Let's be clear(-er) about mining wastes: Junks vs. valuables

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ESD
ecological systems design
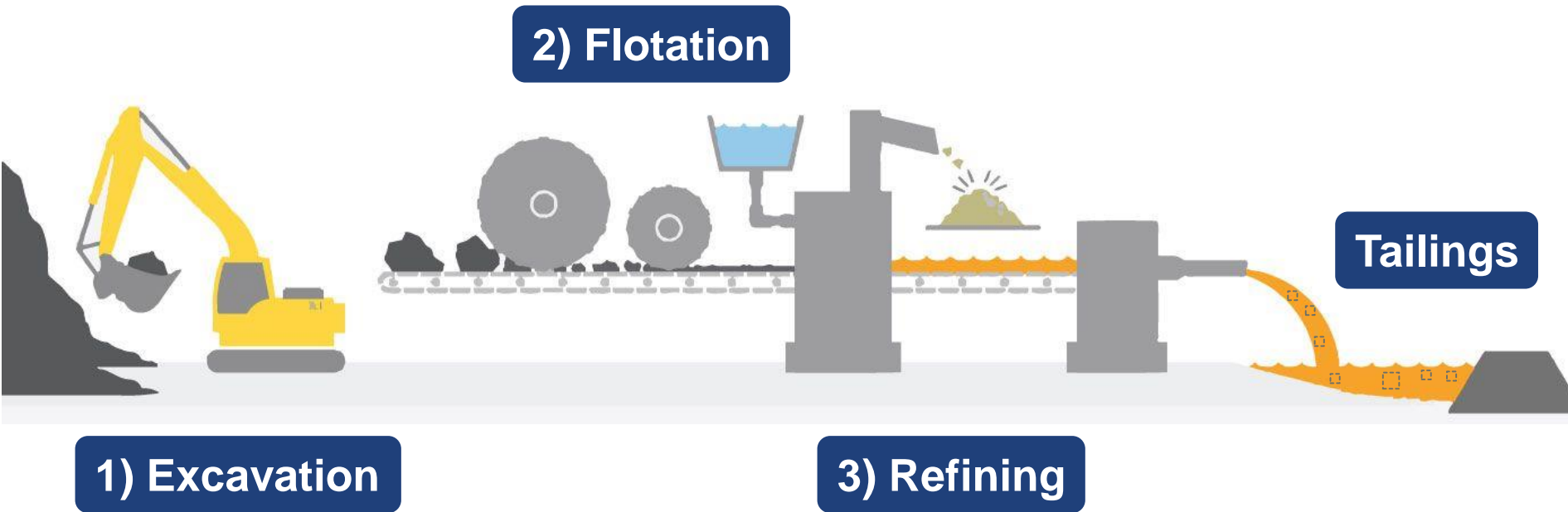
www.esd.ifu.ethz.ch/

https://etn-sultan.eu/

MSCA-ETN
SULTAN

European Training Network for the Remediation
and Reprocessing of Sulfidic Mining Waste Sites

HOW DO WE

'MINE' FOR THE FUTURE?

