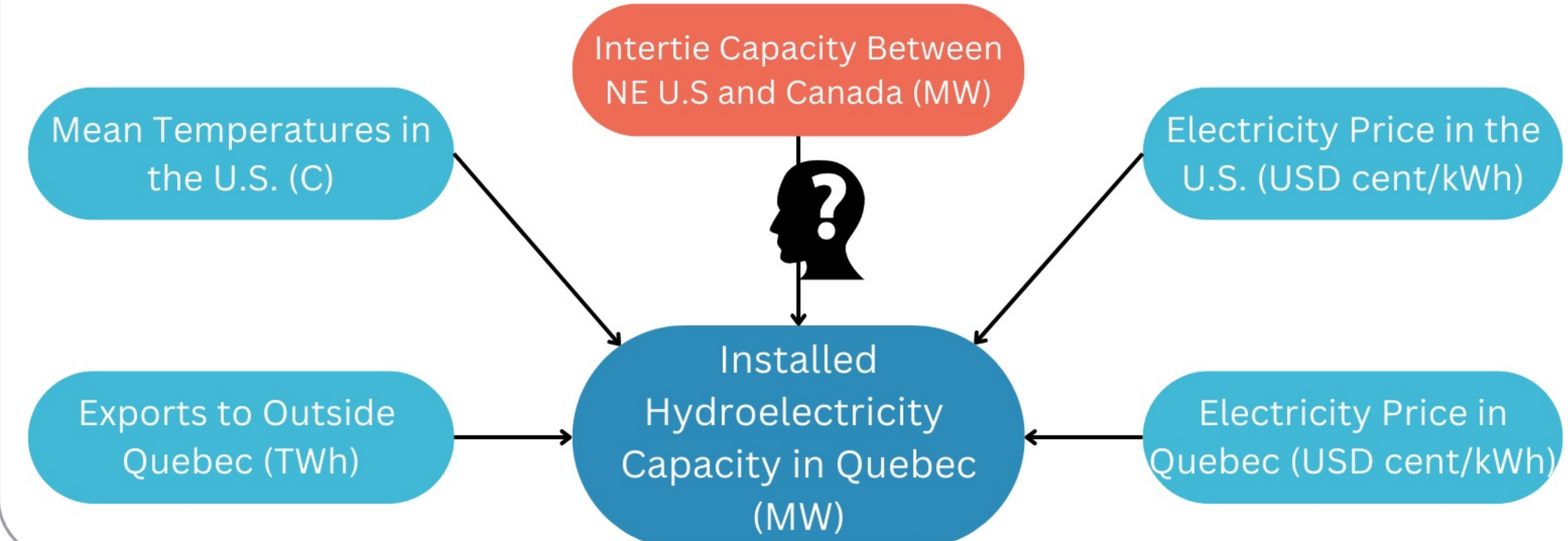
3 Environmental impact assessments under NEPA must address impacts caused by the assessed project but there is debate about the standard of causation to apply



4 Multi-sector systems mediate environmental/health impacts through causal models that are frequently disputed and incompletely understood



