An integrated approach for river water quality monitoring in a large scale gold mining watershed

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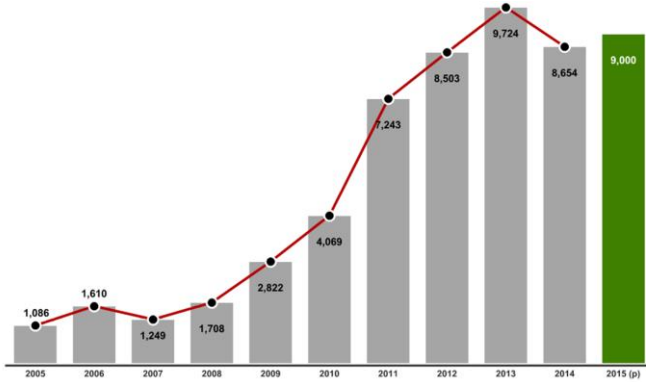
IS IT REALISTIC TO STOP MINING?

- High economic and technological importance
- Optimistic recycling rate = maximum 50%
- Rich ore deposits in fragile ecosystems
- Continuous social reluctance
- Water resources = a major problem

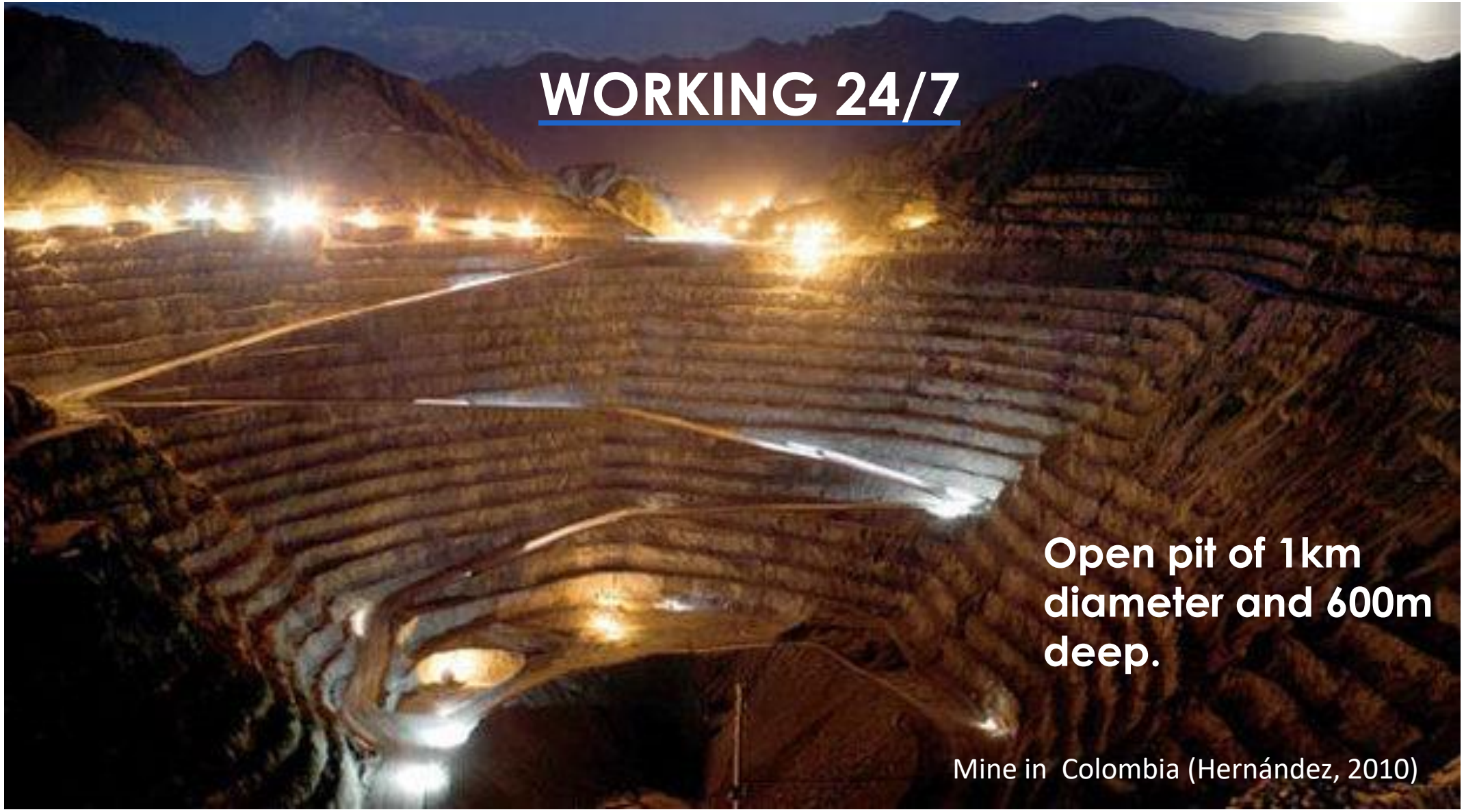
Inversiones Mineras
2005 -2015



Fuente: Min. De Energía y Minas

(Garcia Parra,2013)

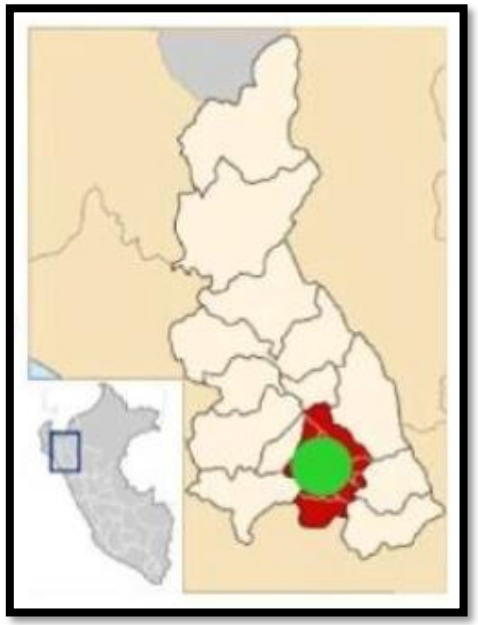
IS IT REALISTIC TO STOP MINING?