Content

- Systems investigated
- Approach
- Results
- Next steps

MSCA-ETN
SULTAN

European Training Network for the Remediation
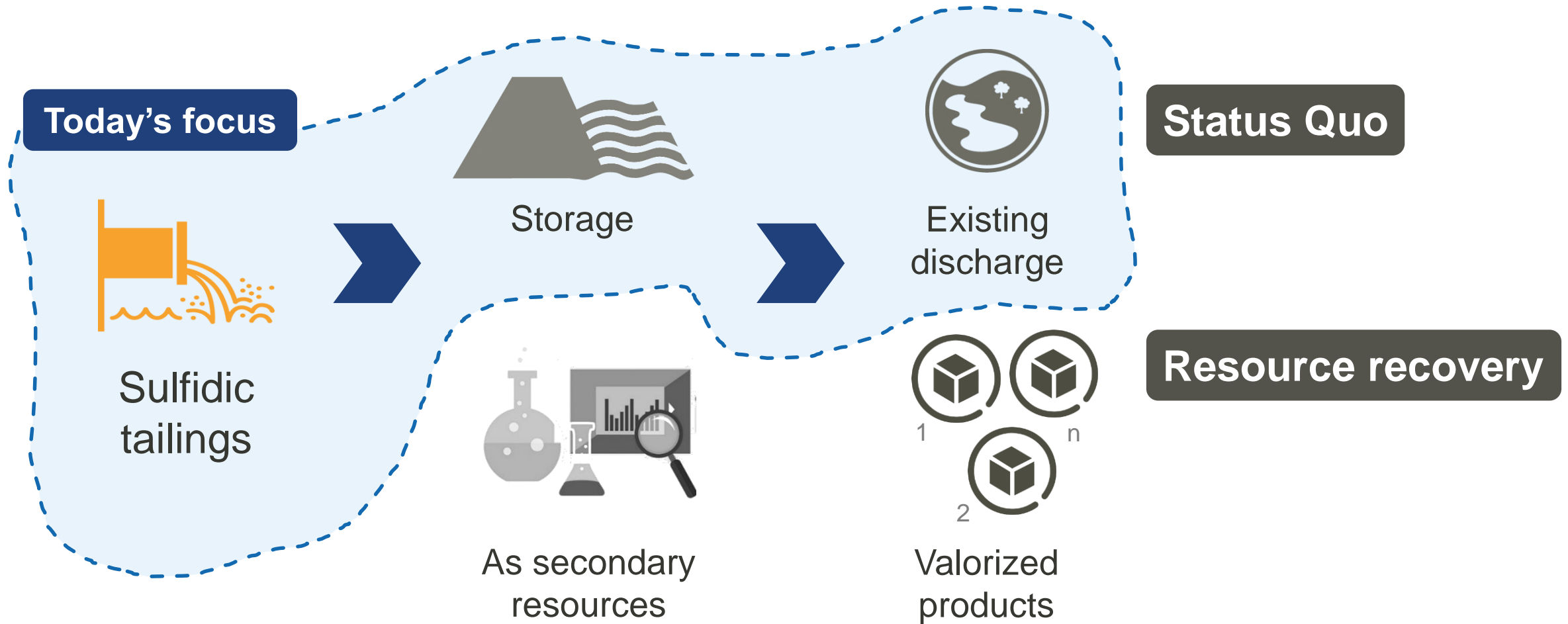and Reprocessing of Sulfidic Mining Waste Sites

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Tailings: what and where?

2) Flotation

Tailings

1) Excavation

3) Refining

