

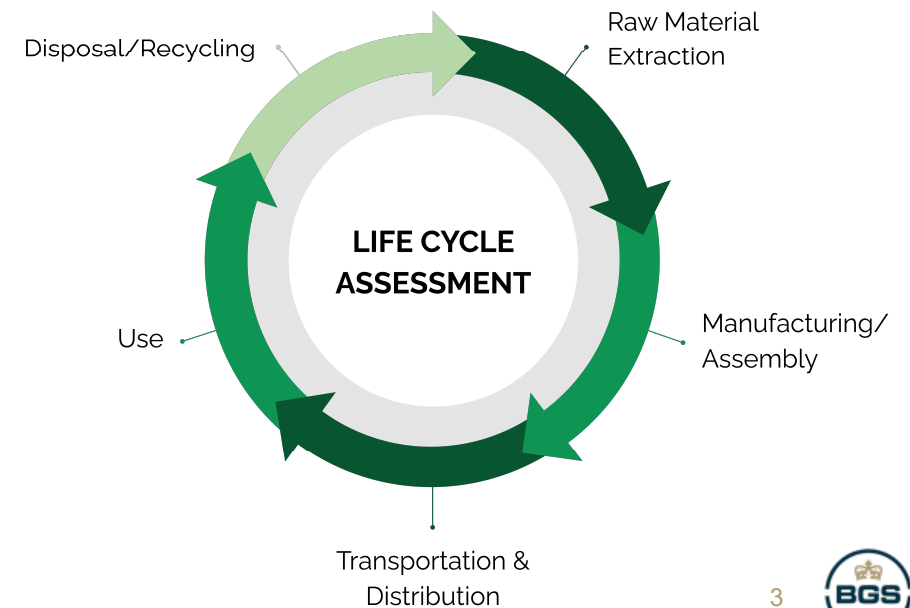


British
Geological
Survey

Life Cycle Assessment (LCA)

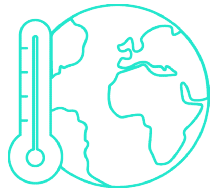
Life Cycle Assessment (LCA) - What

- Tool to assess the environmental impacts associated with all stages of a product, process or activity
- Enables impact ‘hotspot’ identification and mitigation
- ISO 14040 and 14044 (and 14046)
- EU Battery Regulations – Carbon Footprint
- Has limitations, not a ‘silver bullet’

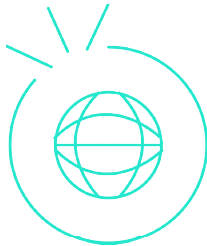


LCA – How?

Impact Categories



Climate Change



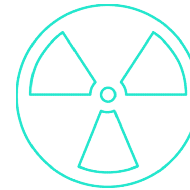
Ozone Depletion



Human Toxicity



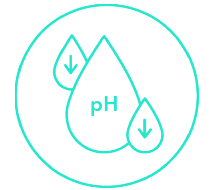
Particulate Matter,
Respiratory



Ionising Radiation,
Human Health



Photochemical
Ozone Formation



Acidification



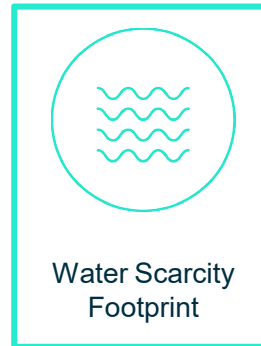
Eutrophication



Ecotoxicity
Freshwater



Land Use



Water Scarcity
Footprint



Resource Use
Minerals & Metals



Resource Use,
Energy carriers

Graphic Credit: Minviro

LIFE CYCLE ASSESSMENT – WHAT & HOW?

LCA and Critical Raw Materials

- Image removed

LIFE CYCLE ASSESSMENT – WHAT & HOW?

