Assessing water inputs of global mining activities

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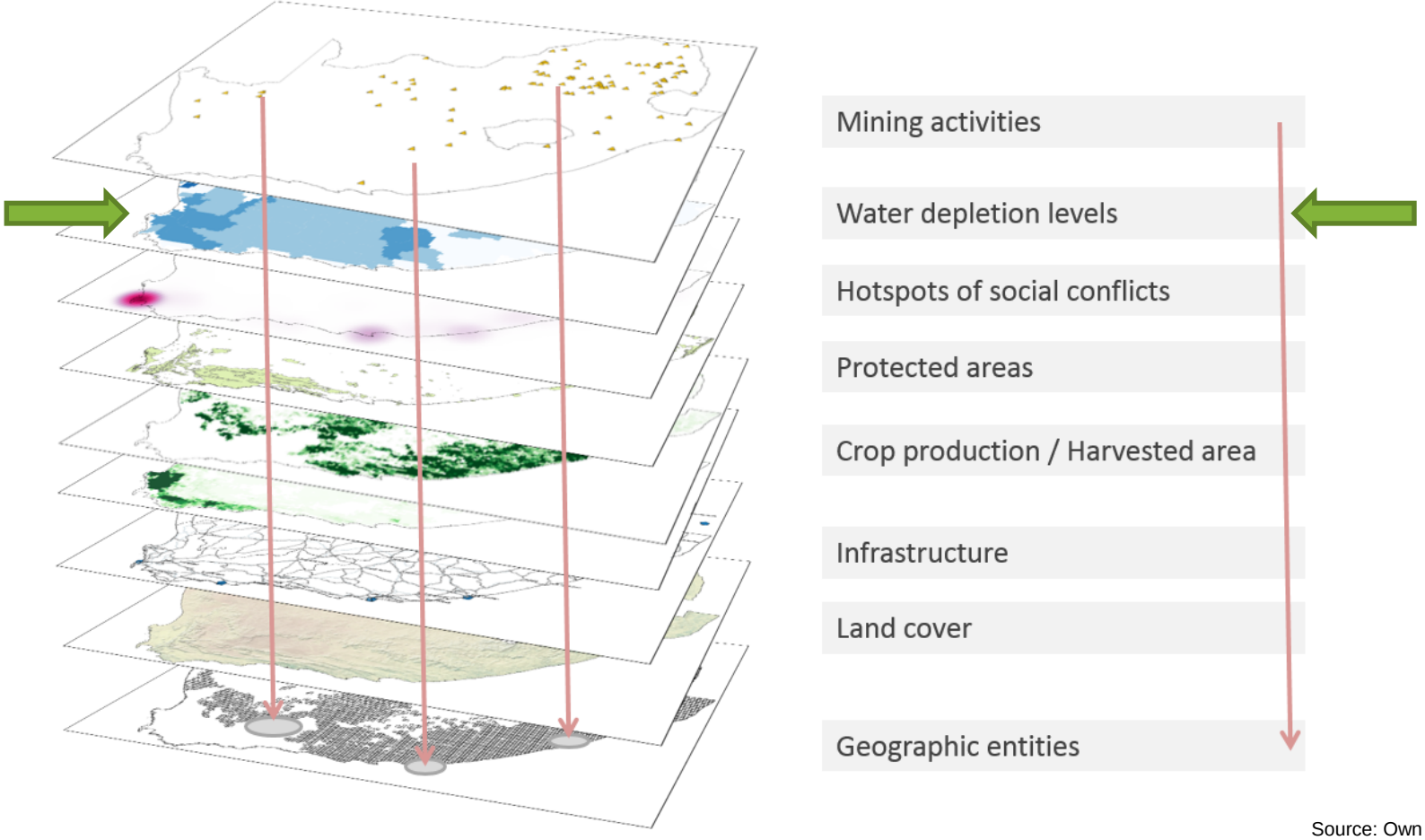
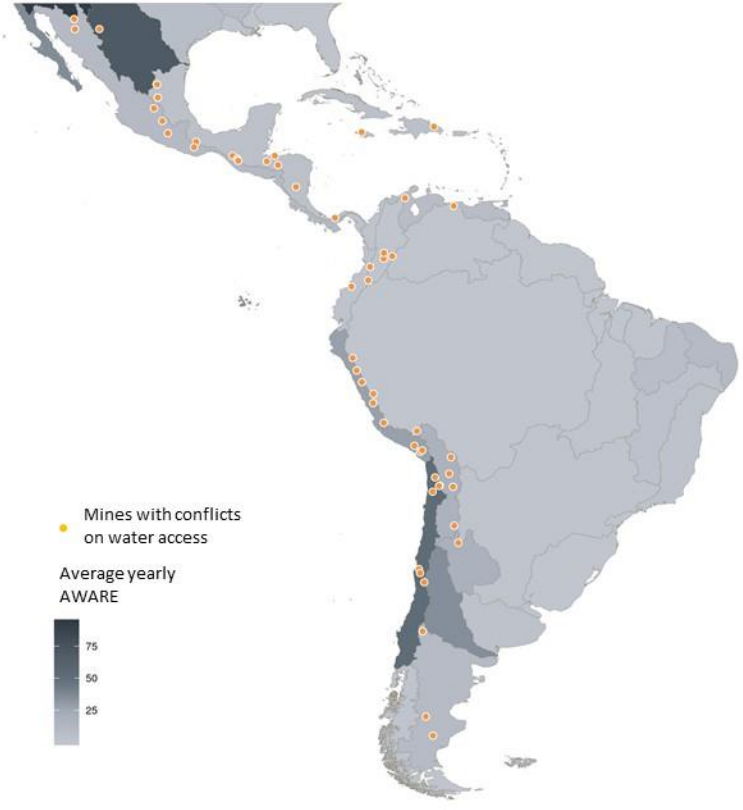
Water in the FINEPRINT project