Adapted from Spitz and Trudinger, 2008

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Tailings: what and where?

2) Flotation

Tailings

1) Excavation

3) Refining

Emission

Adapted from Spitz and Trudinger, 2008

- As new "ore" resources
- Minerals valorization

3 case studies

ETN SULTAN, 2019
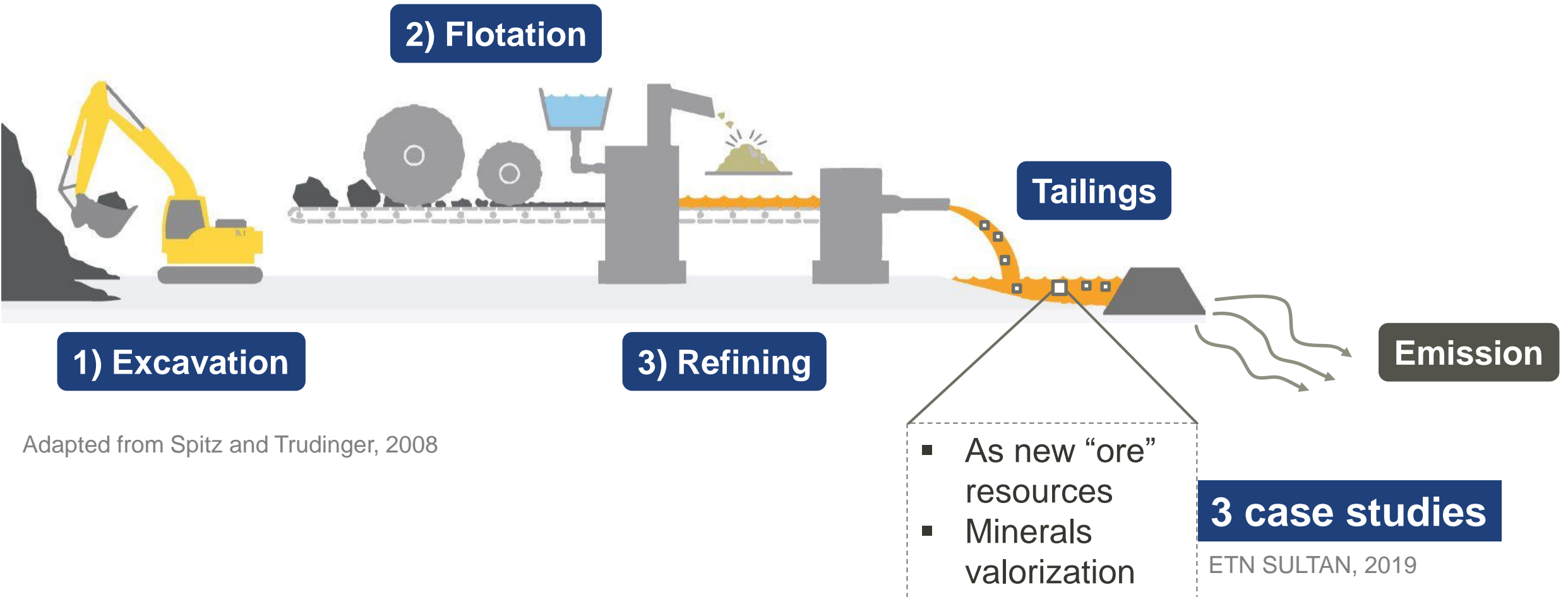
Assessed systems: Two major routes

