Towards Sustainable Nanofiltration Membrane Manufacturing

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Twente membranes

UNIVERSITY OF TWENTE.

Research problem

Hollow fiber membranes have gained relevance for water treatment and purification, yet their manufacturing often relies on fossil-based raw materials and solvents. **Emerging lab-scale technologies** have shown potential as sustainable alternatives to conventional processes. Nevertheless, they lack a full **sustainability evaluation**.

Approach

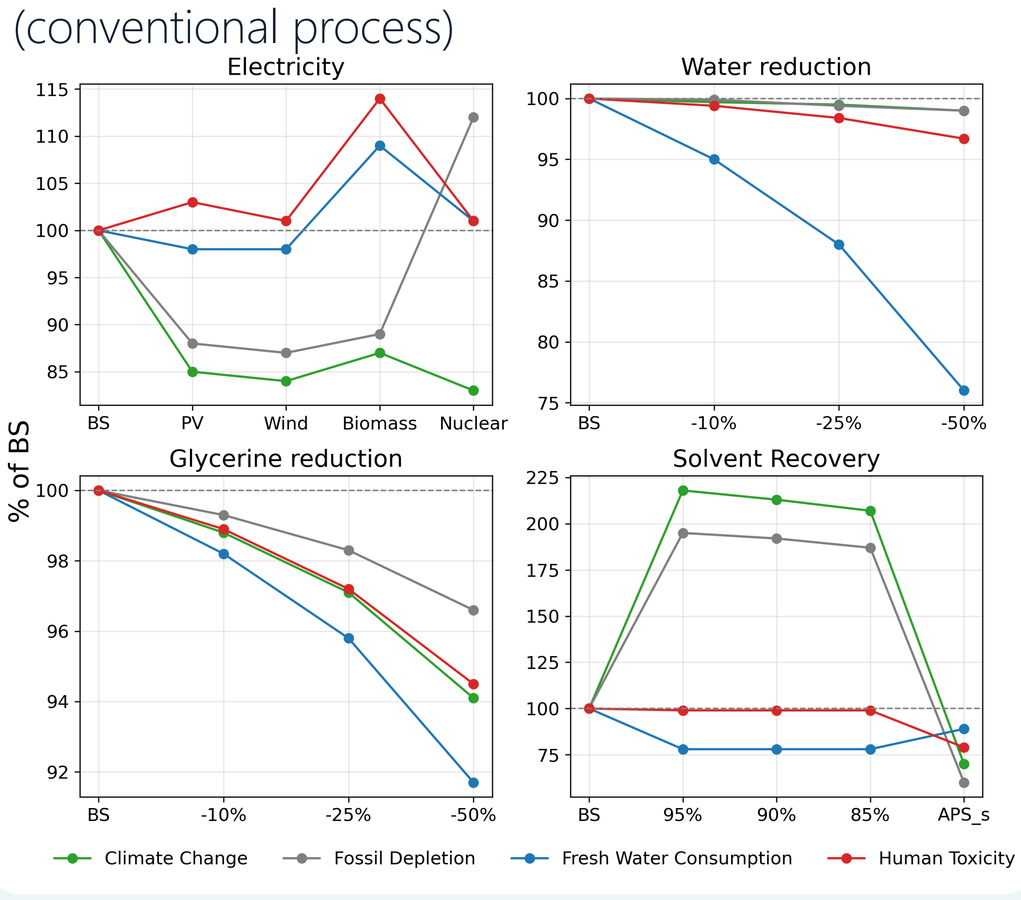
Prospective LCA-based is proposed as sustainability assessment technique, when done at early stages ensures **scalable and circular technology development** for emerging technologies.

Methodology

Goal: Assess the environmental impacts and scale-up potential of **emerging** membrane fabrication technologies through **process modelling**, in comparison with **conventional processes**.
Functional unit: 1000 m^2 of membrane.
Data sources: Real data and lab-scale experiments; secondary data from patents, literature, and LCA databases.