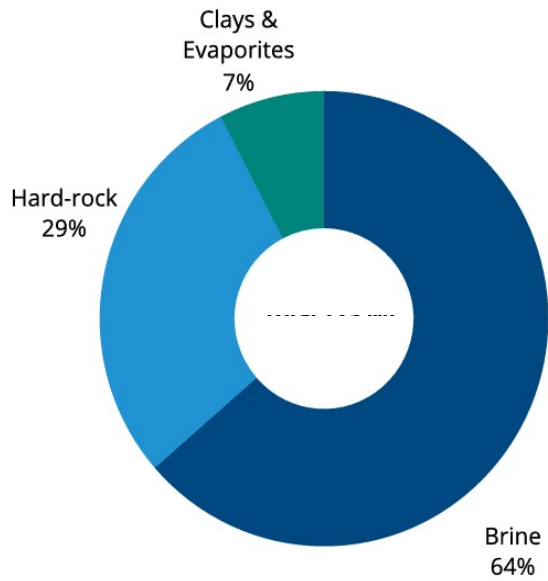
LCA and Critical Raw Materials

- Image removed

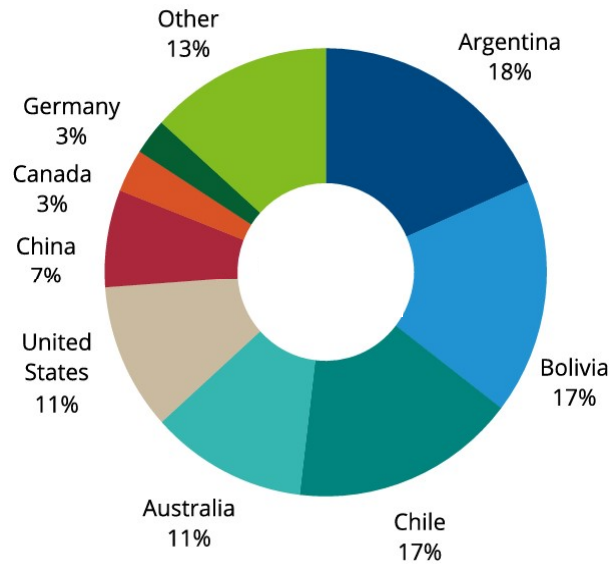
LiFT Project: LCA, Lithium & Water

