Presentation of the UN Environment Rapid Response Assessment on Tailings dams storage facilities

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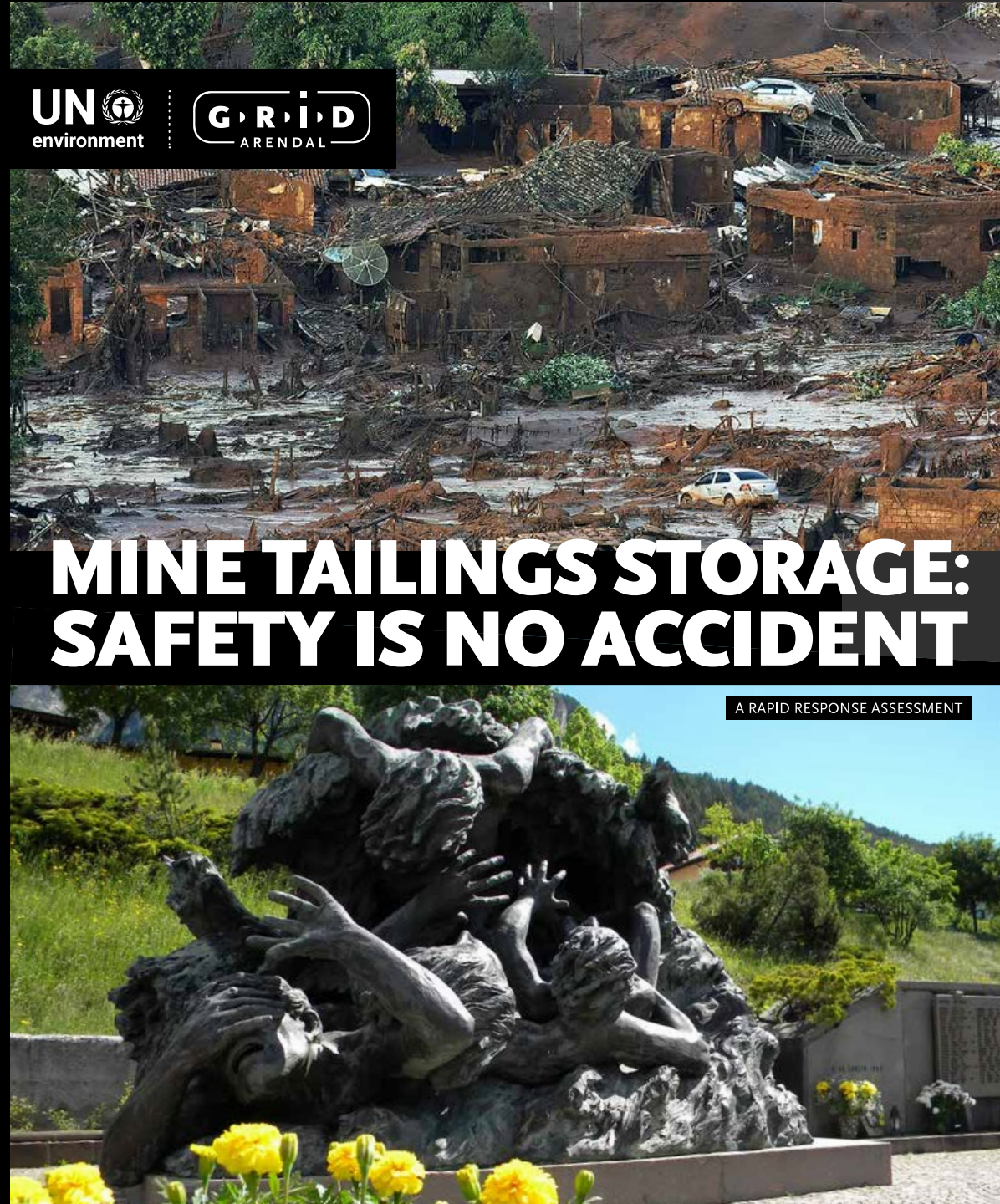
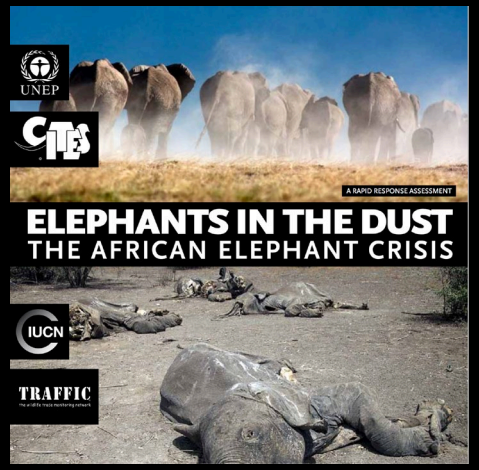


The aim of Rapid Response Assessments

The UN Environment reports are designed to:

1. shine light on an issue
2. gather and visualise information and catalyse research
3. develop recommendations for actions

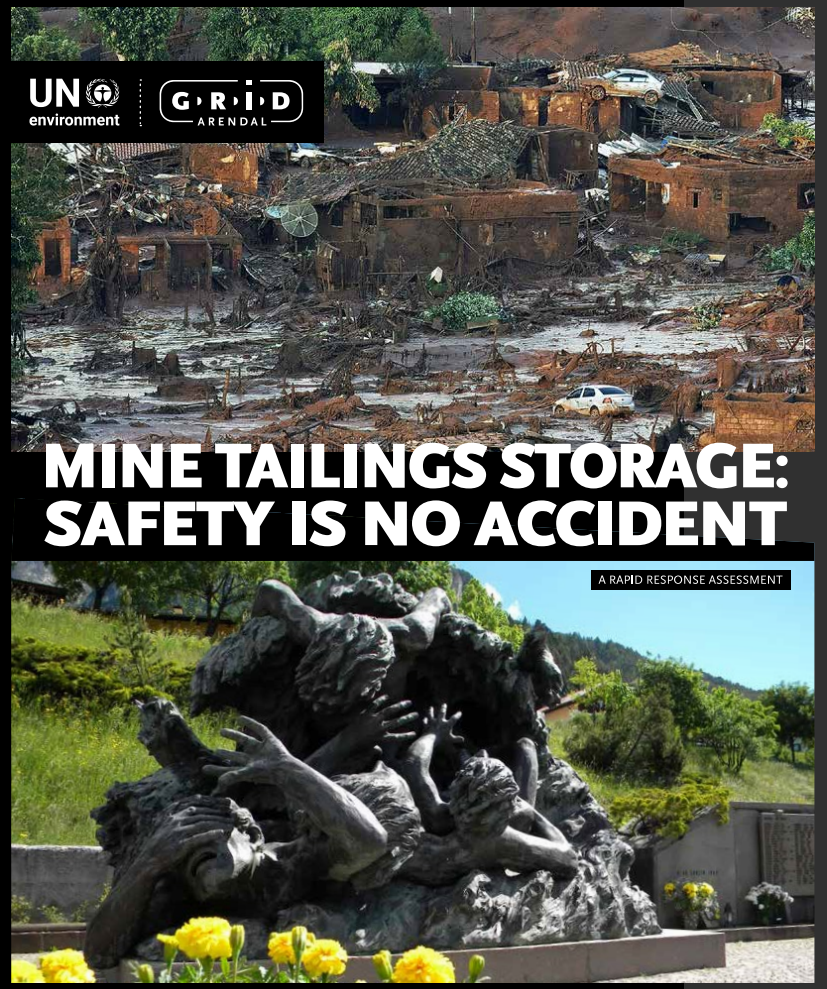


More RRA´s can be accessed here: http://www.grida.no/publications

The Rapid Response Assessment

The report was motivated by community concerns, and acknowledges the human and environmental costs of continued tailings dam disasters.