Today's focus

Sulfidic tailings

Storage

As secondary resources

Existing discharge

Valorized products

Status Quo

Resource recovery

We want to predict, but …

Source: Kalgoorlie Tailings Facility, 2013

SORRY
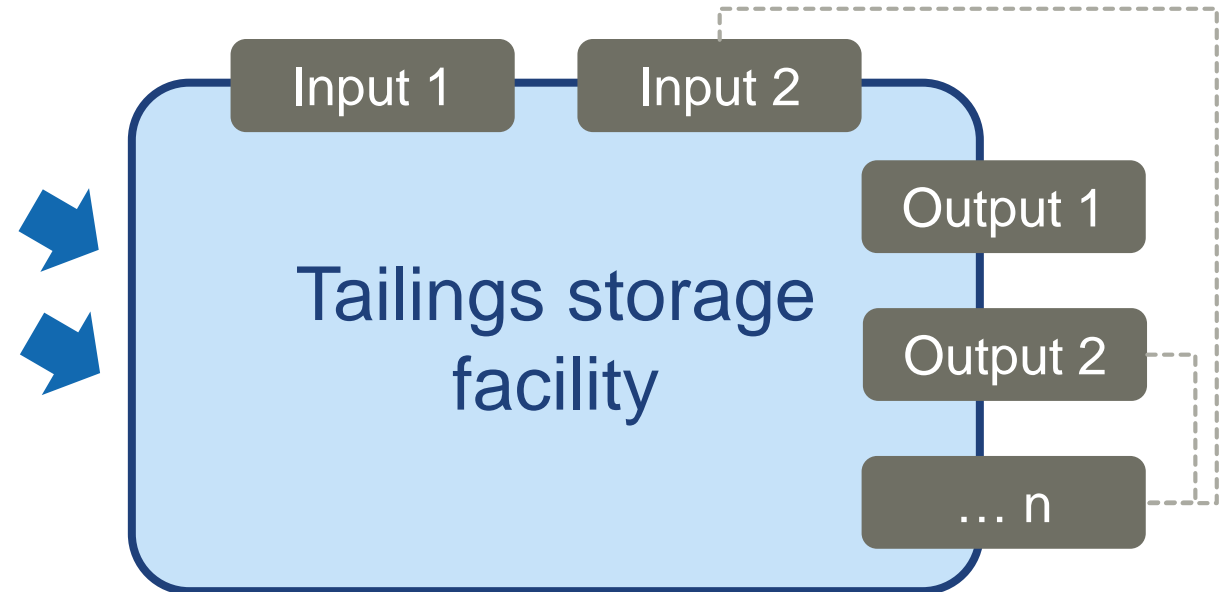
THE CRYSTAL
BALL IS BROKEN

Un-boxing the "black" box
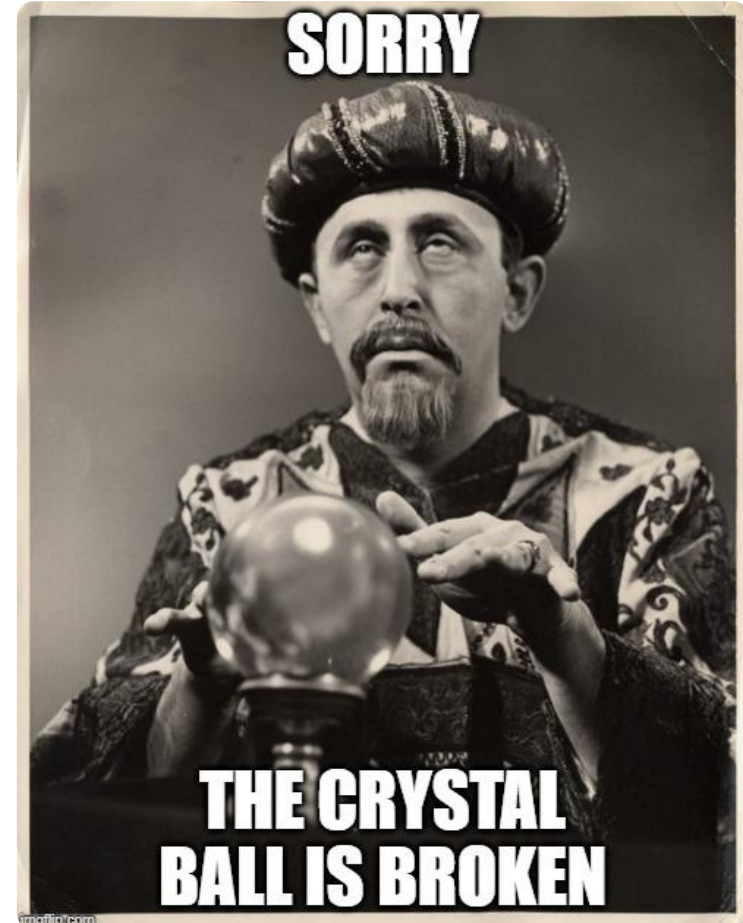
Aim: parameterizing tailings storage emission

Source: Kalgoorlie Tailings Facility, 2013
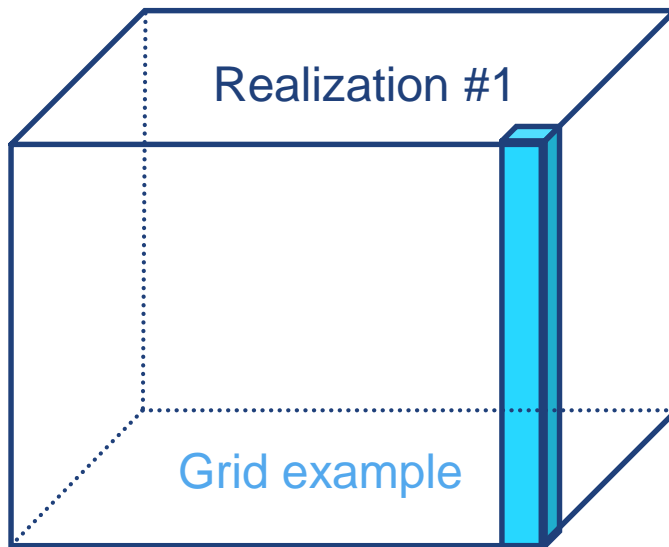
Why?

To update it with relevant *parameters*

Input 1 · Input 2

Tailings storage facility

Output 1

Output 2

… n

Modelling Workflow

③ Life cycle impact assessment — Species emission into surroundings

② Water quality prediction — Future tailings behavior (long term)