LIFT PROJECT: LCA & LITHIUM

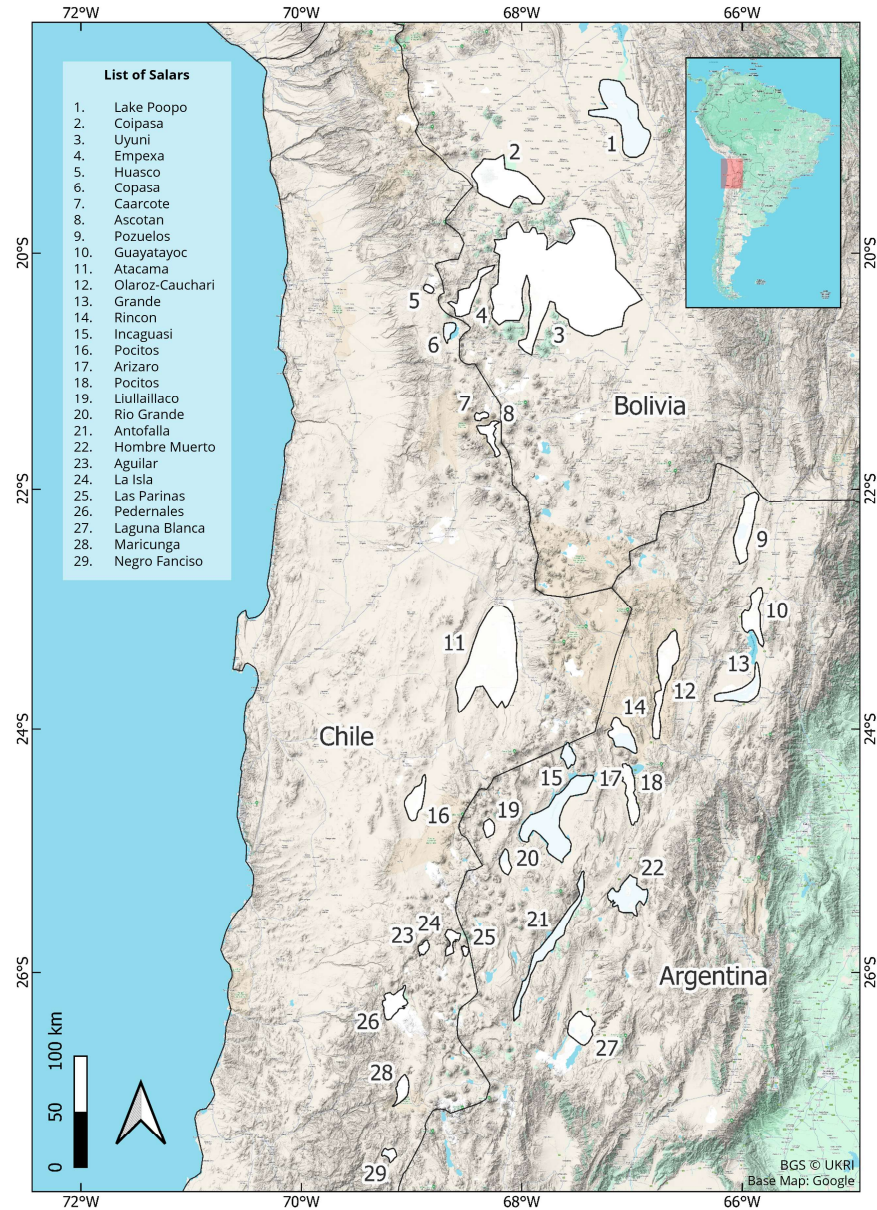
The Lithium Triangle



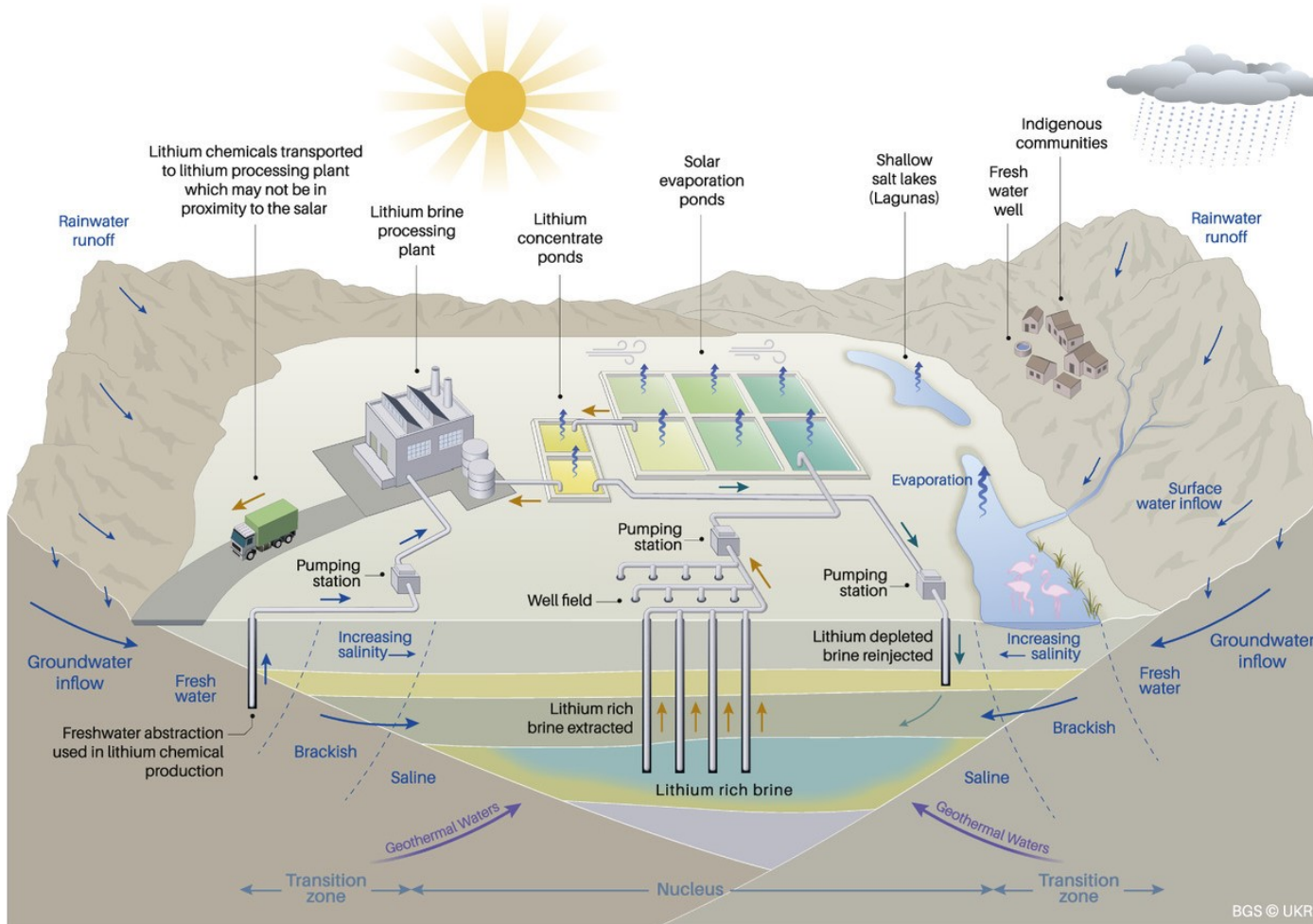
Global Lithium Resources by Deposit Type