Source: Own illustration

Mining and water

- Extraction and production of raw materials need water.
- Overall quantities of water used in metal mining rather low, but locally high hydrological significance
- Globally, 50% of all copper mines located in areas with water stress
- Lithium mining in the driest deserts of Latin America
- Mining operations as competitors for scarce water of other users including subsistence farming
- Mining operations as polluter of drinking/irrigation water
- Increasingly conflicts about water
- Water quantities AND related impacts part of comprehensive water management

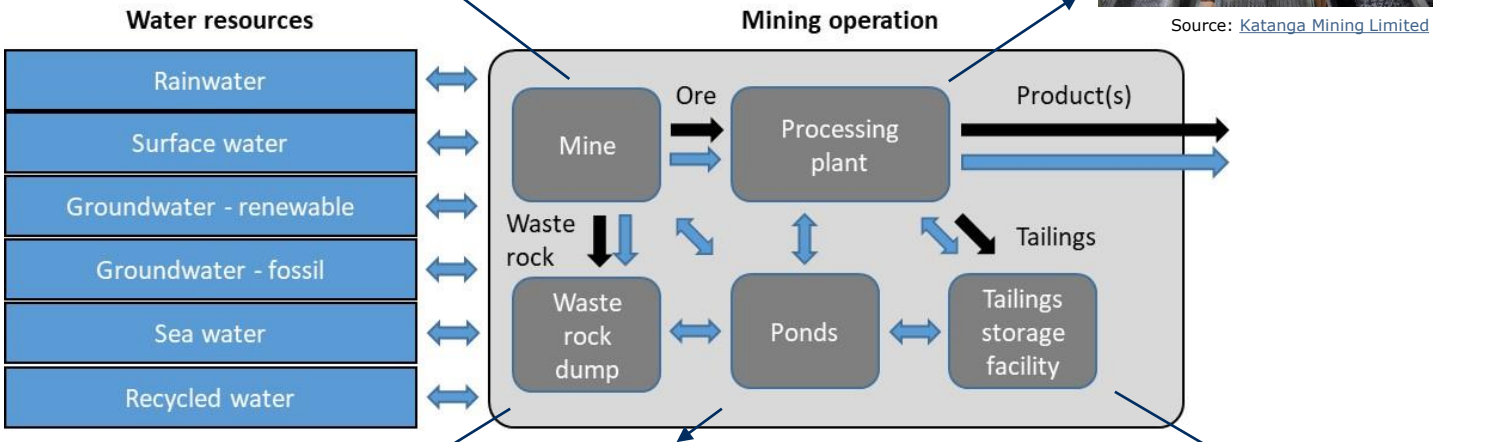


Source: Own illustration

Mining and water

Source: Chemibond

Source: Katanga Mining Limited



adapted from Northey et al., 2016

Source: Gordon Myphail

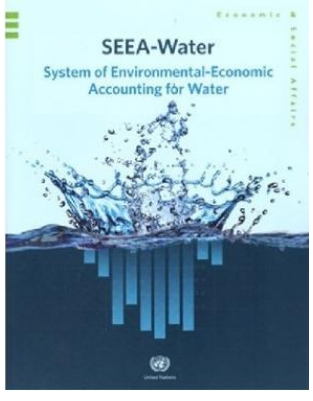
Source: https://i.imgur.com/YunmZcg.jpg

Source: Newcrest Mining

Accounting for global mining water use

Standards:

- UN System of Environmental-Economic accounts for Water (2007)
- Minerals Council of Australia (2014): Water Accounting Framework for the Minerals Industry
- International Council on Mining & Metals (2017): A practical guide to consistent water reporting

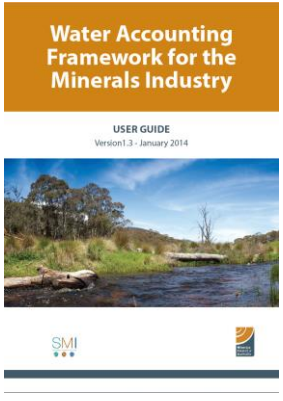


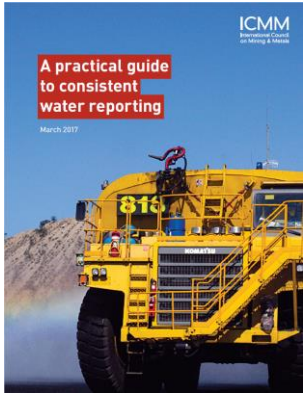
Data sources:

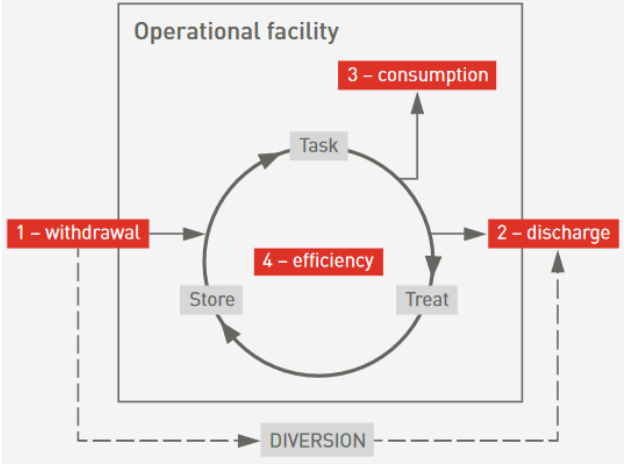
- Sustainability/annual reports
- Environmental compliance
- Scientific literature

Data coverage:

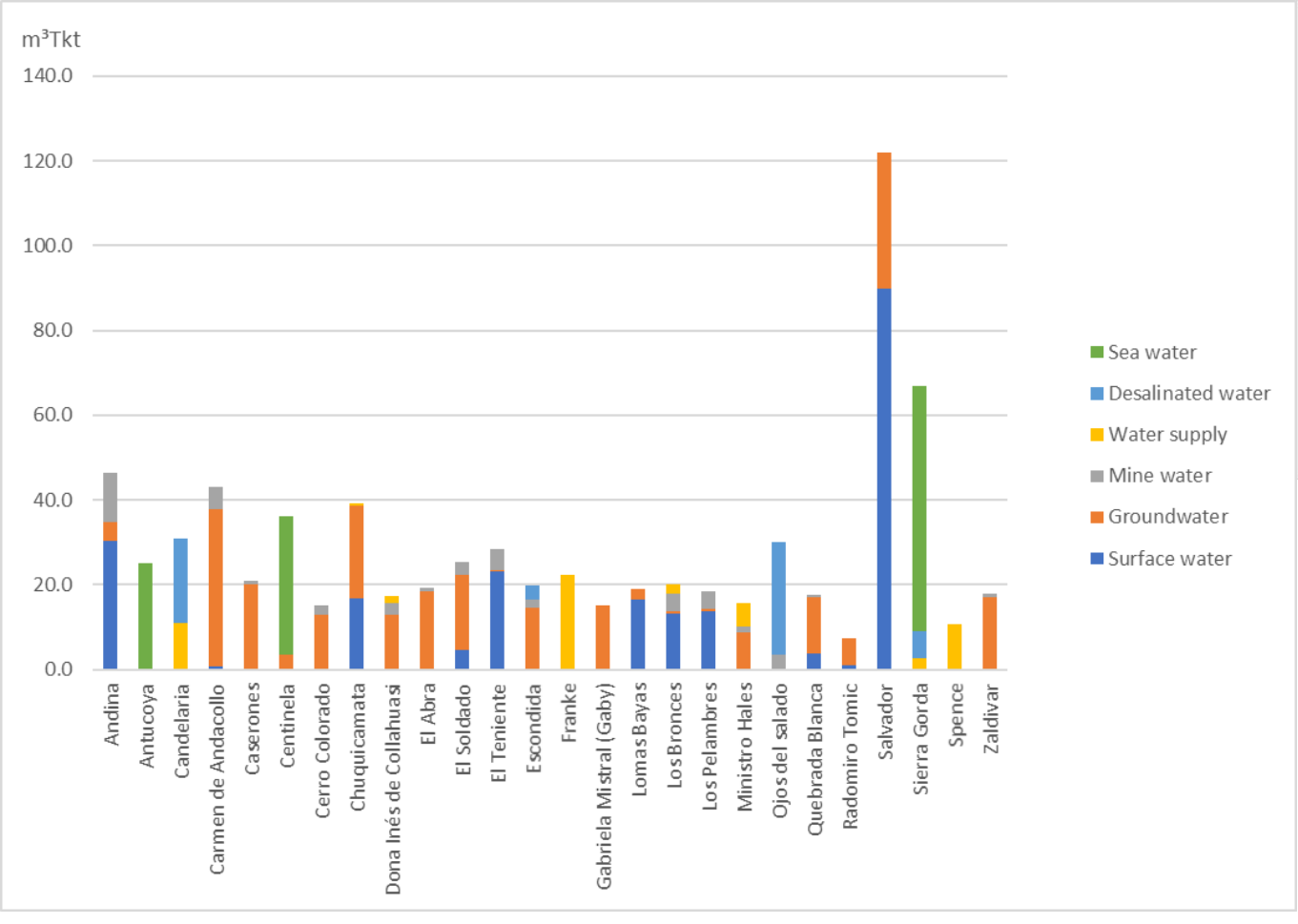
- Very poor coverage (often no data or only company-wide data)
- Some good examples: Chile, South Africa, Australia, India, etc.

