The Cobalt Supply Chain and Its Impact on Life Cycle Assessment of Lithium-ion Battery Energy Storage Systems

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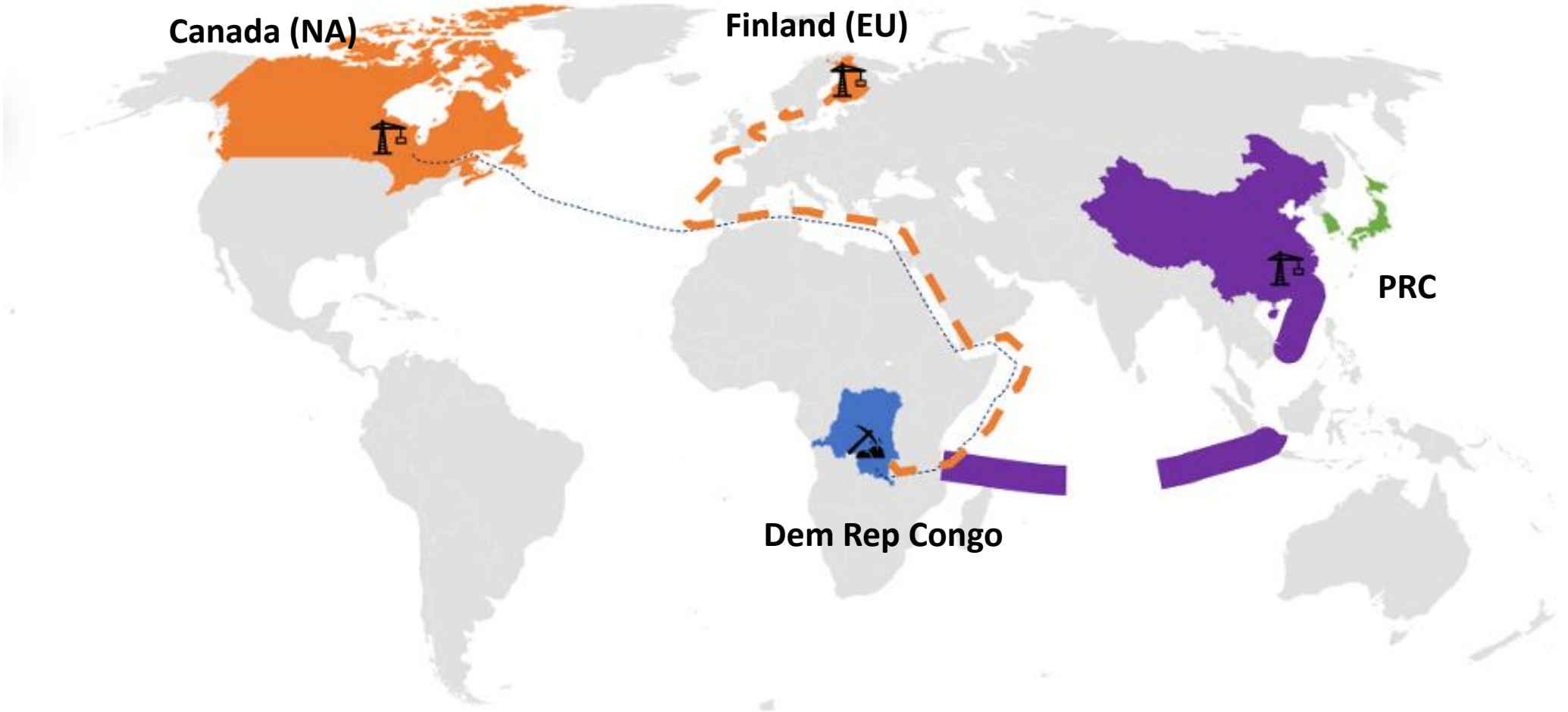
Why Are We Studying Cobalt Supply Chain?