Global Lithium Reserves & Resources by Country



Li Production



Not to scale. Diagram is schematic and may not accurately represent all scenarios.

BGS © UKRI

RESPONSIBLE LITHIUM PRODUCTION

Life Cycle Assessment and Lithium

- Image removed

The spiralling environmental cost of our lithium battery addiction

WIRED

The rush to 'go electric' comes with a hidden cost: destructive lithium mining

In pictures: South America's 'lithium fields' reveal the dark side of our electric future [euronews.green](https://www.euronews.com/green)

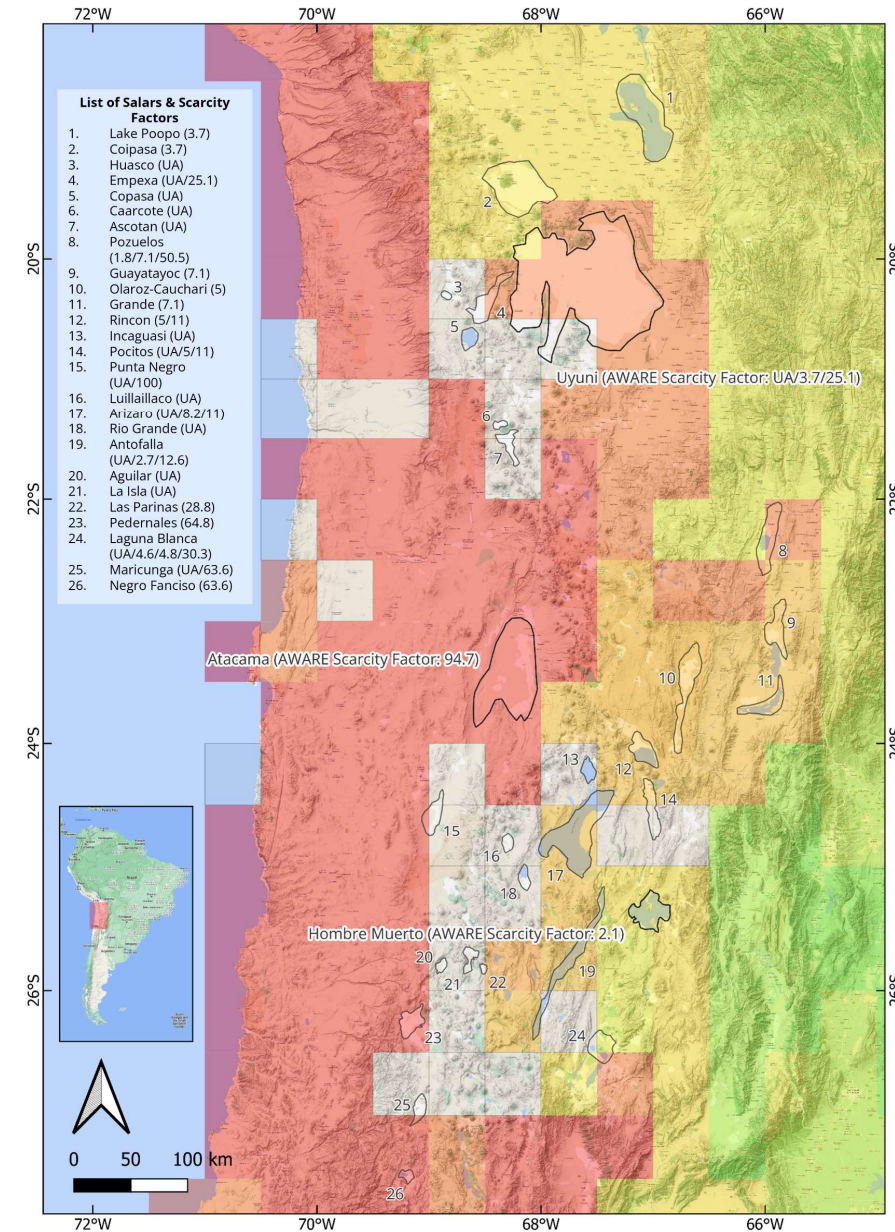
**The
Guardian**



LIFT PROJECT: LCA & LITHIUM

Available Water Remaining (AWARE) Method

- Produces a Water Scarcity Footprint (WSF) – ISO14046
- **Freshwater** remaining after aquatic ecosystems and human demands are met