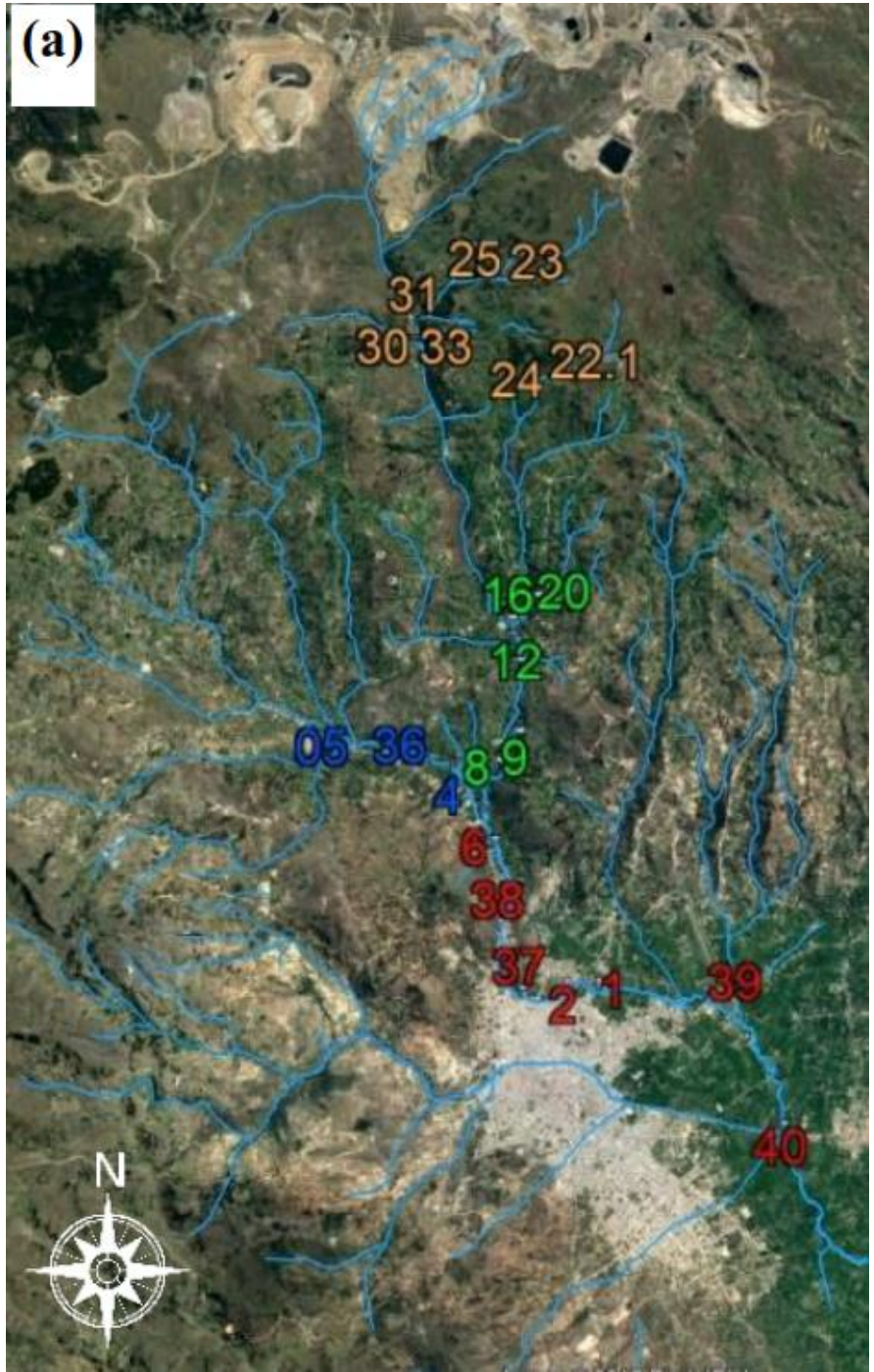


MINING IN COMBINATION WITH GLOBAL CHANGE

Poopó lake in Bolivia (Terrazas, J., 2017) , dried out due to combined urban growth, climate change, El Niño and water demand → High complexity

WATER QUALITY MONITORING OF A LARGE-SCALE GOLD MINING WATERSHED (CAJAMARCA, PERU)





14 sites near the **mine**

14 sites at **midstream**

4 sites in **Porcón** tributary

8 sites in the **city**

= **40 sites total** assessed for:

Dissolved metals, organic pollutants and benthic macroinvertebrates. Landuse and hydromorphology

(Mercado-Garcia et al., 2019)