The report informs a wider audience of the consequences of failure and importantly, the OPPORTUNITIES to reduce risk and improve safety of tailings storage.

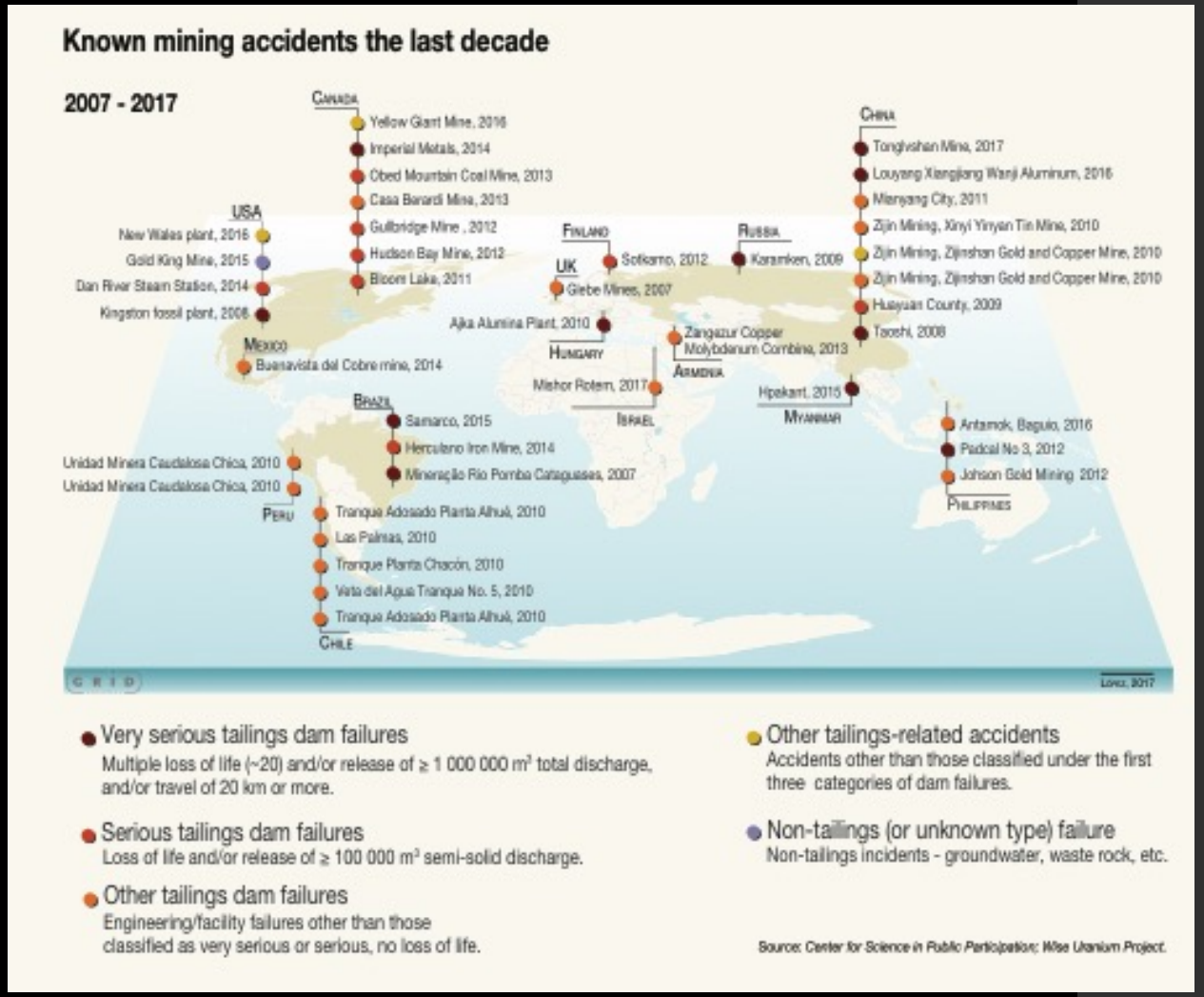


This Rapid Response Assessment

This report provides an overview of the KEY ISSUES surrounding tailings dam failures.

It uses case studies to illustrate:

- causes of failure and
- direct and long-term consequences for the people and the environment