- AWARE scarcity factors (SFs), e.g. 10 represents a watershed with 10x times less freshwater available than global average
- SFs are combined with freshwater consumption to assess the potential to deprive ecosystems or humans of freshwater





British
Geological
Survey

Findings: Challenges

AWARE issues

- Groundwater
- Ecosystems
- Human activities
- Data availability and variability

Salars & AWARE issues

- System complexity & variability
- Data availability
- Ecosystems
- Multiple process routes & reinjection
- Temporal aspects
- Cumulative impacts
- Brine & Freshwater

Findings: Opportunities

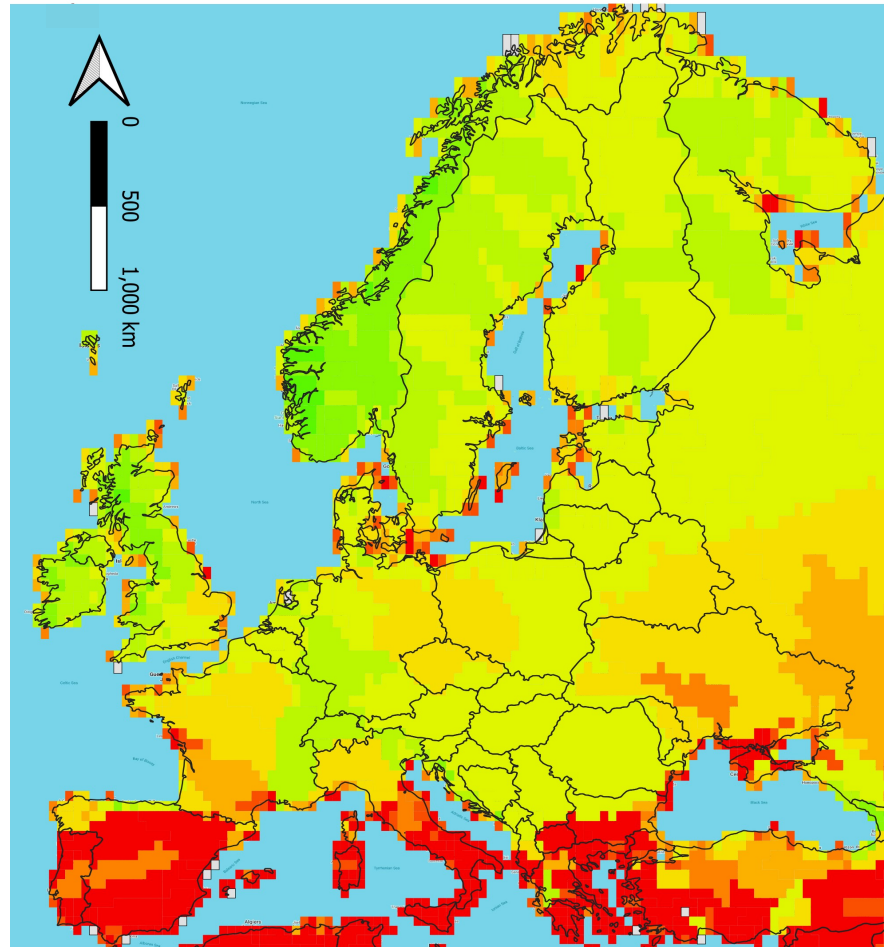
- Introduction of salar-specific AWARE SFs
- Improvements to underlying AWARE data and methods (AWARE 2.0)
- Improved understanding of salars and impacts
- Water Availability Footprints