- Cobalt is used in many battery electric storage systems, especially those in EV's
- Mining and processing cobalt ore leads to environmental impacts
- Understanding where, when and how impacts occur can help industry design lower environmental routes and processes

What are some Questions We Seek to Answer?

- How will changes in ore quality impact environmental footprint?
- How will changes in refinery locations affect environmental footprint?
- How do impacts of different battery chemistries compare?

LCA of Global Supply Chain for Cobalt – Cradle-to-Gate



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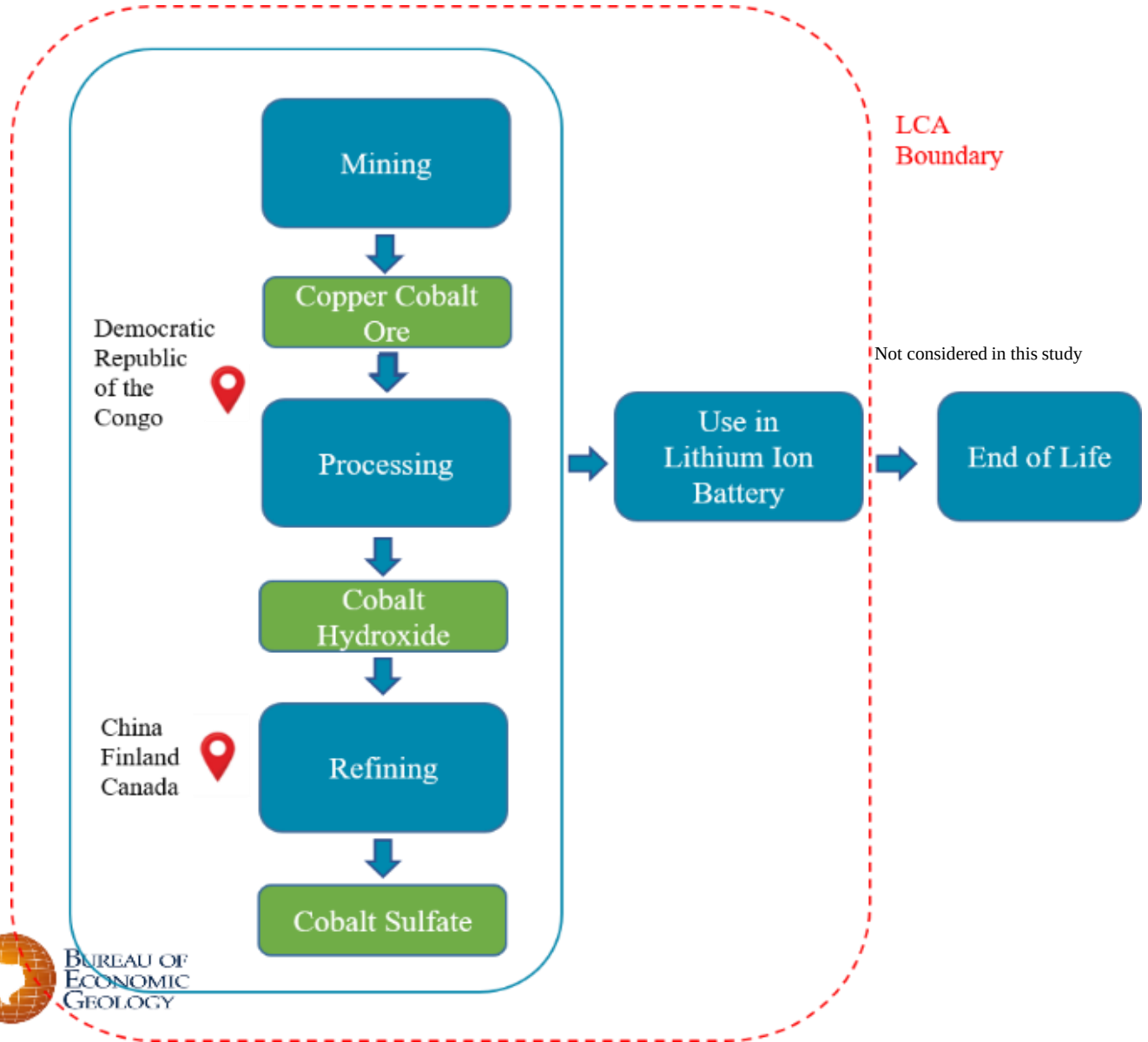
Source: created with data on various company reports