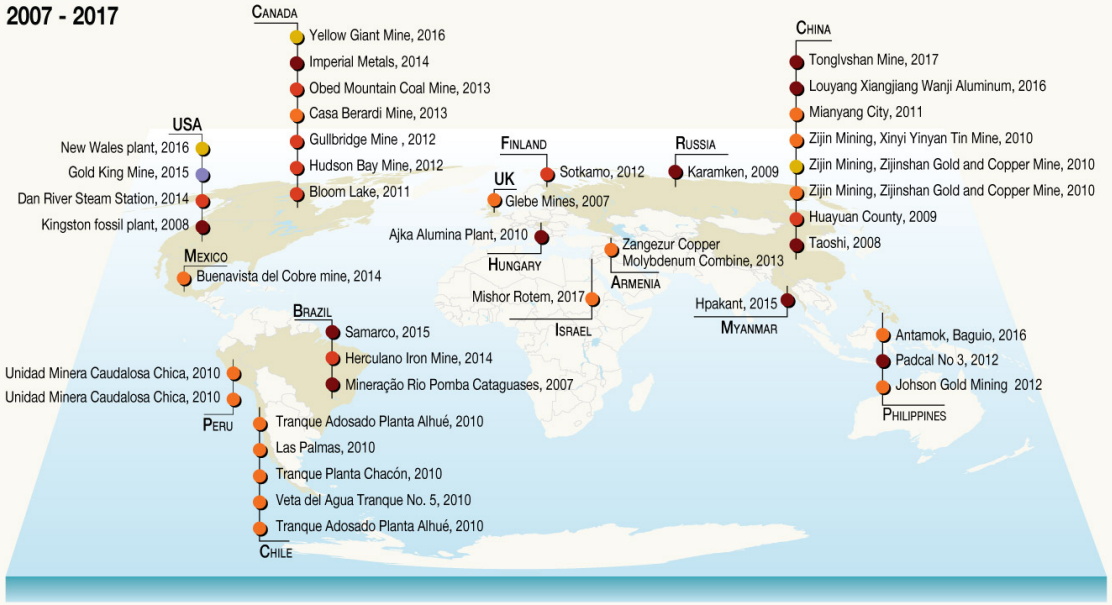


Known mining accidents

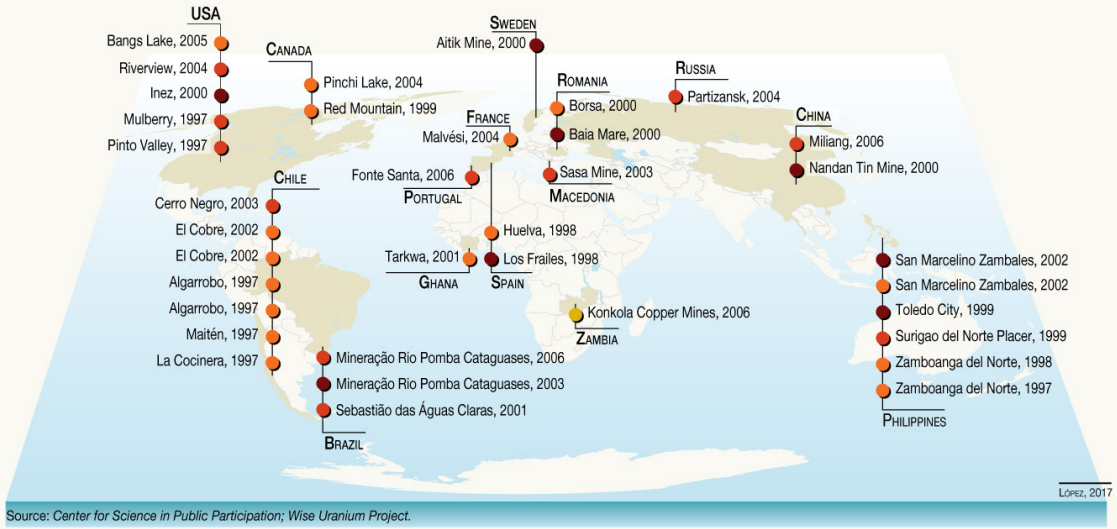
- **Very serious tailings dam failures**
  Multiple loss of life (~20) and/or release of ≥ 1 000 000 m³ total discharge, and/or travel of 20 km or more.
- **Serious tailings dam failures**
  Loss of life and/or release of ≥ 100 000 m³ semi-solid discharge.
- **Other tailings dam failures**
  Engineering/facility failures other than those classified as very serious or serious, no loss of life.
- **Other tailings-related accidents**
  Accidents other than those classified under the first three categories of dam failures.
- **Non-tailings (or unknown type) failure**
  Non-tailings incidents - groundwater, waste rock, etc.

1985-1996

2007 - 2017

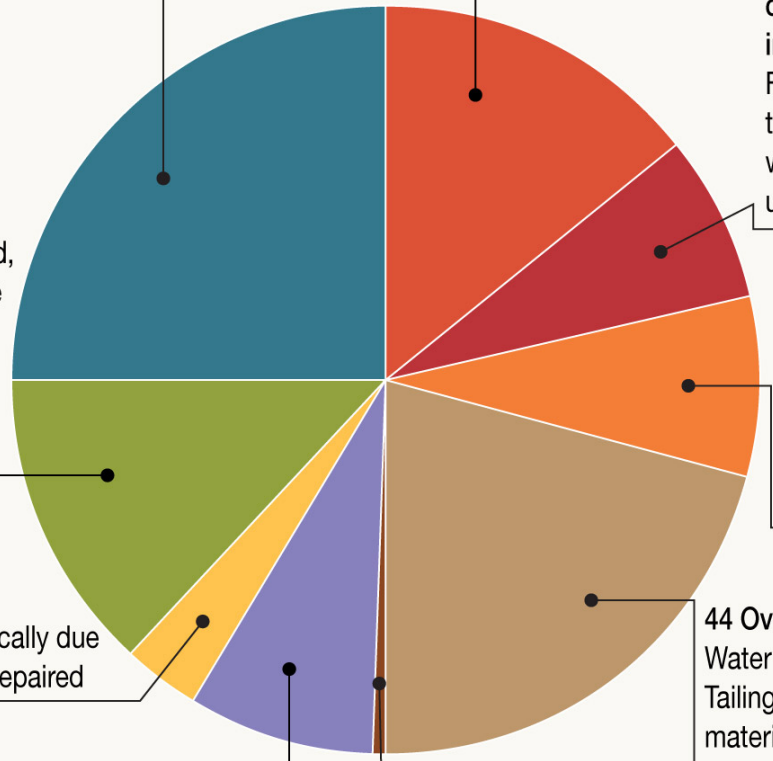


1997-2006



Source: *Center for Science in Public Participation; Wise Uranium Project.*

Causes of tailing dams failures 1915-2016



30 Slope instability - static failure
A constant load that causes deformation, to the point at which a dam partially or completely fails. Often caused by partial saturation of areas of the dam that are designed to remain dry.

52 Unknown
Many of the older dam failures that were not sufficiently documented may fall into this category.

15 Foundation - structural and foundation conditions, foundations with insufficient investigations
Failure related to building the dam on a surface that does not provide sufficient support for the weight of the dam. An example is a layer of clay under a dam.

27 Earthquake - seismic instability
Dams are designed to withstand earthquakes, but if the earthquake is larger than that which was anticipated, the structure can be destroyed by the shaking.

16 Structural - structural inadequacies, inadequate or failed decants
Design errors or failure of a designed component to function as designed. Failed decants (which drain water from the impound-ments) are a common cause.

7 Erosion - external erosion
Simple erosion of a dam face, typically due to precipitation run-off that is not repaired

44 Overtopping
Water flowing over the top of a dam. Tailings dams are made of erodible material, and overtopping will cause erosion.

17 Seepage - seepage and internal erosion
Erosion of dam material due to water passing through areas of the dam that are designed to remain dry.

1 Mine subsidence
If the dam or impoundment is built above an underground mine, collapse of the underground mine workings can lead to release of the impounded tailings.

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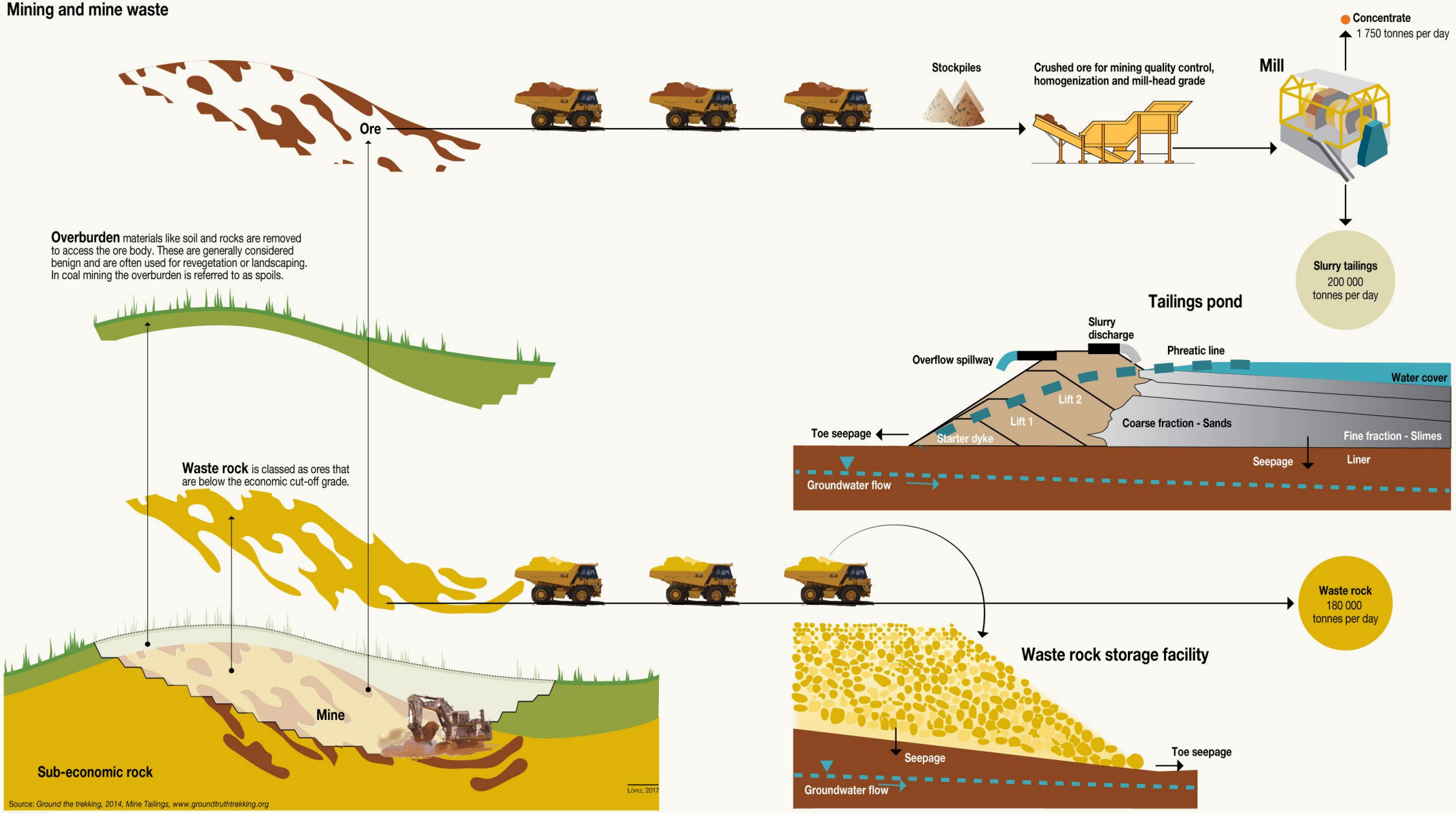
Source: ICOLD 2001, Chambers 2017