Lithium and salars is a special case, but challenges and opportunities of using LCA to assess water-use impacts apply to other CRMs

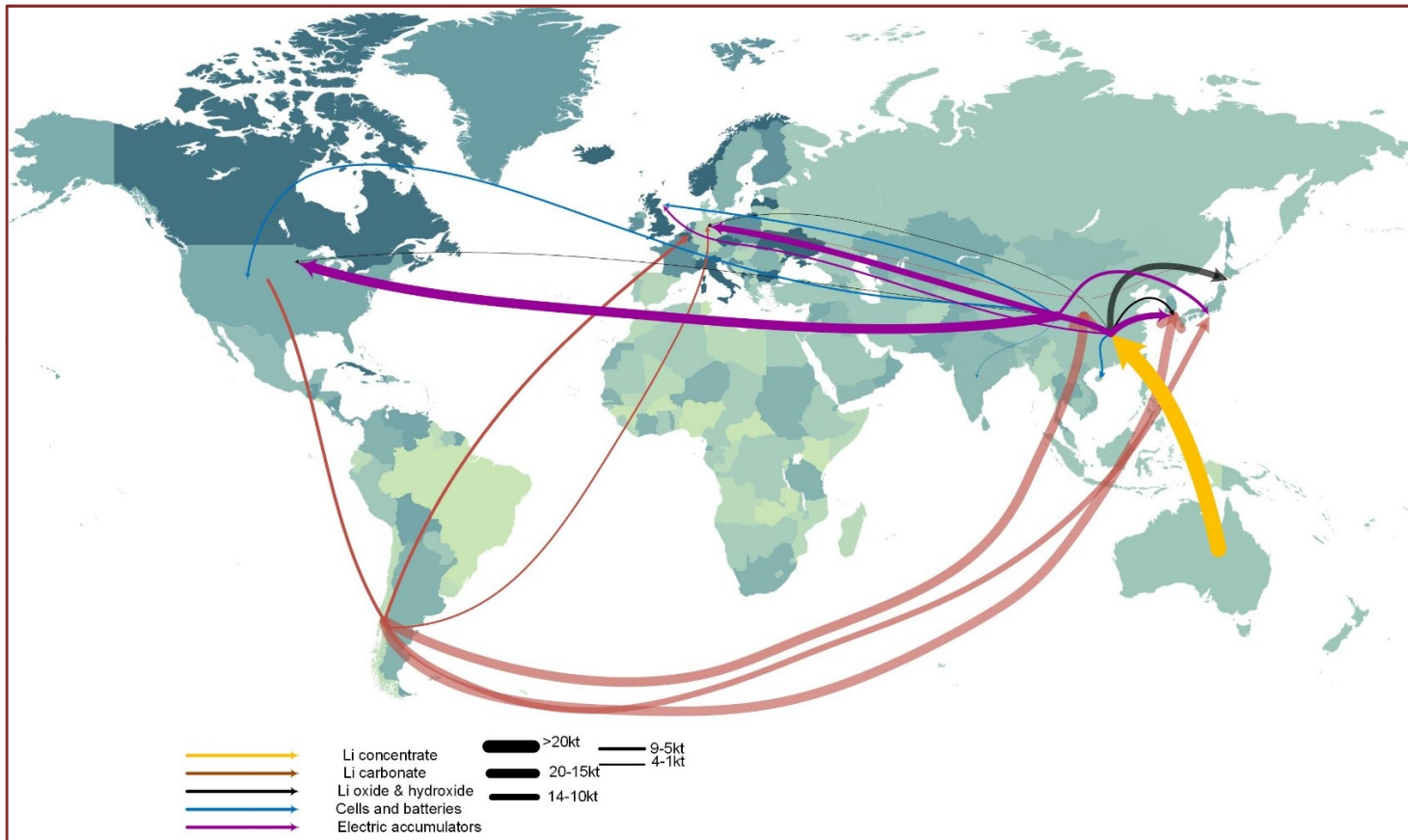
LCA and AWARE are still valuable tools but results should be considered with limitations in mind, and in conjunction with other techniques in a holistic approach