5 We investigate the causal relationship between transborder transmission and new hydropower



6 A literature review reveals that this is a novel approach to scope environmental impact assessment

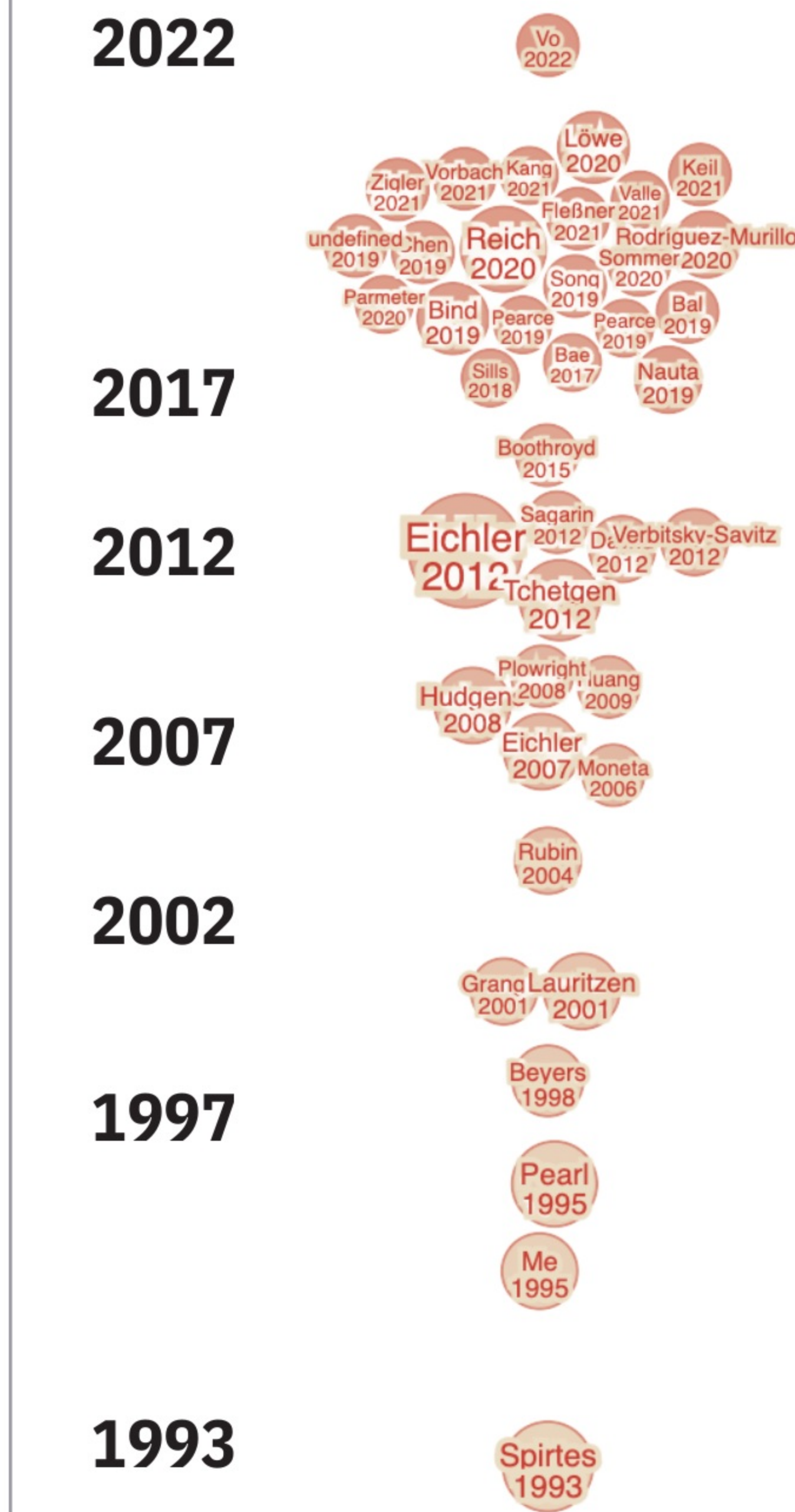
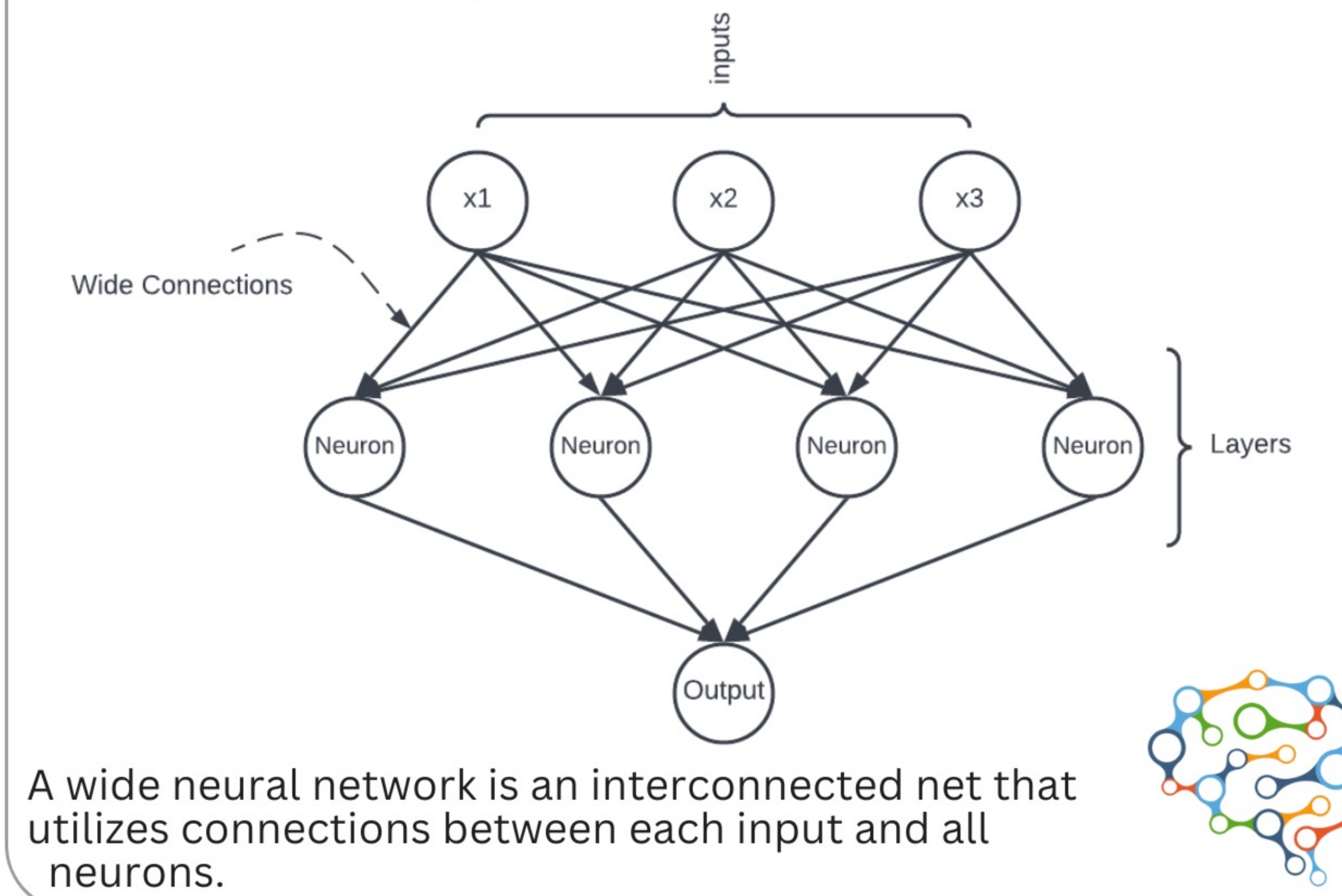