Tailings Dams – size

Photo credit: Northern Alaska Environmental Centre

The Fort Knox gold mine in Alaska. The tailings are contained in a valley behind an earth and rock embankment that creates a dam
This tailings storage facility is eventually expected to cover 395 hectares and store approximately 270 million tonnes of tailings.

Mining and mine waste



Source: *Ground the trekking, 2014, Mine Tailings, www.groundtruthtrekking.org*

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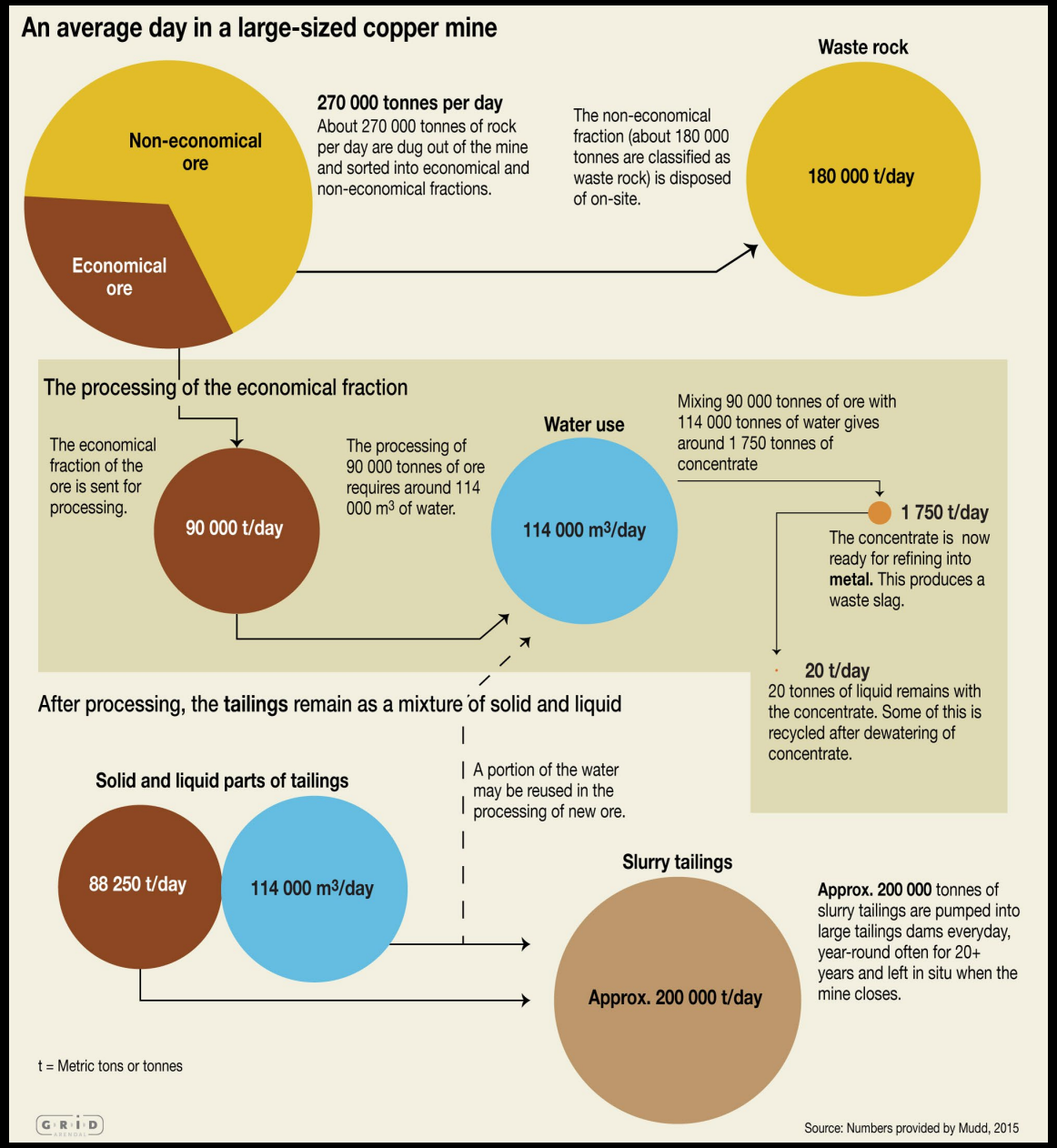
Not just waste



