UNIVERSITY OF THE
FREE STATE
UNIVERSITEIT VAN DIE
VRYSTAAT
YUNIVESITHI YA
FREISTATA
ECONOMIC AND
MANAGEMENT SCIENCES

Let's learn from disasters: Six lessons from the Jagersfontein tailings dam disaster

Four years ago, on 11 September 2022, the Jagersfontein tailings dam collapsed. Two people were killed and one was never found. Five to six million cubic metres of slurry escaped, damaging infrastructure and 200 homes and contaminating roughly 1600 hectares of agricultural land. A criminal case is underway.[1] The court case may prove negligence and non-compliance with legislation, but it cannot ensure full accountability for the disaster.[2]

The official report on the Jagersfontein disaster uses the word 'disaster' only four times but the word 'failure' more than 400 times and 'catastrophic failure' only once.[3] The overwhelming emphasis is on technical failure. There is no reference to non-compliance with the Disaster Management Act 57 of 2002.[4] The Act requires municipalities to identify risks to communities and households. To do this, municipalities must involve communities in disaster planning and integrate disaster risk reduction into municipal strategic plans (called Integrated Development Plans in South Africa).

This policy brief presents six lessons to be learnt from the Jagersfontein tailings dam disaster. The brief is informed by a four-year collaborative research project following the disaster.[5]

Lesson 1: Understand that tailings storage facility disasters result from long-term governance problems not just technical failure

The Jagersfontein collapse was caused by the instability of the dam's southern wall, embankments constructed on weak foundations of old tailings, and long-term deformation of the dam wall.[6] Satellite imagery indicated progressive wall movement and deformation of nearby infrastructure, including displacement of an access road.[7] This evidence was available to the mining company and the Department of Water and Sanitation but was not accessible to the municipality or the community.

The conditions preceding the Jagersfontein tailings dam disaster developed over 150 years of mining: successive phases of exploration, operation, closure, and reprocessing of mine waste. Each phase introduced new actors, technologies and governance arrangements.[8]

Technical factors are important but do not alone explain the disaster. Engineering failures occurred within a governance context characterised by regulatory gaps, ownership transfers, technological changes and insufficient oversight.[9]

Technical factors alone do not explain the disaster

[1] Marais, L., Kemp, D., Van der Watt, P., Matebesi, S., Cloete, J., Harris, J., Ang Li Ern, M., Owen, J.R., 2024. The catastrophic failure of the Jagersfontein tailings dam: an industry disaster 150 years in the making. *International Journal of Disaster Risk Reduction*, 109, 104585

[2] State versus Jagersfontein Developments (Pty) Ltd and Others, 2024

[3] DWS (Department of Water and Sanitation), 2024. Final Investigation Report: Failure of the Jagersfontein Fine Tailings Storage Facility, Eastern and Western Compartments. Department of Water and Sanitation, Pretoria

[4] Admittedly, the report's purpose was to expose the technical aspects of the failure.

[5] This policy brief is based on a collaborative research project between the University of the Free State and Queensland University, entailing in-depth interviews with survivors and institutional respondents over the past four years. This work was supported by the Australian Research Council (ARC) LP200301160.

[6] DWS, 2024

[7] DWS, 2024

[8] Marais et al., 2024

[9] Marais et al., 2024; DWS, 2024

The mine closed in 1971, but the site reopened in 2010 to reprocess the old tailings, making it necessary to add more tailings storage compartments to the dam. This meant that historical infrastructure interacted with newer structures and operational decisions. These changes, along with the weak governance context, created conditions where risk gradually intensified.

Lesson 2: Acknowledge early warning signals and integrate them into a disaster risk reduction plan

Warning signs – regulatory reports, miners' concerns and community reflections – preceded the disaster.[10] Two obstacles hindered action. One was the hierarchy of knowledge: the mine company ignored the concerns of miners and the community. The other was concealment of risk: neither the mine nor Department of Water and Sanitation shared what they knew with the local communities, even when the regulator halted mining operations in 2020 because of operational concerns.[11] Satellite imagery revealed signs of instability in 2019, including displacement and deformation along the embankment.[12] This information was never shared with local stakeholders. Nor did it prompt the development of a disaster risk reduction strategy in line with the Disaster Management Act.

Risk detection does not automatically reduce disaster risk.[13] An early warning system needs to integrate risk knowledge, monitoring, communication, and response capability. At Jagersfontein, the mine and the Department of Water and Sanitation managed these components separately. The mine conducted monitoring activities but failed to communicate them to the community warning systems. Institutional hierarchies and technocratic approaches can prevent warning signals from triggering timely responses.

Institutional and technical complexity can delay response

Monitoring data may remain within technical or corporate domains without becoming actionable warnings.

Lesson 3: Include communities to reduce disaster risk

Miners and residents saw warning signs and raised concerns.[14] But corporate and regulatory actors kept the technical information within formal processes. They failed to convert it into practical warnings for the community. Consequently, people did not understand how much they were at risk, received no evacuation guidance and did not know how to react to the first signs of the dam breaking.

Community participation to reduce disaster risk must go beyond occasional consultation. Mining companies, regulators and municipalities should have channels for workers and residents to report concerns, receive feedback and trigger an independent investigation. Risk assessments, inspection findings and emergency procedures should be presented in a form understandable to the layperson. Communities should be invited to participate in identifying vulnerable households, designing evacuation routes, selecting safe gathering points and conducting regular drills. Community inclusion strengthens risk knowledge, improves the interpretation of warning signals and ensures that emergency plans reflect local realities.