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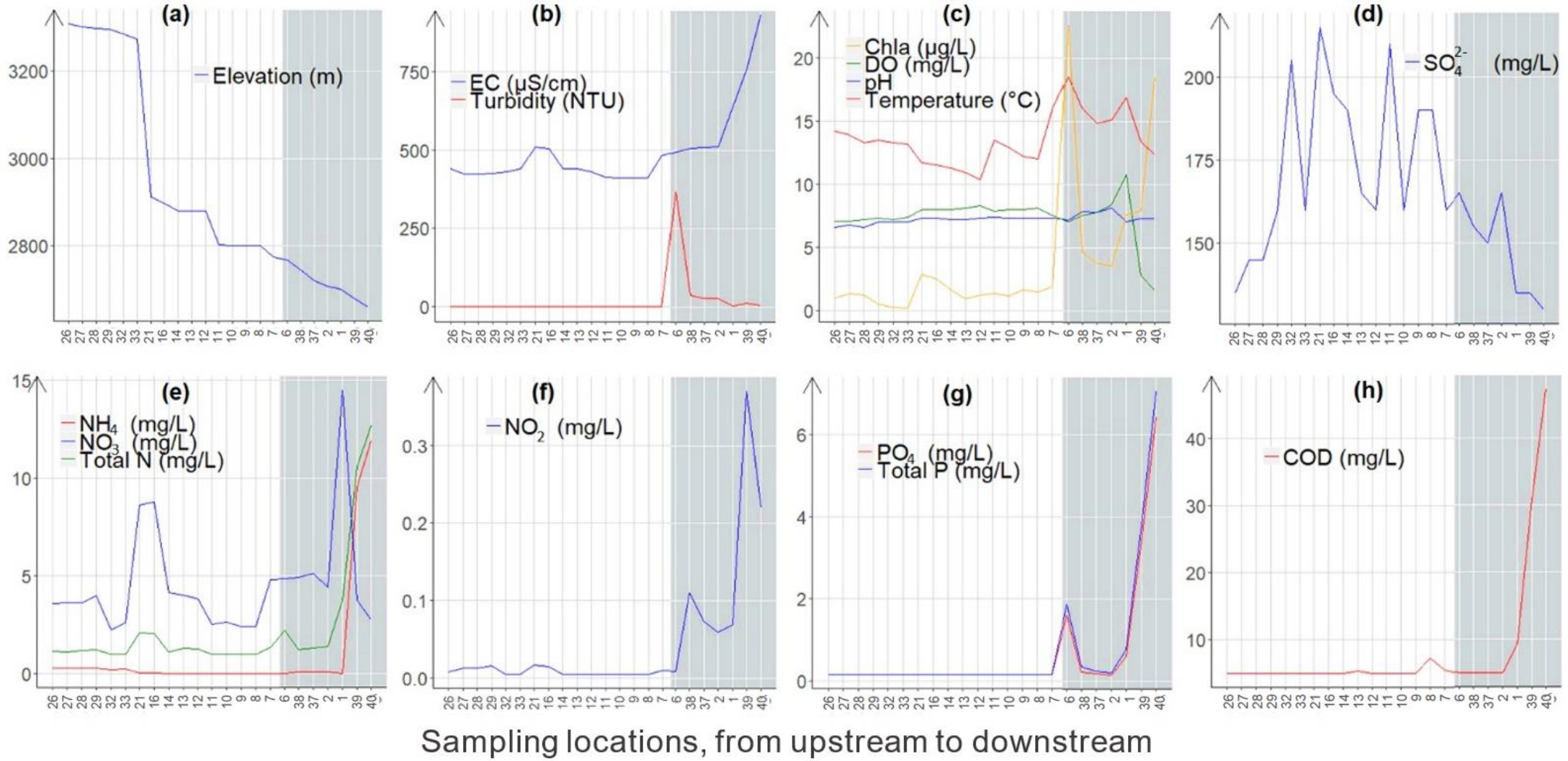
PHYSICOCHEMICAL MEASUREMENTS



White background= rural and peri-urban areas

Grey background= Cajamarca City

BIOASSESSMENT MINING SITES

Acari:

Gripopterygidae:

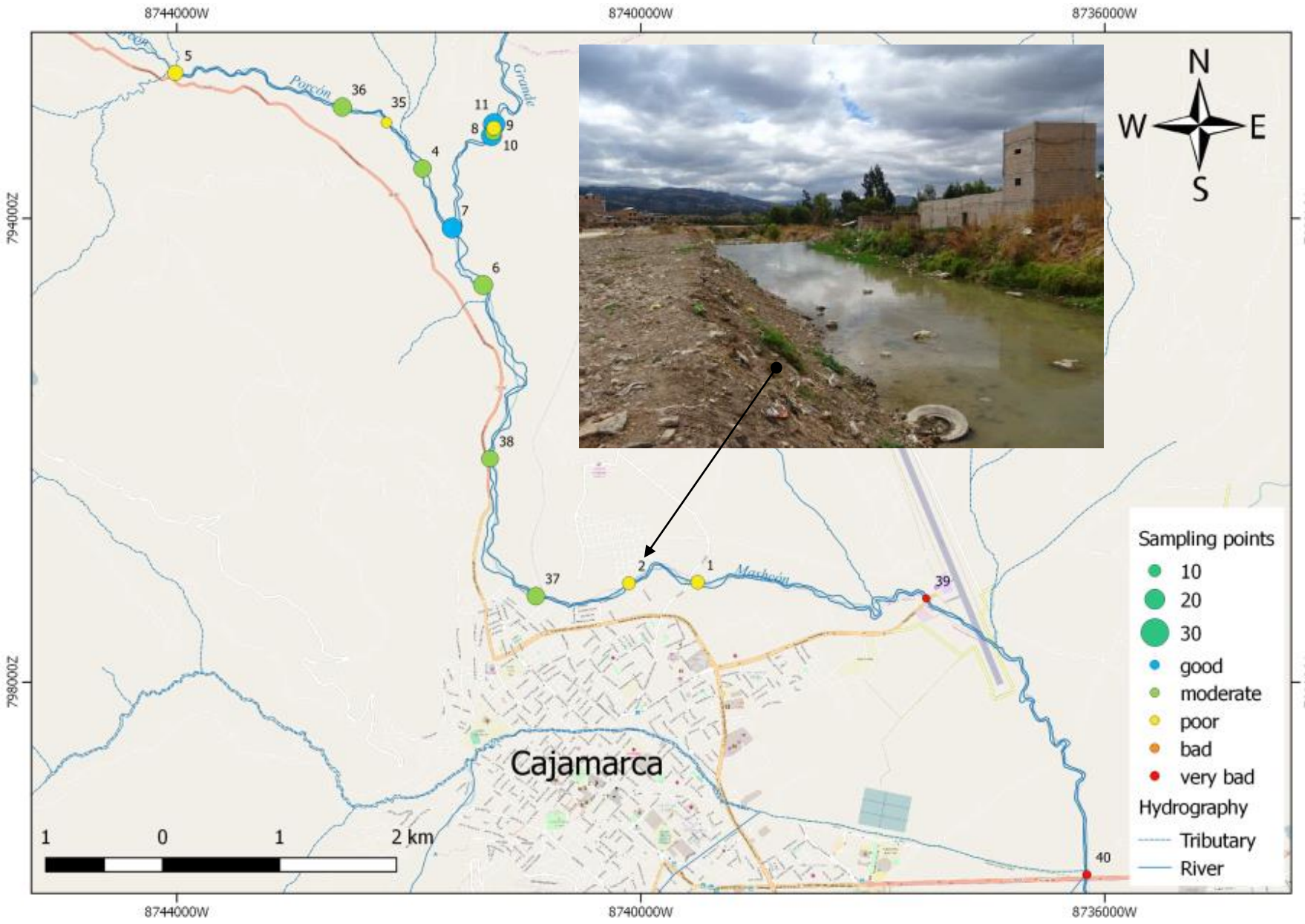
& others :

BIOASSESSMENT MIDSTREAM

Best quality and biodiversity, despite agricultural pollutants → good physical habitat structure (hydromorphology)