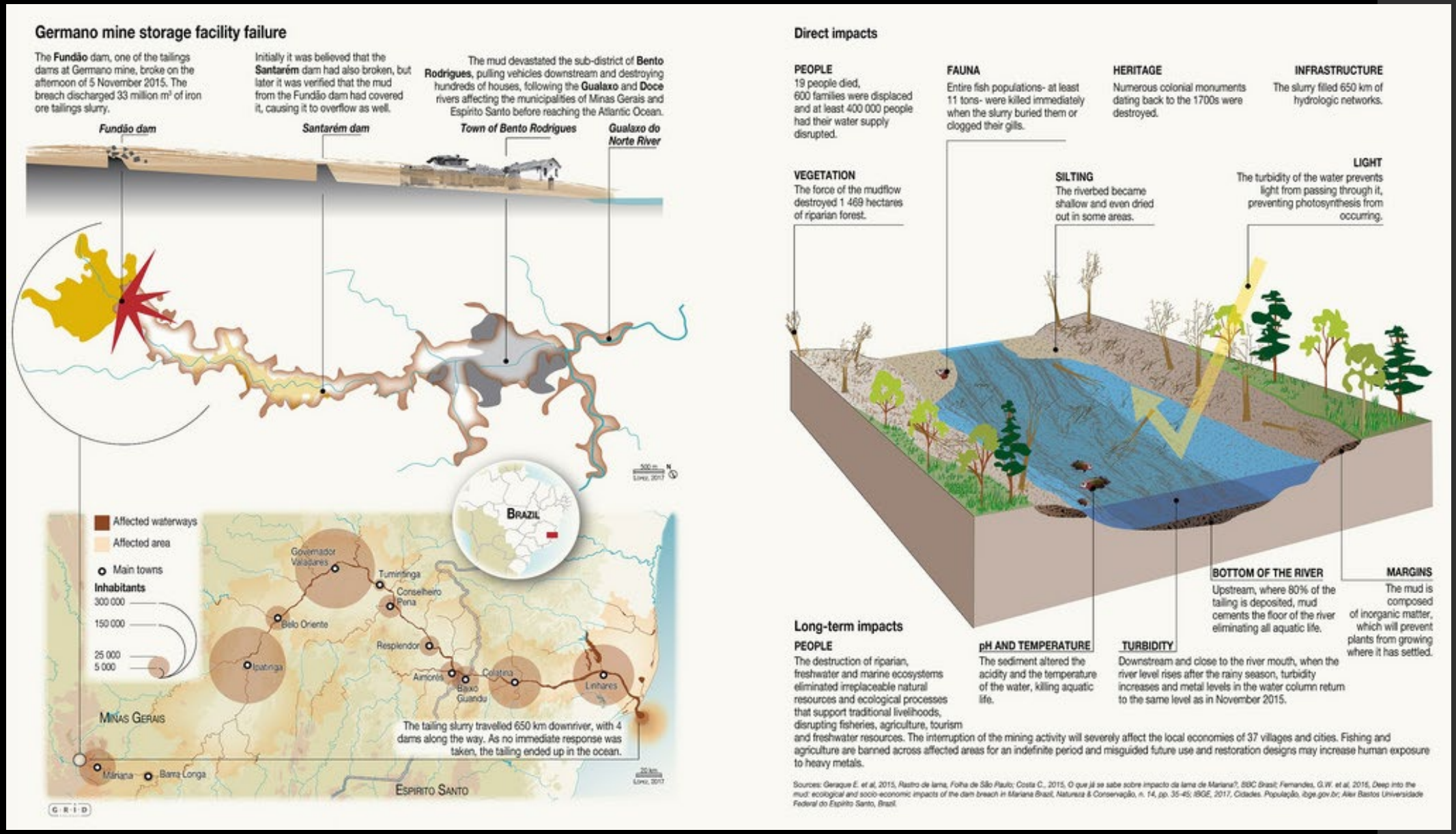
Samarco – Brazil 2015

5 November 2015, the Fundão dam breached, releasing an estimated 33 million m^3 of mine waste slurry.

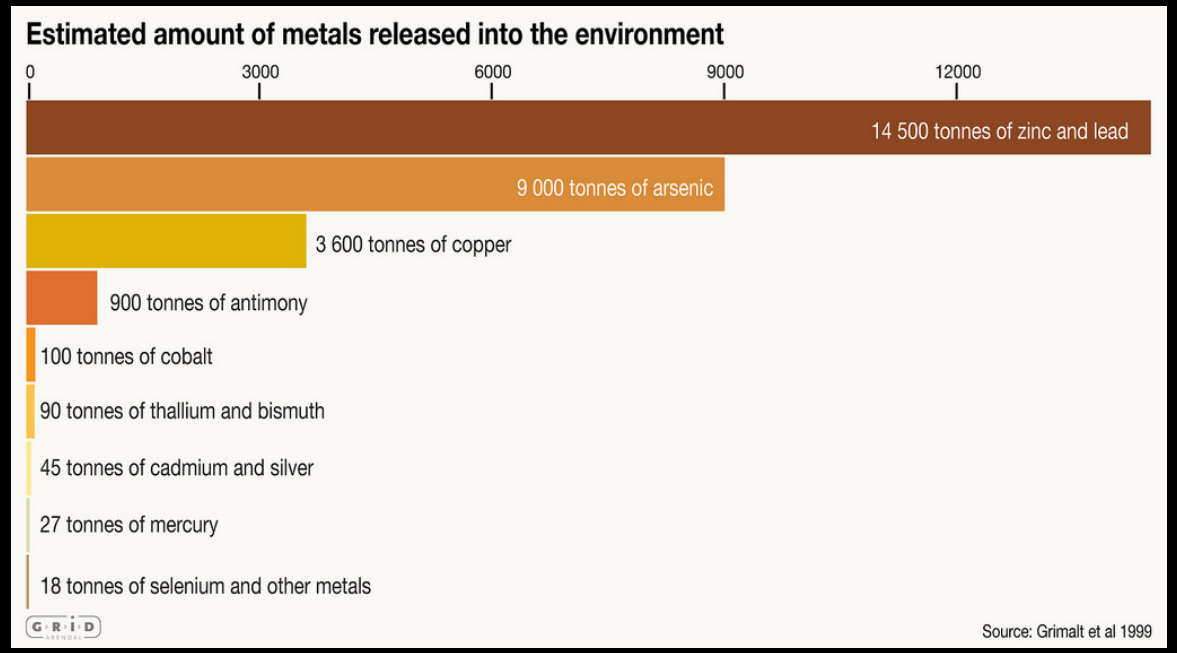
19 people were killed - village residents and Samarco employees.

The slurry reached the Doce River Valley and travelled for 665 km until it reached the Atlantic coast 14 days later.