Implications for Northern Europe

Why this matters for Northern Europe



Why this matters for Northern Europe

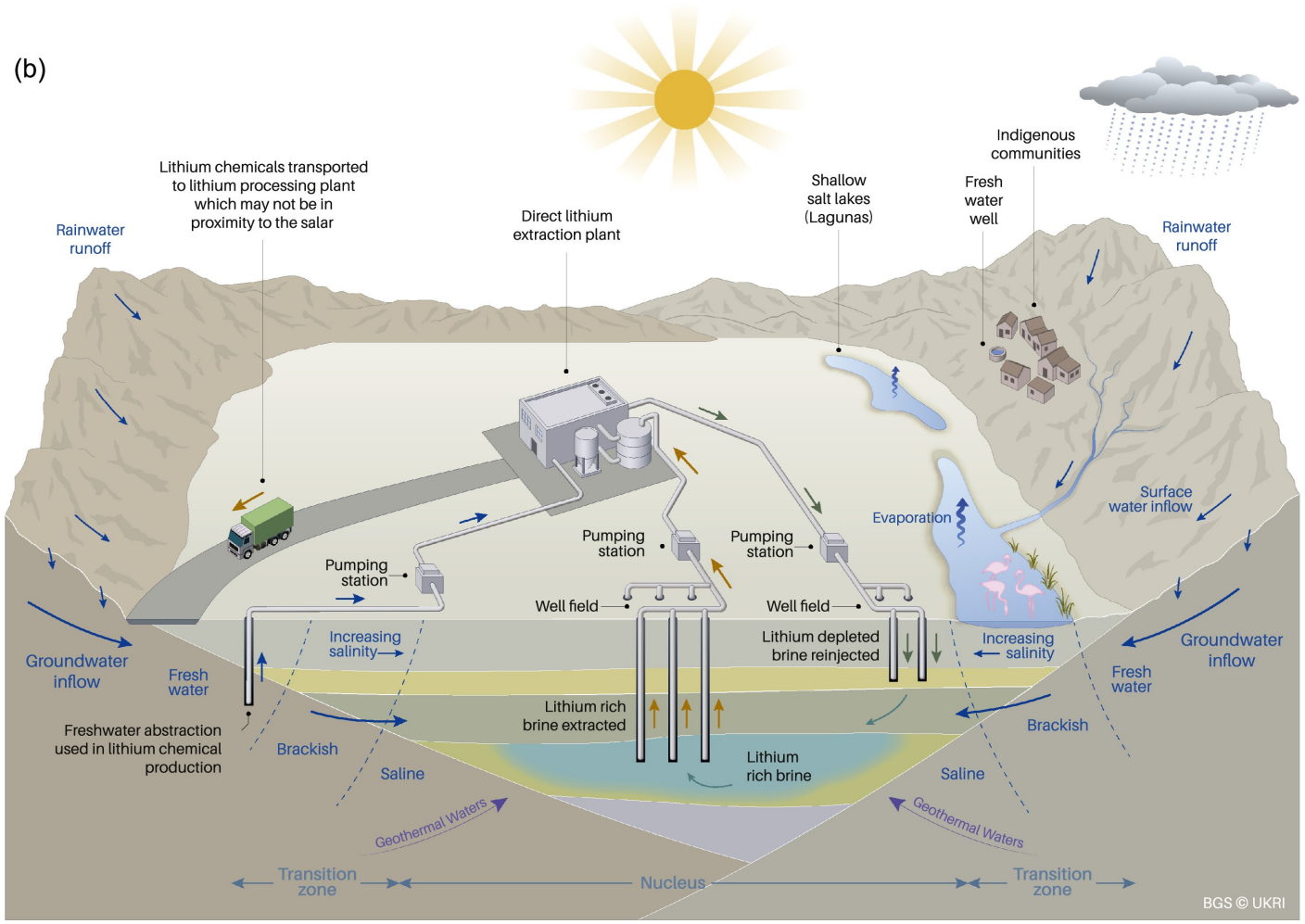


Global trade flows of lithium and LIBS



British
Geological
Survey

LIFT PROJECT: LCA & LITHIUM



Not to scale. Diagram is schematic and may not accurately represent all scenarios.

LIFT PROJECT: LCA & LITHIUM