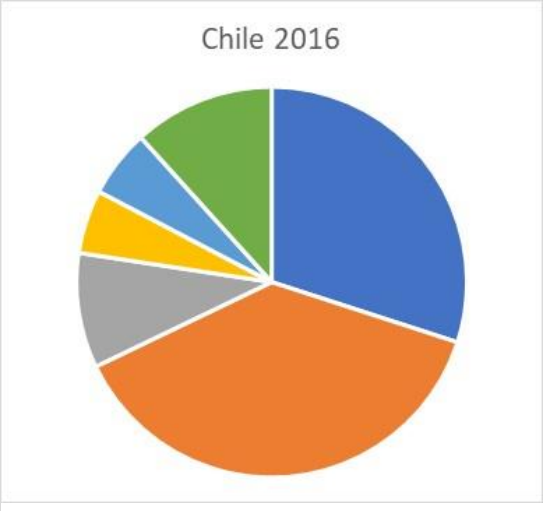






Best case: Water use in Chilean copper mining

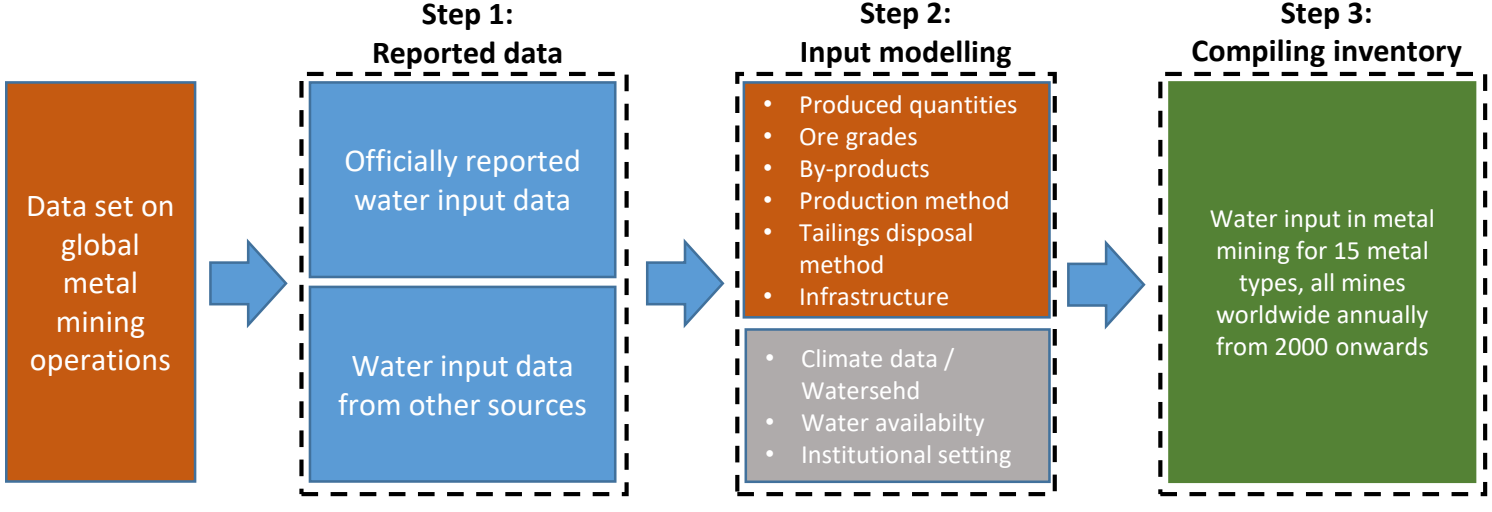




Source: COCHILCO, 2018

Filling the gaps:
Estimating global mining water use

- Collect reported data on water use for mine level
- Identify variables influencing water use
- Collect calibration data for mine level
- Use econometrics / machine learning to model water use
- Integrate estimated data in overall data system



Test case: Water use in copper mining

- Collaboration of
  - WU Vienna, Austria
  - Monash University, Australia
  - Montanuniversität Leoben, Austria
- Data set
  - ~8,800 copper mines / 2014-2018 (ideally 2000-2018)
  - 15 determinant variables / 13 types of water appropriation
  - ~1.500 Data points on water appropriation
  - Sources: mainly company reports, also national sources
- Method:
  - supervised statistical-learning methods (regression-tree method, logistic regression, and support vector machine) → relationship amongst variables
  - unsupervised statistical-learning methods such as clustering → hidden structures in variables

Test case: Water use in copper mining

- Types of water appropriation
  - Surface Water Withdrawals (ML)
  - Groundwater Withdrawals (ML)
  - Marine Withdrawals (ML)
  - Third-party Withdrawals (ML)
  - Raw Water Use (ML, kL/t Ore, kL/t product)
  - Worked Water Use (ML, kL/t Ore)
  - Worked Water Use (kL/t Ore)
  - Discharges (ML)
  - Consumption (ML)
- Determinant variables
  - Primary/secondary commodity
  - Mine type (Underground, open pit, incl. smelter, etc)
  - Metal content/ore produced
  - Ore grade
  - Production method / Infrastructure
  - Grain size
  - Water scarcity / Access to sea
  - Biome/Climate zone
  - Institutional setting/risk