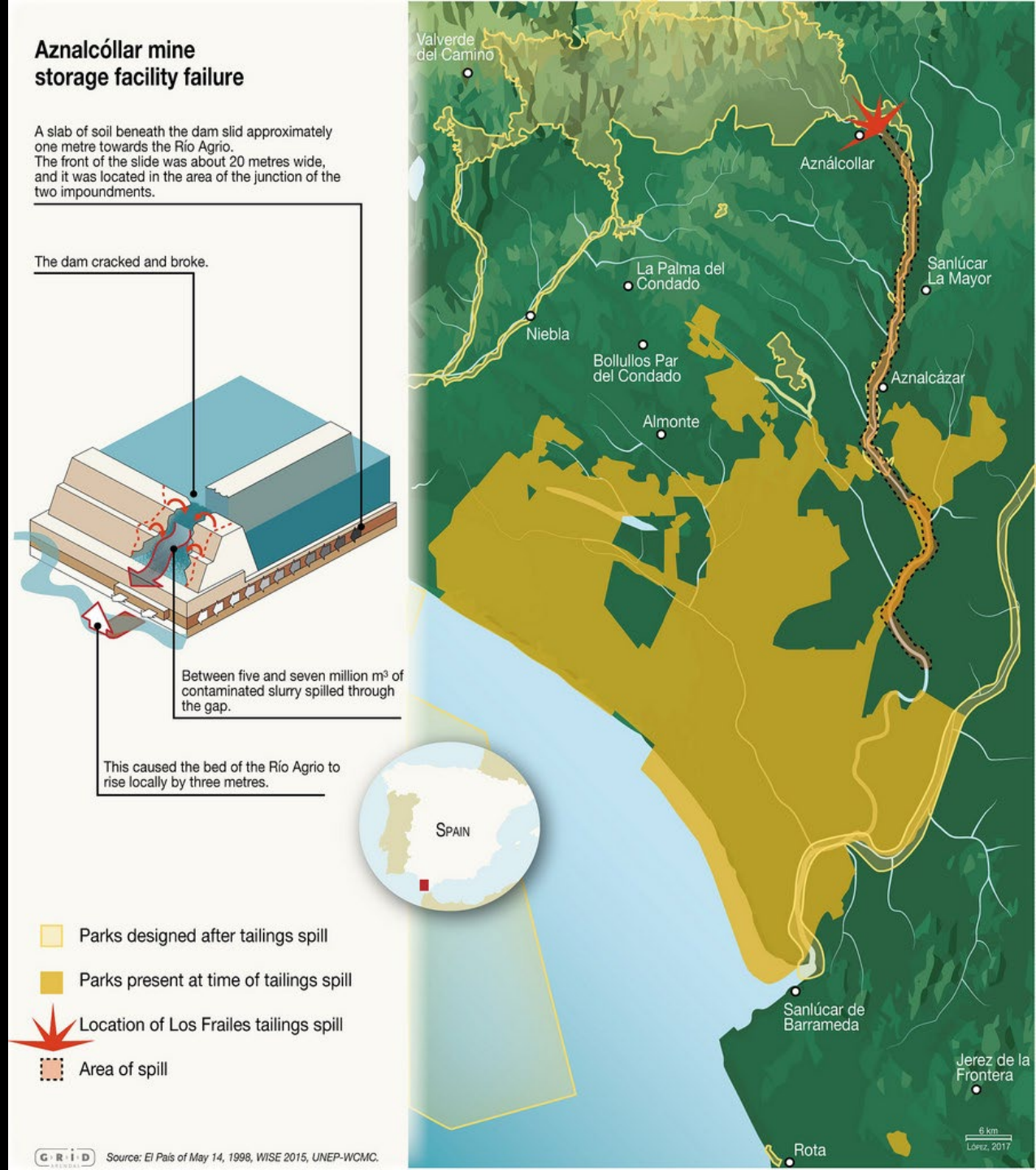
Samarco – Brazil 2015



Aznalcóllar, Spain 1998



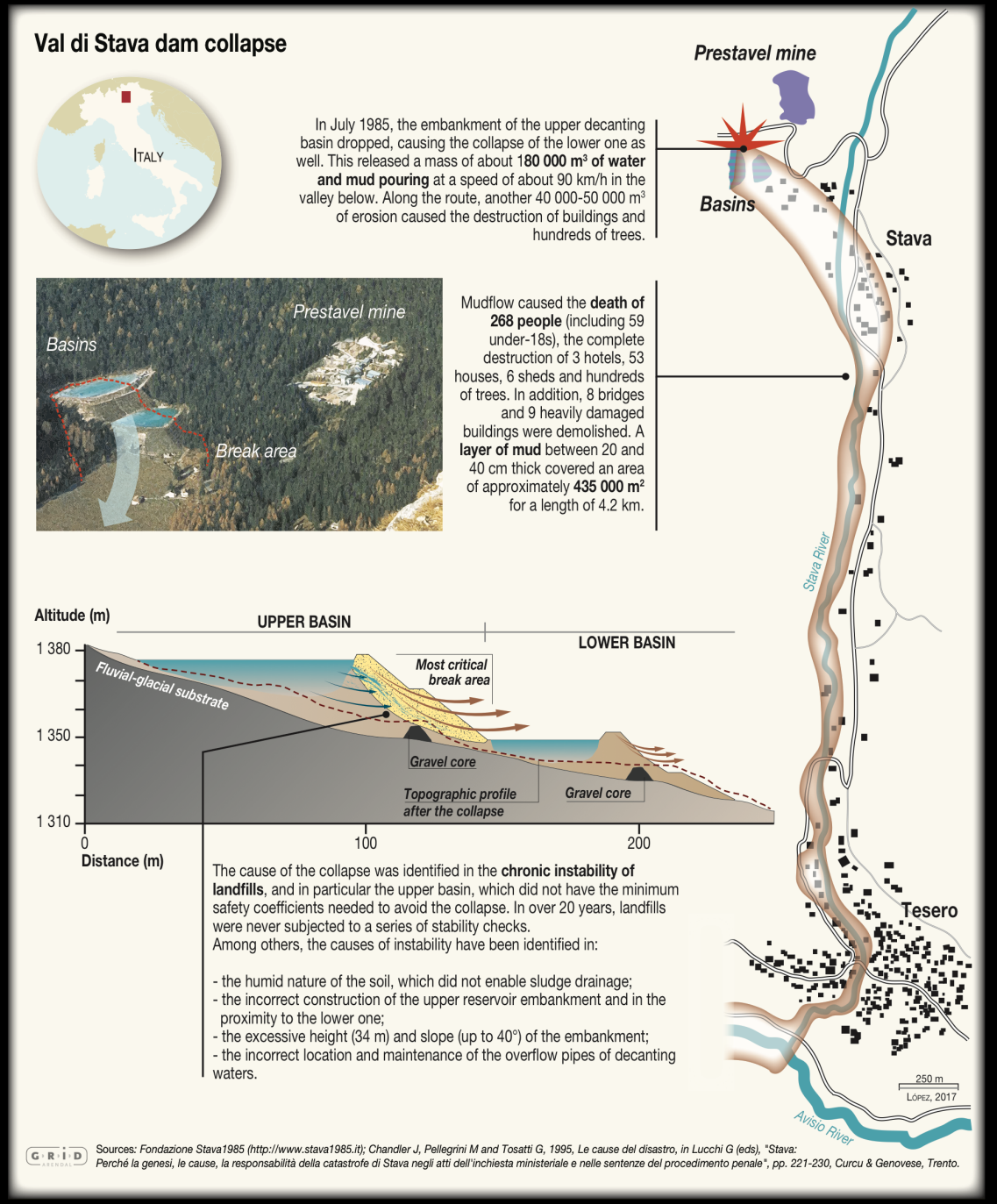
It released approximately 5.5 million cubic metres of acidic, metal-rich water and approximately 1.3 to 1.9 million cubic metres of toxic tailings into the Agrio, Guadiamar and Los Frailes Rivers



Stava *Italy 1985*

In July 1985, the tailings dam of the Prestavel fluorite mine collapsed, causing the deaths of 268 people.

Around 180 000 m^3 of semi-fluid tailings were released, burying the downstream villages of Stava and Tesero.