Diagram from ResearchRabbit showing the timeline of publications relevant to causal inference and environmental modeling in general.

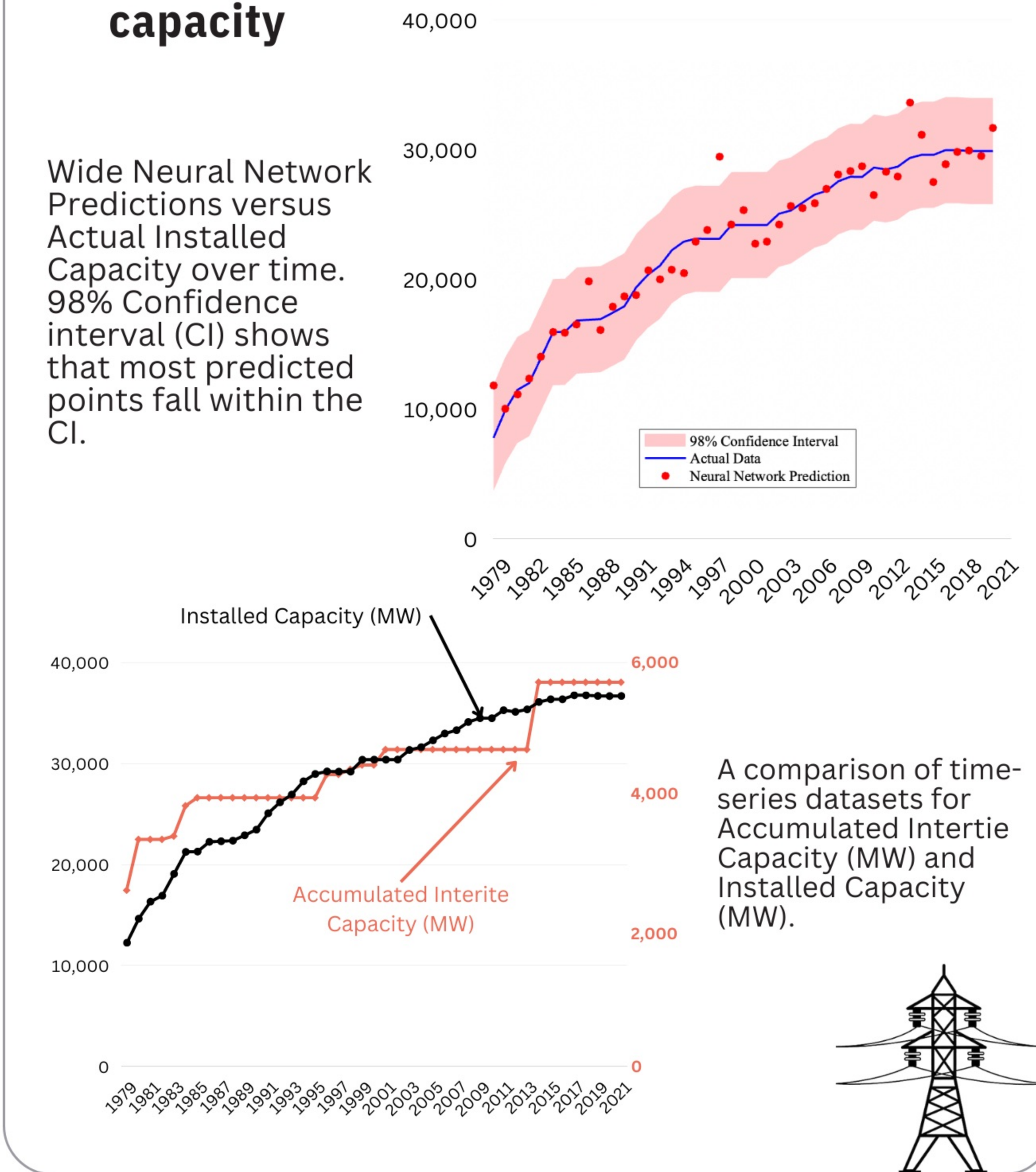
A Web of Science search returned no articles mentioning causal inference in the context of environmental impact assessment in the abstract.

7 By using a rich time-series dataset, we modeled the causal relationship at question

8 Multiple regression models were used concurrently with wide neural networks



9 No model evaluated supports a causal role of transmission capacity in installed capacity



Let's connect!

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References: ¹ Calder et al. (2022). Total social costs and benefits of long-distance hydropower transmission. *Environ Sci Technol* (in press); ² Grafton et al. (2018). The Paradox of irrigation efficiency. *Science* 361(6404) pp. 748-750.
³ Calder et al. (2018). Risk tradeoffs associated with traditional food advisories for Labrador Inuit. *Environ Res* 168 pp. 496-506.