BIOASSESSMENT URBAN AREAS

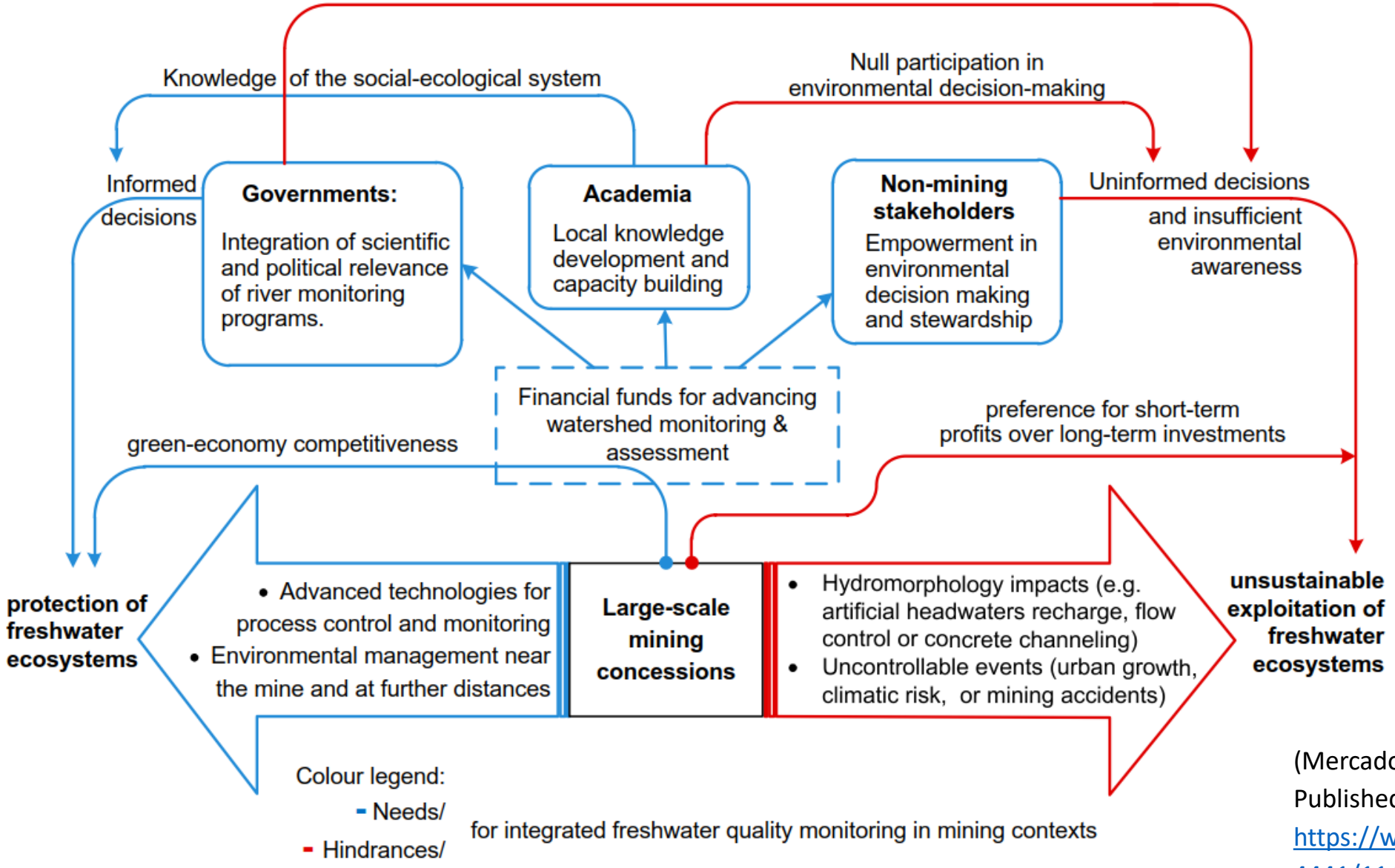
Worst quality and biodiversity, degraded hydromorphology, severe pollution and nauseous smells



LESSONS FROM OUR ASSESSMENT

- Hallmark mining impacts are absent according to the selected freshwater quality indicators (conceived in different contexts)
- Acid- and metal-tolerant ‘good-quality’ bioindicators were present, and other potential ones (e.g., Acari, Grypopterygidae, ecotoxicological or microbial enzymatic activity) are uncharacterized
- A quantitative determination of freshwater quality might be a weak assessment endpoint due to the high complexity of open-pit mining

IDENTIFYING KEY ACTORS AND DECISION MAKERS ($)



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CONCLUSIONS

1. More importance of ecological losses over data-driven quality thresholds is needed, since mining operations causes complex changes in the overall system.

2. A system-based understanding is urgently needed for integrating governments, scientific disciplines and mining businesses in the protection of aquatic habitats and non-mining stakeholders in the long run.

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