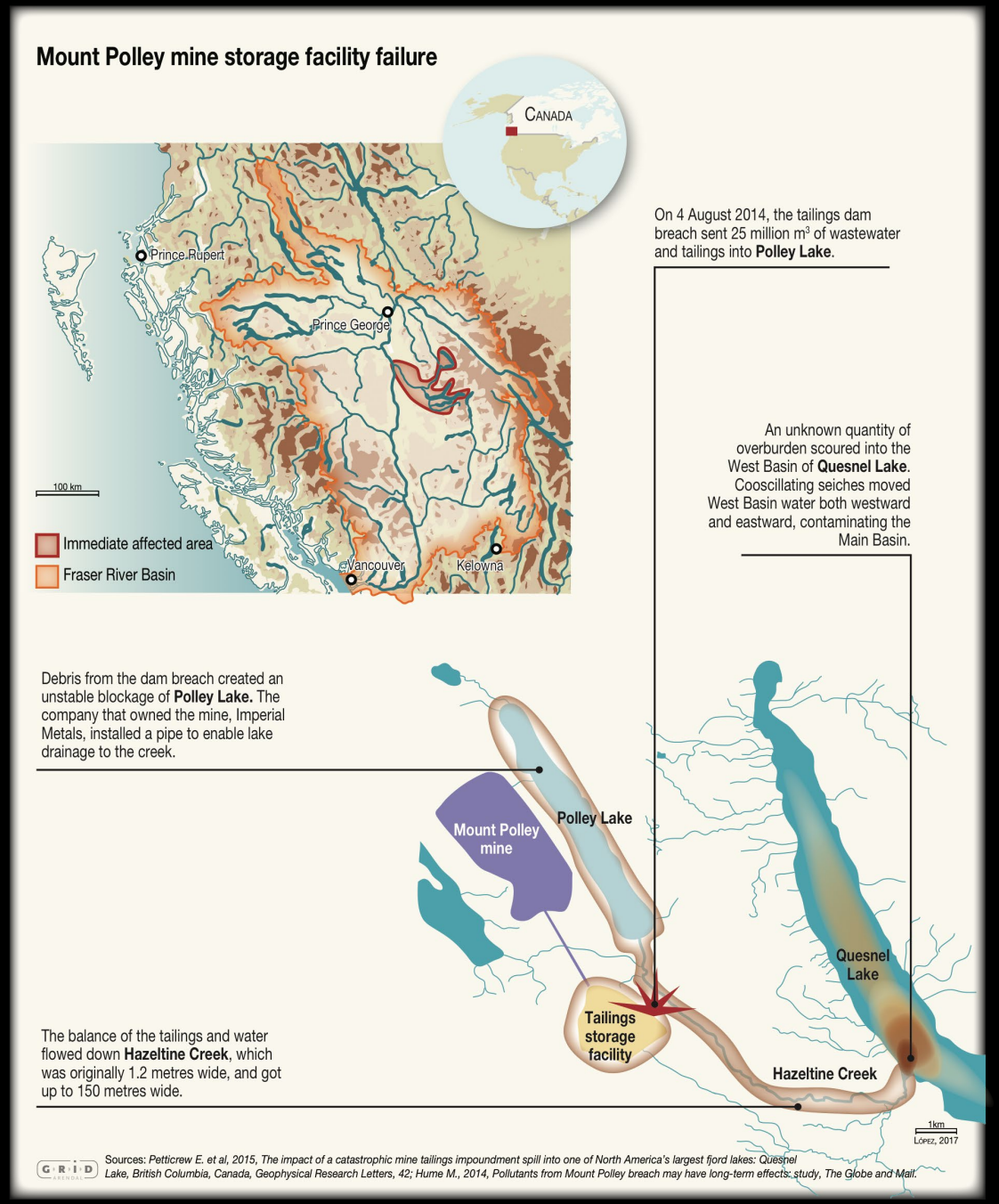


Stava – Italy 1985

Cariboo

Canada 2014

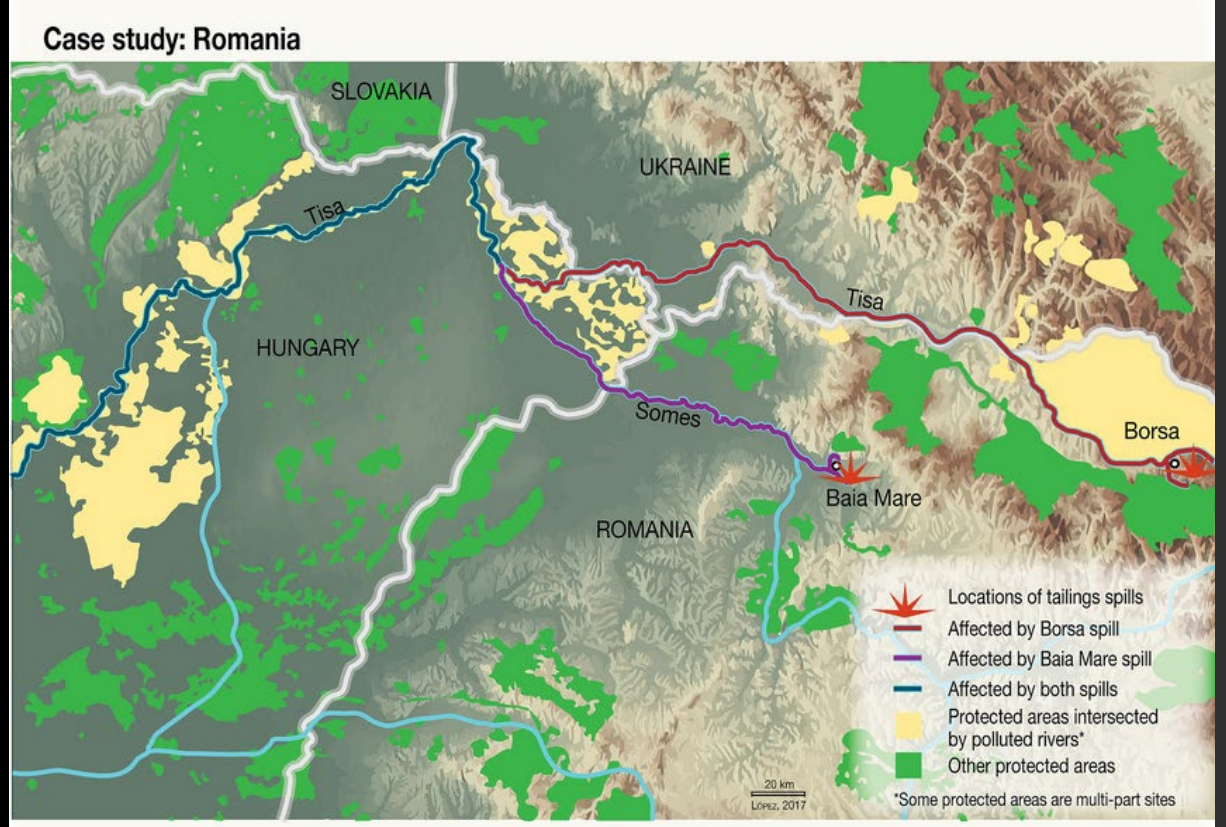
- major mining nation

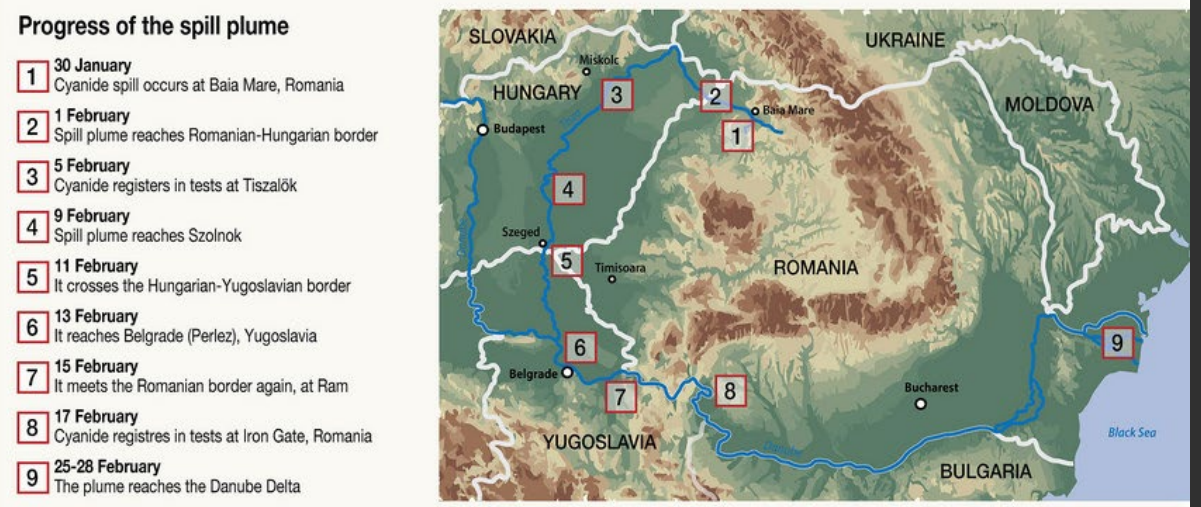


Maramures County

Romania, 2000

- Cumulative
  - Baia Mare – gold
  - Borsa - Zink
- Transboundary



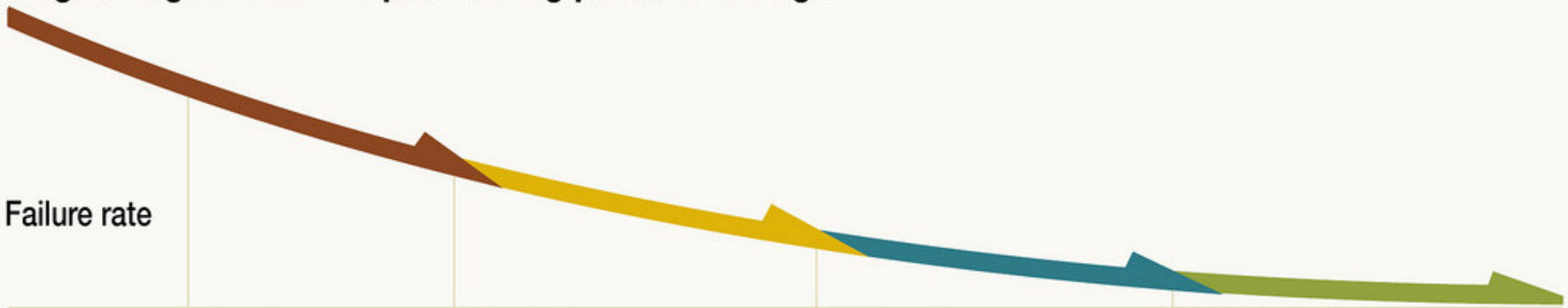


Sources: *UNEP/OCHA, 2000, The Cyanide Spill at Baia Mare, Romania. Before, During and After.*

