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# Tailings Dams – Not Your Normal Dam Hazard

**C. Kelly**

*Disaster Management Consultant*

*United States*

havedisastercallkelly@gmail.com

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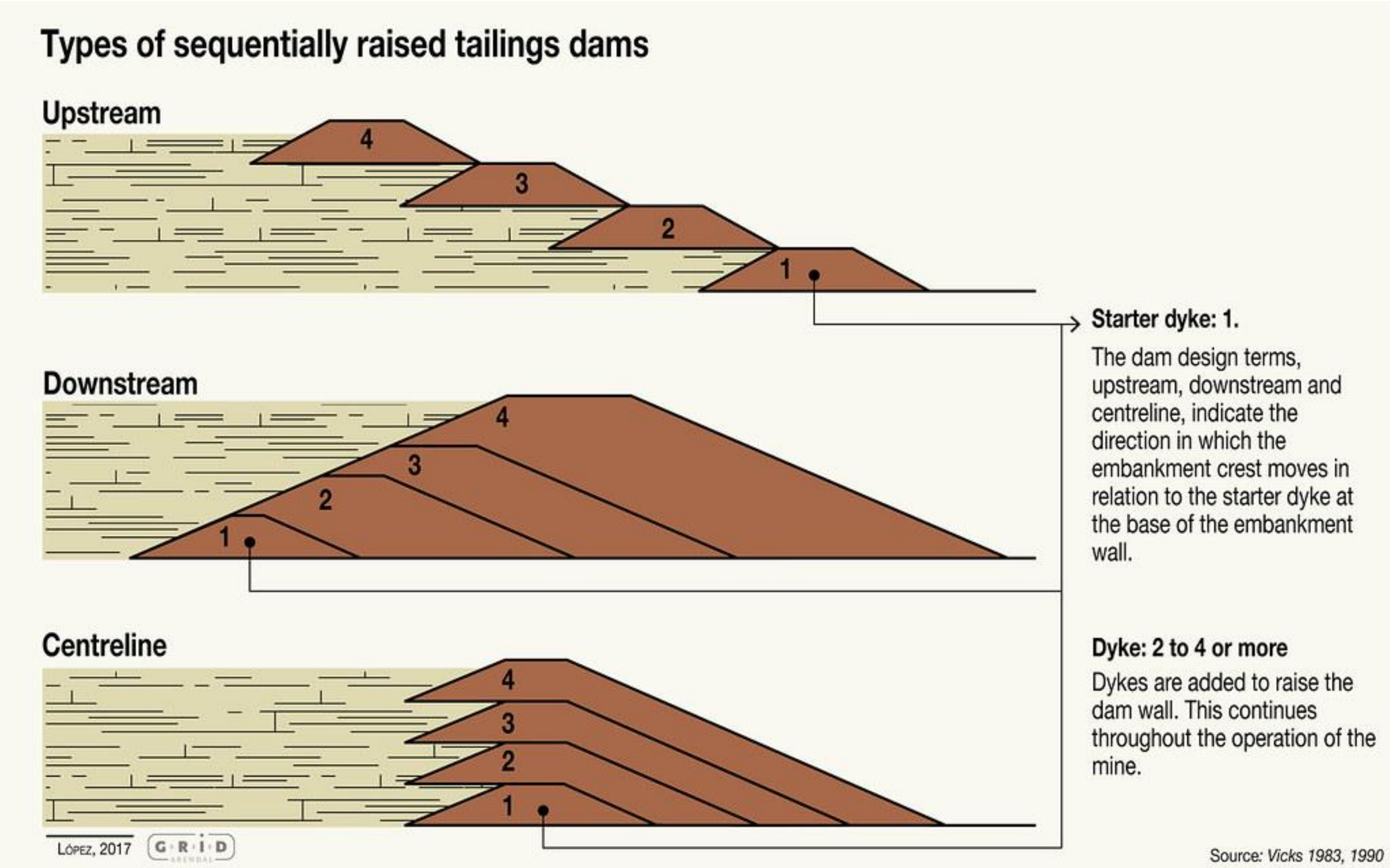
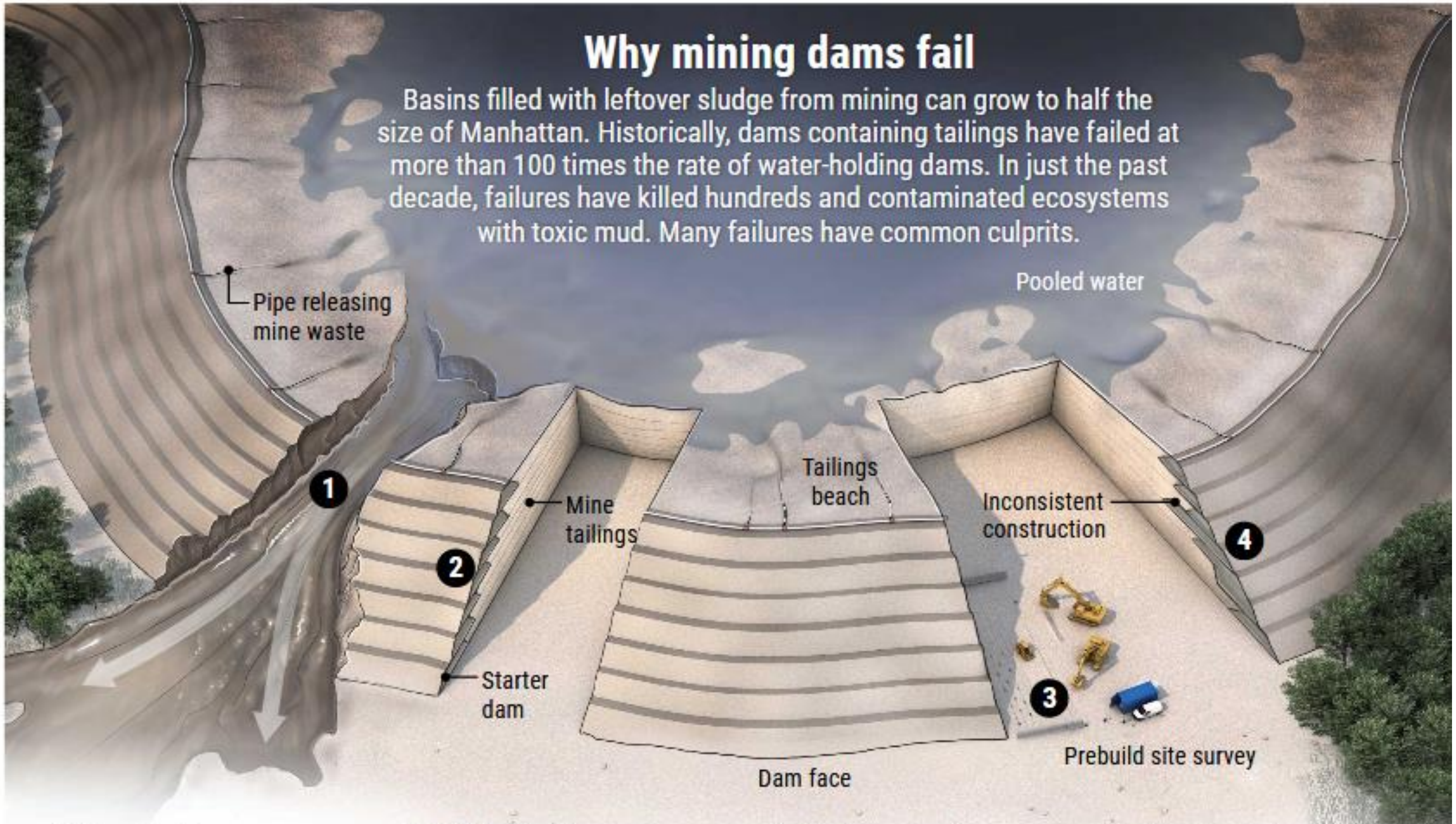
# Not Normal Dams