[10] Mavundla, X., Marais, L., Van der Watt, P., Venter, A., Cloete, J. and Matebesi, S. 2026. Signals without systems: Early warnings in the Jagersfontein tailings disaster, *The Extractive Industries and Society*. Manuscript under review.

[11] DWS, 2024
[12] DWS, 2024
[13] Mavundla et al., 2026
[14] Mavundla et al., 2026

Lesson 4: Build disaster planning on grounded experience

Disaster planning could benefit from drawing on the lived experiences of disaster survivors. The Jagersfontein research shows that 'disaster scenes' can reconstruct what happened before, during and after a disaster and reveal realities that plans often overlook.[15] These include how residents interpret warning signs, where they go when danger becomes visible, which routes become inaccessible, how communication systems fail, and who provides the first rescue and support.

At Jagersfontein, residents discovered the disaster for themselves, escaped despite the absence of an official warning, and relied on one another as first responders to save lives. This shows the disconnect between formal emergency plans and the conditions that residents and responders faced. It shows how institutional absence, delayed communication and poor coordination can intensify harm.

Residents managed by themselves, escaped despite the lack of warning and depended heavily on neighbours[16]

Communities should also participate in testing plans, identifying safe routes, and defining practical response measures. Grounded experience can improve disaster planning. Regulators, mining companies, municipalities and emergency services should document survivor experiences to learn and reflect on lessons learned.

Lesson 5: Ensure complete recovery and avoid new harm.

The Jagersfontein experience shows that rebuilt houses and partial compensation do not necessarily produce recovery.[17] Four years after the disaster, residents continue to live with unfinished repairs and poor reconstruction, and are unable to replace the furniture, vehicles, gardens, livestock and income-generating equipment that they lost. Many used pensions to survive and reduced their spending on food, health care and transport. They absorbed their unresolved losses privately.

Uneven recovery occurs when compensation rules are unclear, decisions are undocumented, promises are not kept, and one must negotiate unaided with the responsible party. Further harm is possible through recovery. These conditions weaken collective influence, prolong uncertainty and make seeking remedy costly and humiliating.

Policy should distinguish interventions from actual recovery. Authorities should assess whether households have restored their livelihoods, assets, social ties, security and dignity, not just whether houses were delivered. Compensation systems require transparent criteria, independent oversight, accessible appeals and long-term monitoring. Recovery should remain an institutional obligation until material, economic and social losses have been remedied. An incomplete remedy can turn temporary harm into permanent loss.

Lesson 6: Document disasters and create opportunities for reflection

Disasters should be systematically documented and reviewed. Official

[15] Owen, J., Kemp, D., Van der Watt, P., Harris, J., Ang, M., Marais, L., 2024. Disaster scenes as a foundation for emergency response planning. *International Journal of Disaster Risk* Reduction, 113, 104795

[16] https://www.ufs.ac.za/econ/faculty-of-economic-and-management-sciences-home/departments-and-divisions/centre-for-development-support-home/jagersfontein-project/jagersfontein-pixels-to-perspectives

[17] Harris, J., Van der Watt, P., Owen, J.R., Marais, L. and Kemp, D. (2026) Recovery without recovery: Adaptation and unresolved loss following the Jagersfontein mine tailings disaster. *International Journal of Disaster Risk Reduction*. Manuscript under review.

investigations often focus on technical causes, legal compliance and physical damage. Although these issues matter, the process of documentation must not overlook how warning signals were handled, how institutions responded, what people experienced and why recovery measures succeeded or failed.

The Jagersfontein case shows that survivor accounts can reconstruct the disaster across its pre-disaster, immediate, response and recovery phases. These accounts reveal communication failures, improvised evacuations, local rescue efforts, institutional absence and continuing losses that technical reports may not record.

Documentation should combine technical evidence, official records, worker knowledge, community testimony, photographs, maps and long-term follow-up research. Authorities should preserve this material and use it in independent reviews, public discussions, emergency exercises and scenario planning. Reflection should not become a once-off exercise conducted only to assign blame. The review should identify institutional weaknesses, assess how policies worked in practice, and track the implementation of recommended reforms. Documenting recovery is equally important because rebuilding activities may cover up unresolved material, social and emotional harm. Without documentation and reflection, disasters become isolated events from which institutions learn little.

Studying disasters as isolated events teaches us little

A learning process can strengthen accountability, improve planning and prevent governance failures from recurring.

Recommendations and practice notes

The Jagersfontein tailings dam collapse is a prime example of how such disasters arise from the interplay of long-term technical weaknesses, governance failures, historical decisions and social exclusion. In addition to these lessons, we recommend that policymakers:

- Treat tailings storage facility disasters as governance failures, not just technical failures.
- Regulate tailings storage facilities throughout their full lifecycle.
- Convert warning signals into an early warning system.
- Make risk information accessible and actionable.
- Include communities in disaster risk reduction.
- Base emergency plans on lived experience.
- Clarify institutional responsibilities before a disaster occurs.
- Assess people's risk exposure alongside technical risk.
- Measure recovery according to people's own experience
- Create transparent and independently supervised recovery measures.
- Recognise that incomplete recovery can create new harm.
- Document disasters and reflect on them publicly.
- Monitor recovery outcomes and take action to address gaps.