The challenge

- Tailings dams are increasing in number and size
- Consequences of failure, the disproportionate impact on indigenous and poor communities.
- These risks present a challenge for this generation, now. And if not addressed, will be a debt we leave to future generations.
- Opportunities to reduce risk and improve safety.
- Industry and regulators have been aware of the challenge of safe tailings storage for many years. New process, management strategies, industry guidelines and a commitment to safety resulted in a reduction of catastrophic failures.
- We need to build on these successes.

Regulating for risk - implementing positive change



	Reactive	Dependent	Independent	Interdependent
Priority	Business risk, cost reduction	Meet regulatory standards, business risk	Independent assurance, medium-term focus	Safety and community first, long-term focus
Management	Hands-off	Focused on minimum standards	Focused on satisfying independent external experts	Focused on satisfying and including stakeholders
Incidents	React to incidents	Reduce and respond to incidents	Prevent incidents, planed and assured response	Eliminate incidents, collective stakeholder incident preparation
Transparency	Very poor, obscure or absent systems	Poor systems exist	Good, visible systems	Very good, highly visible, interactive and responsive systems
Safety	Requires self-motivated individuals	Is a goal	Is a personal value	Is a core value
Financial assurance	Often inadequate	Conforms to local standards	Independently assured	Equitable and comprehensive

Reactive — Proactive regulation

"We really care about safety - we always respond to serious incidents"

"We consider seriously what we don´t know"

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Source: adapted from DUPONT Bradley curve 1995

Recommendations – the way forward

Recommendation 1

The approach to tailings storage facilities must place safety first by making environmental and human safety a priority in management actions and on-the-ground operations. Regulators, industry and communities should adopt a shared zero-failure objective to tailings storage facilities where “safety attributes should be evaluated separately from economic considerations, and cost should not be the determining factor” (Mount Polley expert panel, 2015, p. 125)

Recommendation 2

Establish a UN Environment stakeholder forum to facilitate international strengthening of tailings dam regulation.

Actions - knowledge

Knowledge, technology, innovation & people

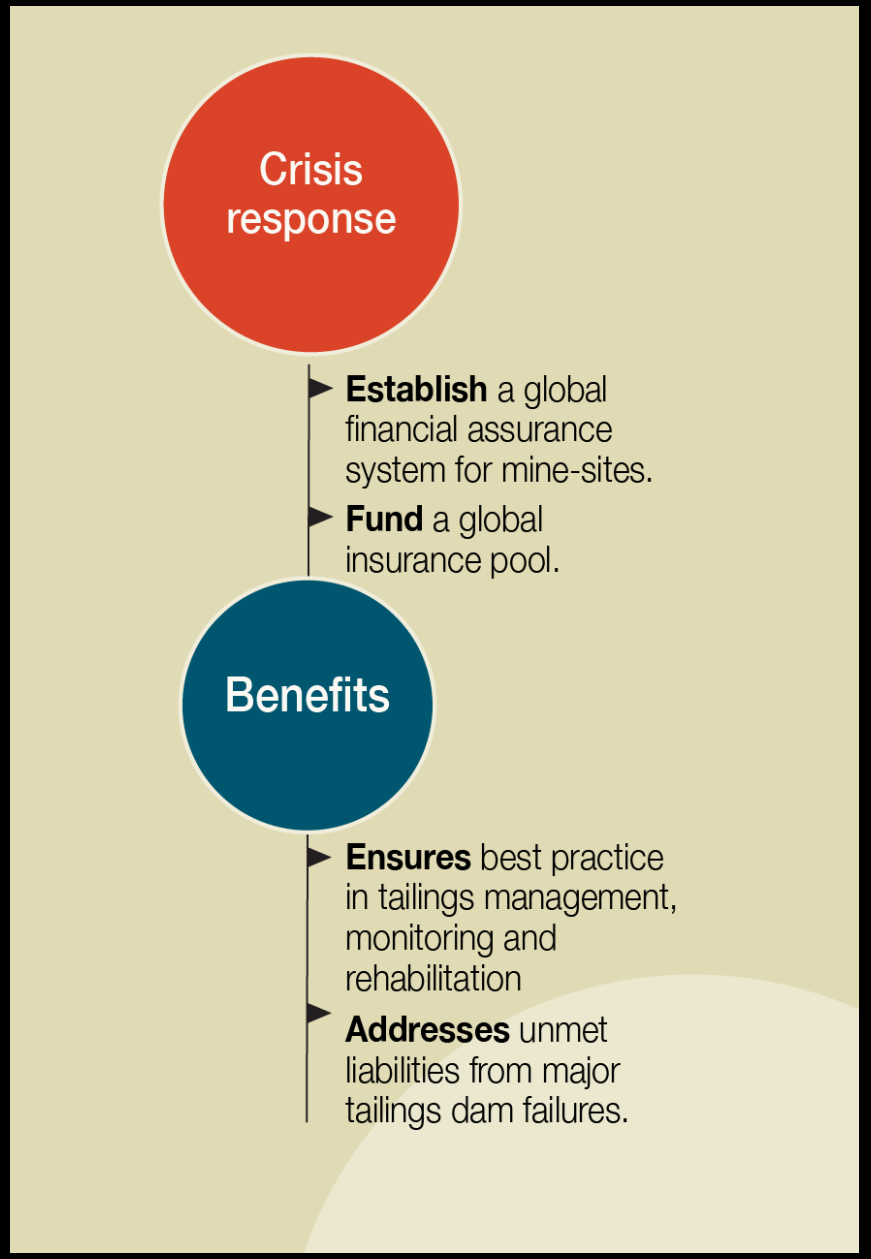
- **Establish** an accessible public-interest, global database of mine sites, tailings storage facilities and research.
- **Fund** research into mine tailings storage failures and management of active, inactive and abandoned mine sites.
- **Compile** and review existing regulations and best practice guidance.
- **Encourage** innovation in the reuse and recycling of mine tailings.
- **Encourage** the development of technological solutions to eliminate the main causes of failures.

Benefits

- **Establishes** a basis for improved regulation and consistent best practice.
- **Assists** in educating people to make informed decisions.
- **Reduces** the volume of tailings stored and potentially creates additional business opportunities.
- **The path** to zero failures (IEEIRP 2015).

Actions – failure prevention

Actions – crisis response



Collective actions – zero failures

- Rethink our approach to tailings dams
- Long-term social assets and liabilities
- Integrative, interdependent approach
- Industry technical and management improvements
- Regulate for success

Recognising the reality of a cyclical global industry, co-operative, international action is the key to ensuring that all tailings dams are fit for purpose and the risks to local and downstream communities, sensitive environments and economics are reduced and managed until we reach our target of zero failures.