LCA System Boundary and Scenarios



Scenarios Considered

- 1 Mining location – Democratic Republic of Congo
- 3 Battery chemistries – NMC111, NCA, NMC811
- 3 Refining locations – China, Canada, Finland
- 10 Ore grades – ranging from 0.1 – 1.0%

90 scenarios total

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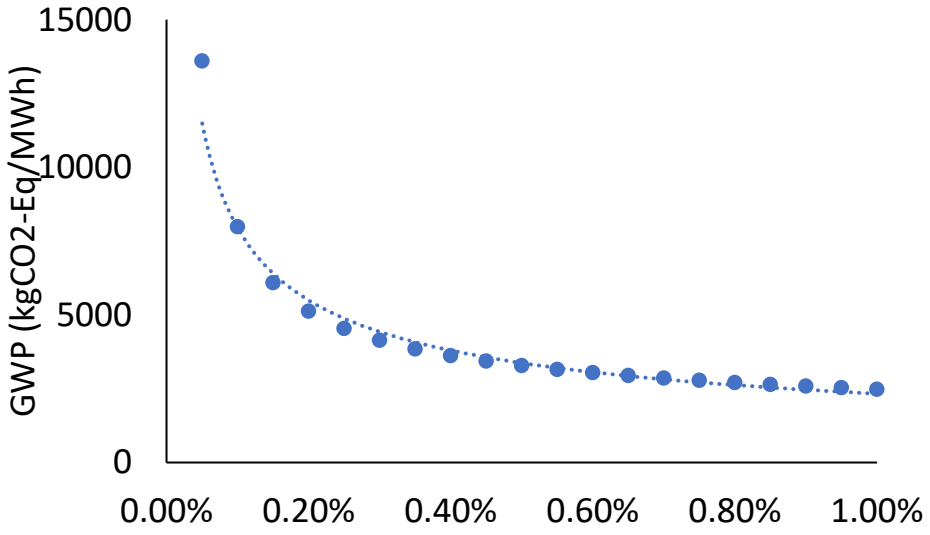
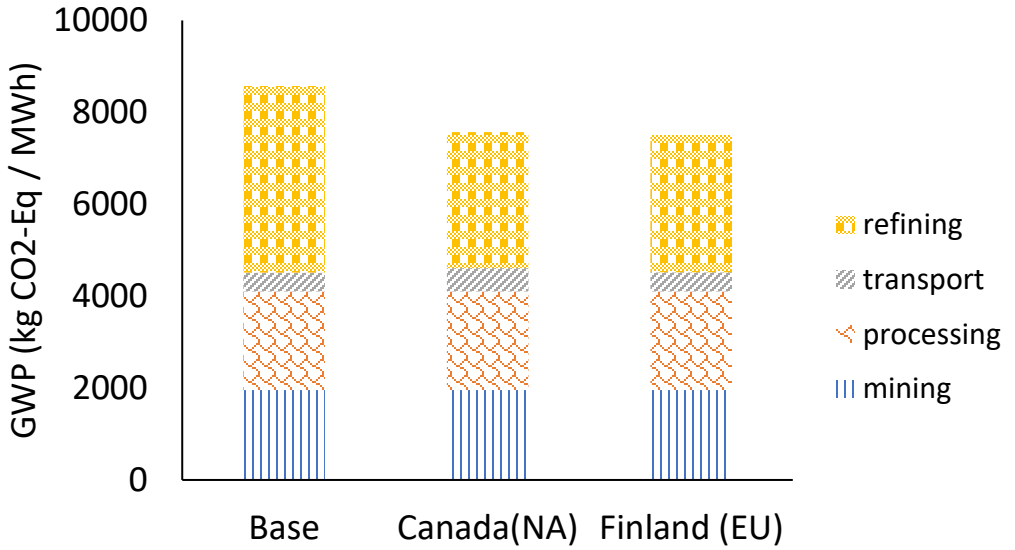
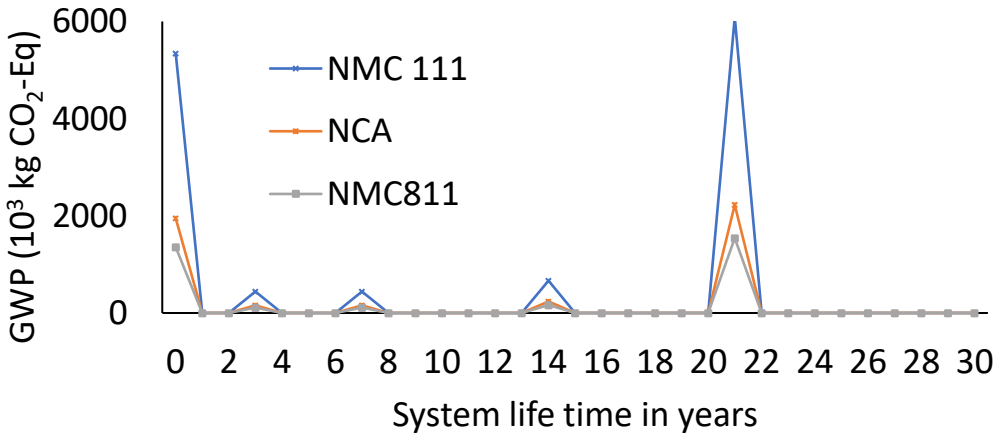
Results