European and global water policies

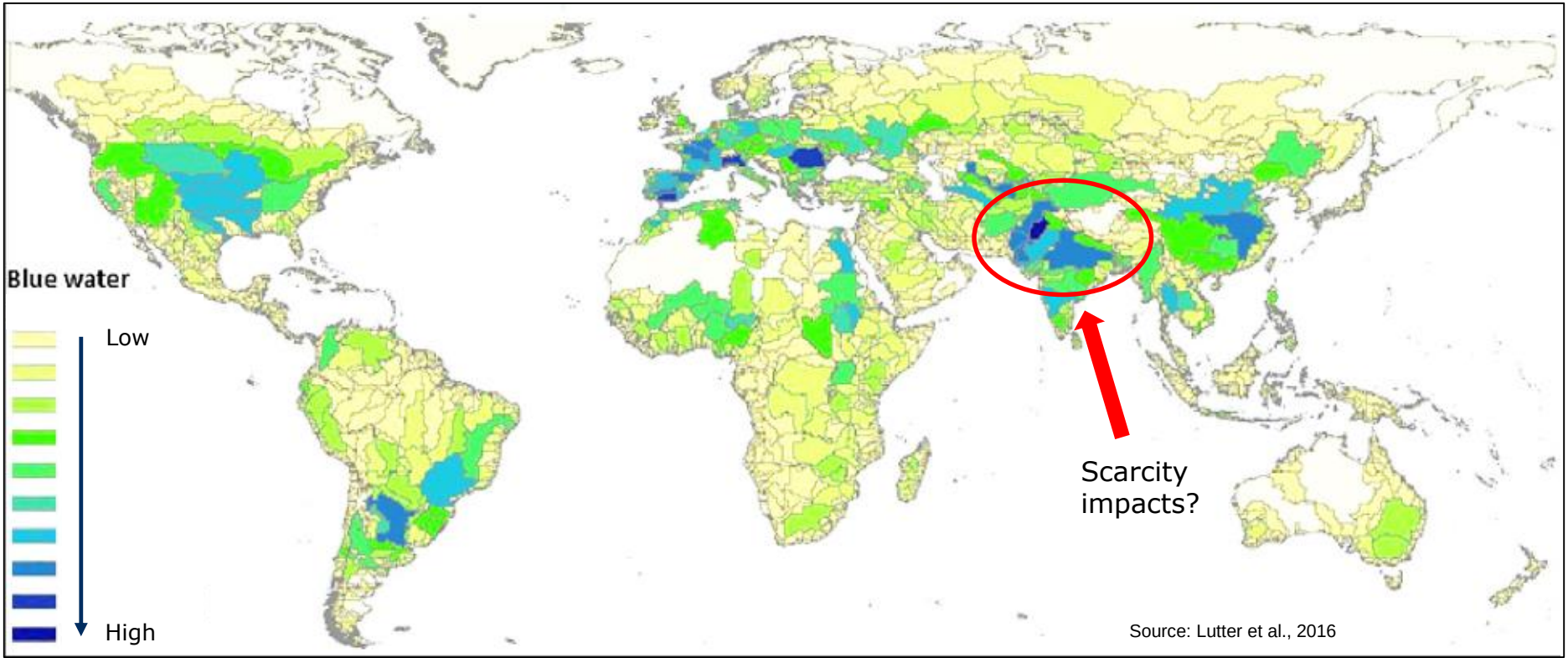
- SDG 6: Ensure availability and sustainable management of water and sanitation for all
  - equitable **access** to safe and affordable drinking water
  - increase water-use **efficiency**, address **scarcity**
  - Apply IWRM
- Integrated Water Resources Management (IWRM)
  - **coordinated management** of water, land and related resources, to sustainably maximize welfare in equitable manner
- EU Water Framework Directive / Blueprint
  - achieve good **qualitative and quantitative status** of all EU water bodies
  - better implementing current **water legislation**
  - **consider indirect uses** of water related to European production and consumption patterns

Policy application

Policy	Target	Contribution
SDG6	6.4 Increase water-use efficiency across all sectors ensure sustainable with-drawals of freshwater	Data on water-use efficiency by specific mines over time Data on water stress per watershed and mine contribution
SDG6/IWRM	6.5 Implement IWRM at all levels	Identification of mines/watersheds where IWRM is needed Amplification of IWRM to the global level
Consensus for development	Align the EU's (development) policy with the 2030 Agenda for Sustainable Development	Identification of imbedded impacts of EU trade as contrast to development policies
EU Blueprint	Better implementing current water legislation	Help to "consider the indirect uses of water and their management related to European production and consumption patterns"

Policy application

- In-situ impacts vs. impacts embodied in trade vs. value creation → sustainable supply chain management



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