- Mining tends to have a low product to waste (tailings) ratio – lots of tailings for the reasons for the mining
- Tailings often stored above ground level, behind dams
- Delivery of tailings is often through a water slurry
- But -  tailings dams **not** generally designed to hold significant quantities of water, on the surface or within the tailings
- Tailings need to be dewatering via drainage or evaporation
- Tailings water may be contaminated and hard to treat

# Different Types of Tailings Dams




**1 Liquefaction**
Infiltration of water into the dam is a chief source of failures. In extreme cases, water combined with stress such as an earthquake can cause an earthen dam to suddenly turn to liquid.

**2 A risky design**
Upstream construction is a common but failure-prone approach. The dam is raised gradually, as tailings accumulate. With each new level, the dam tilts upstream, relying on tailings below to help carry the load.

**3 Shaky ground**
Geologic weaknesses in the ground below a dam can leave it vulnerable. In one of the biggest recent failures, dam builders didn't drill deep enough to discover a weak layer left by receding glaciers.

**4 Piecemeal changes**
Unlike water dams, tailings dams evolve. They are built bit by bit over decades as mine waste piles up. This creates more potential for errors.

https://www.sciencemag.org/news/2020/08/catastrophic-failures-raise-alarm-about-dams-containing-muddy-mine-wastes

# Tailing Dam Failure Hazard and Consequences

- Estimated 29,000-35,000 active/inactive tailing dams (https://worldminetailingsfailures.org/)
- Tailing dam failures reported to be much more frequent than water dams
- Issue of legacy tailings dams – from closed facilities or abandoned mines – even when no longer being used, tailings dams need maintenance
- Recent major failures:
  - Samarco collapse – 2015: 19 fatalities, ecological and built infrastructure damage
  - Brumadinho collapse – 2019: 270 fatalities, ecological and built infrastructure damage
  - Piney Point Creek, Florida – 2021: so far, more a public concern than direct impact.

# The Prospect

- More tailing dams, as resource extraction increases with economic growth
- Bigger, and incrementally expanded, tailing dams
- More legacy dam risks
- Possible trend lines
  - Increased # failures due to more dams
  - Increased # failures of old, retired or abandoned dams due to lack of maintenance
  - Reduced # failures due to better design and management; better legacy site management

# Looking Forward

- Industry good practice for tailings dam management, **A Guide to the Management of Tailings Facilities**, overlaps with environmental impact assessment elements focusing on
  - Failure consequences
  - Social impact
  - Ecological, physical infrastructure impact
  - Risk management (EMMP)
- Given tailing dam failure rate, EIAs need to better anticipate failure modalities and risk management
- Mechanism needed for EIAs for legacy tailing dam – likely a very long term threat



# *Let's continue the conversation!*

Post questions and comments via chat in the IAIA21 platform.

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