Impact of ore grade on GWP per 1 MWh storage



Impact of refining location on GWP



GWP from batteries, including augmentation and replacement

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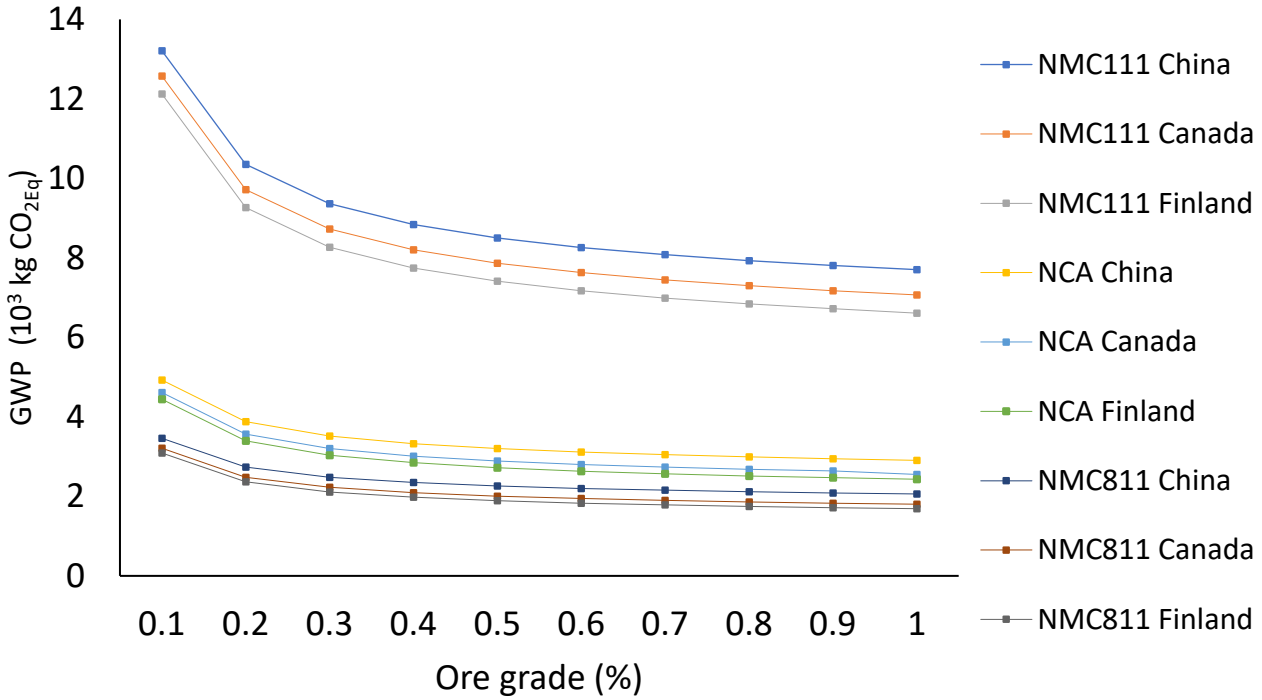
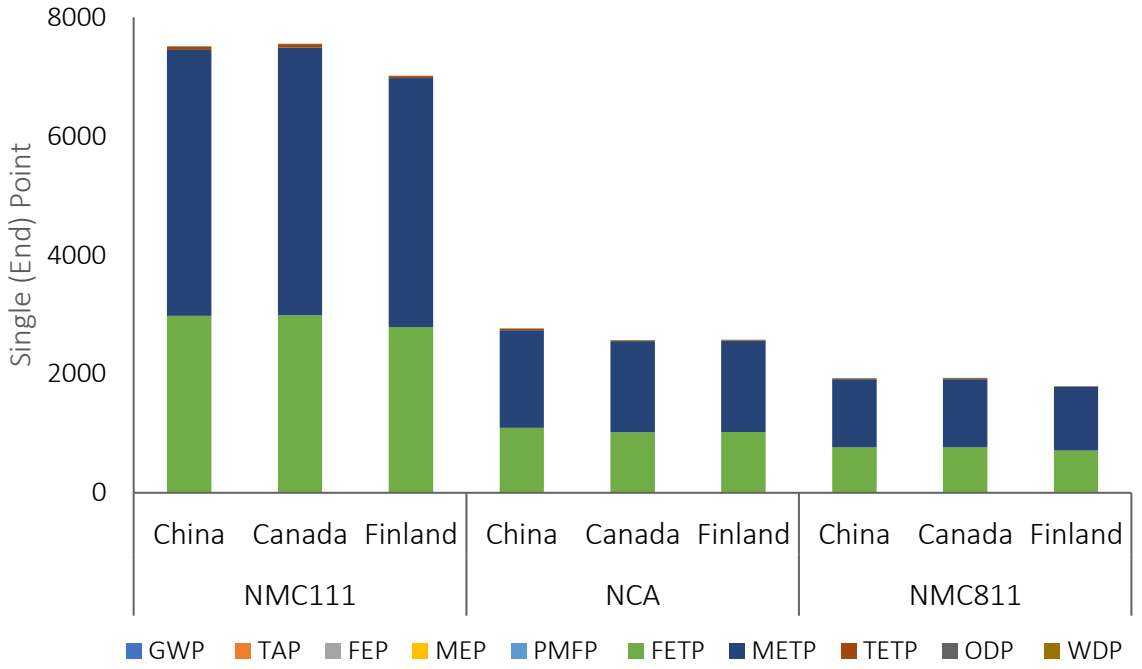
Results



Variation in GWP with ore grade, refining location, and battery chemistry



Single score results of environmental impacts for the defined scenarios for an ore grade of 1.0%

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Das et al. (2023)

Thanks to Our Current Members…

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Any Questions?