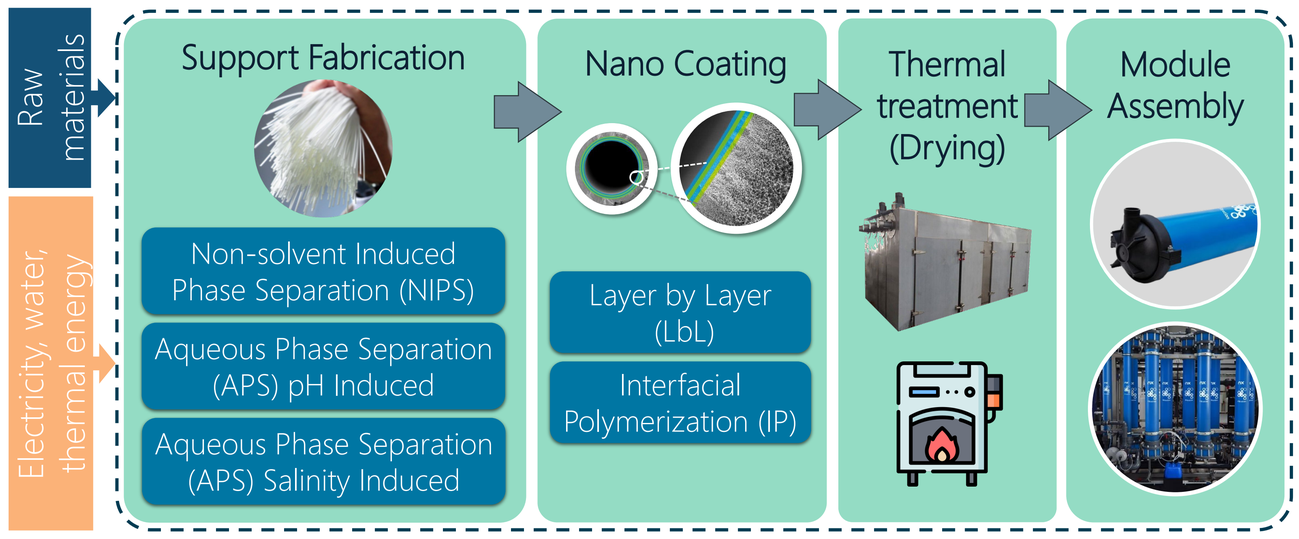
Scenario analysis

Baseline Case (BS): NIPS + LbL + Drying + Module (conventional process)

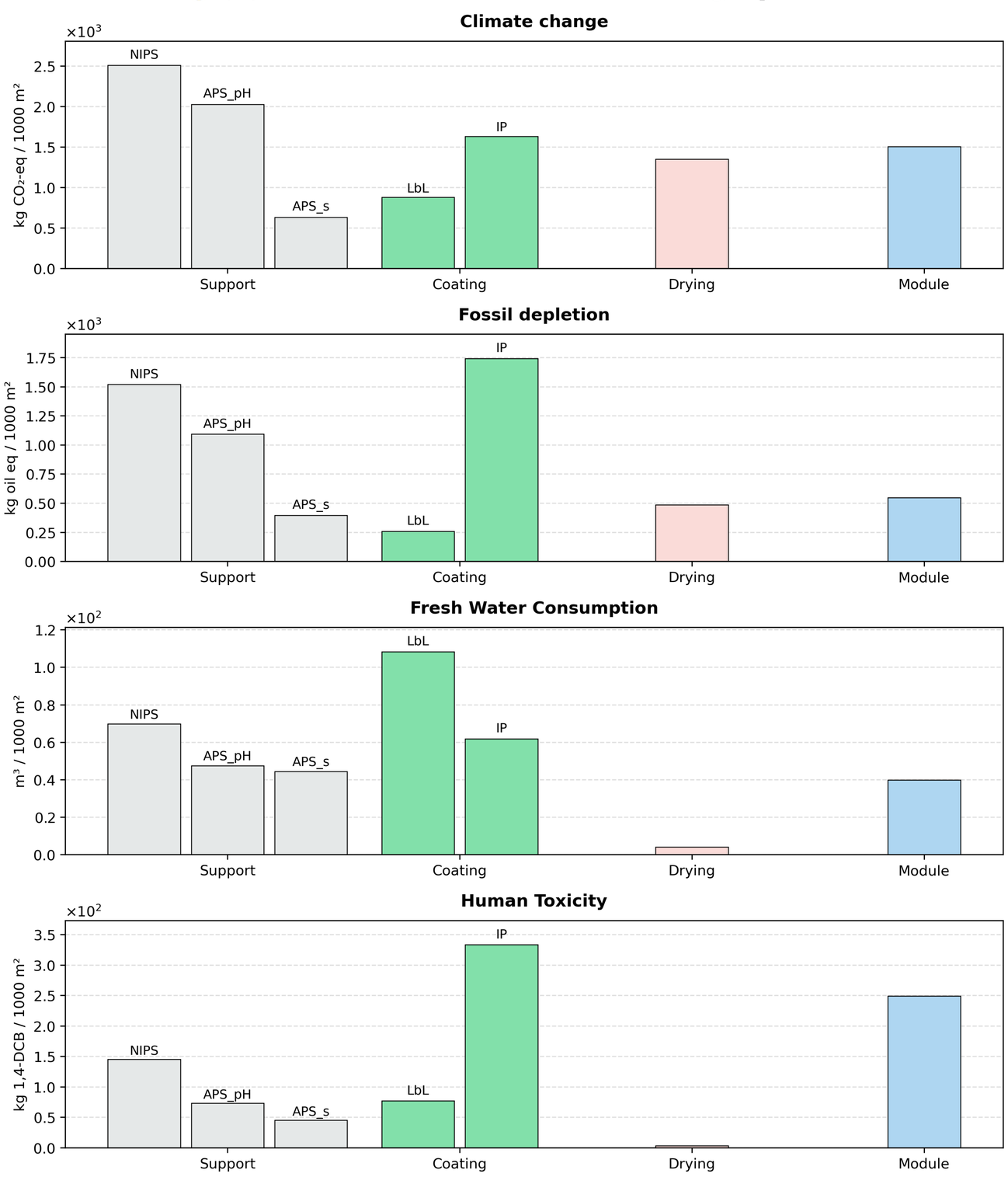


Results

Modelled manufacturing process:



Model build on python™ → LCA Inventory → LCA for Experts sphera®



Impact Assessment Method: ReCiPe Midpoint 2016

Conclusions

- **APS salinity** significantly reduced impacts in the support fabrication step.
- **LbL coating** performs better in most impact categories.
- Different scenarios were evaluated for the key process parameters.
- Valuable **feedback** for researchers developing greener membrane fabrication methods.

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