① Data preparation | Geo statistics

Details in the appendix

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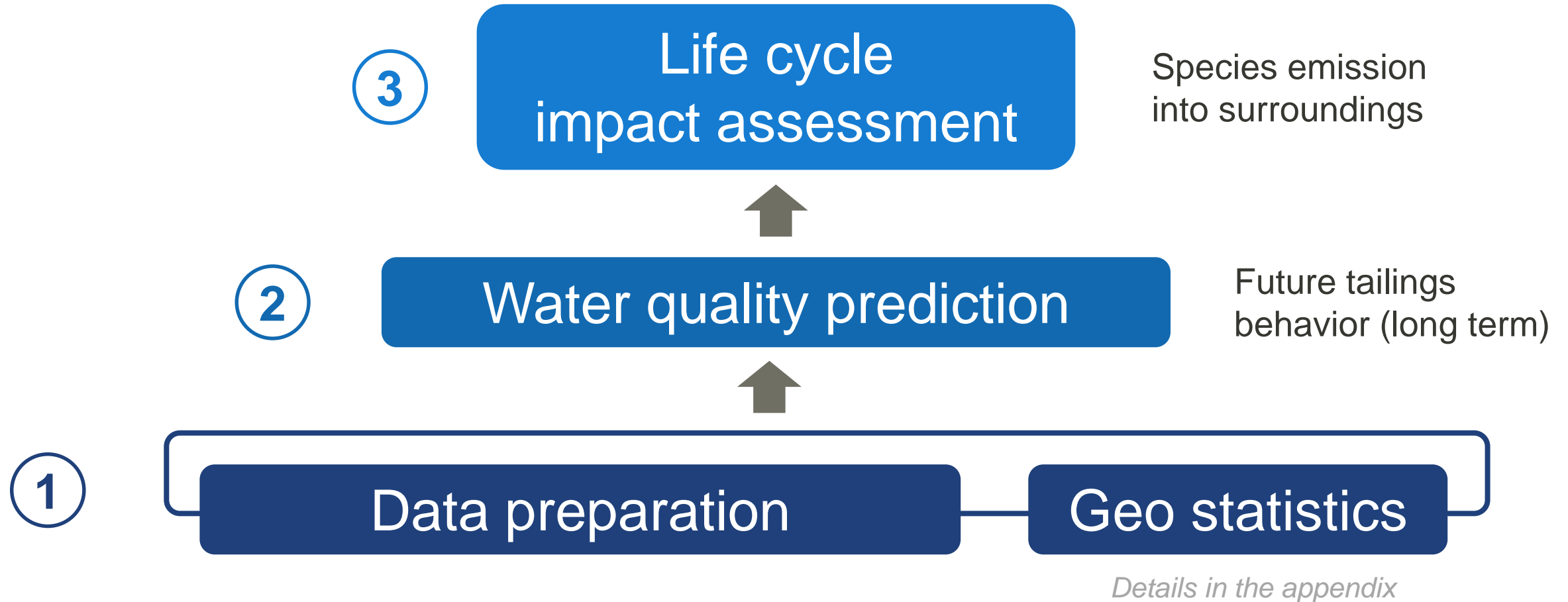
Preliminary result and the expected outcome

Model:

Realization #1

Grid example

Inputs:

- Tailings composition
- Site-specific parameters
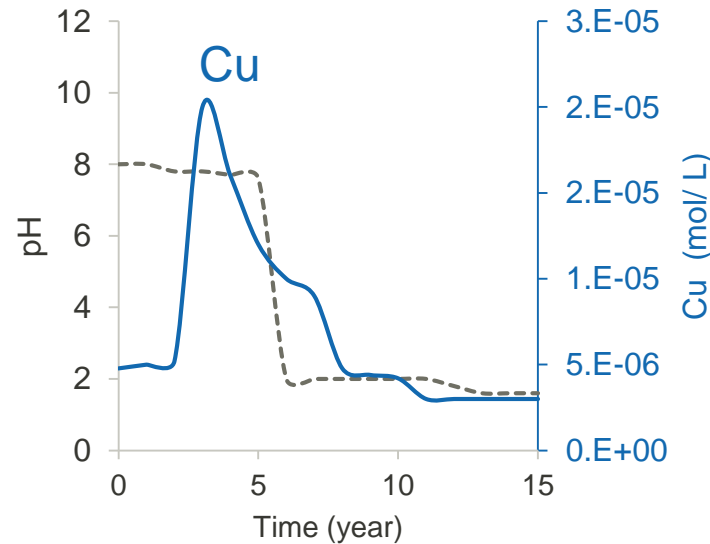
Impact:

Method: USETox (mid point)

Category: Freshwater ecotoxicity

Species' mass in leachate

For Cu
After 15 yrs,
x units of impact

| Data preparation + Geo statistics | → | Water quality prediction | → | Life cycle impact assessment |

Key: reactive transport model

What do I do?

Model integration: <u>parameterized</u> tailings storage facility

Takeaways

Real samples collection to simulate <u>full scale</u> (uncertainties involved)

Implementation

Part of process design work

LCA of Novel Processes
Transition

Full plan in appendix

ETH *zürich*

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Thank you! ☺
Particularly to ASB and D-BAUG community

5th D-BAUG Meet and Share Your Research
October 9, 2019