WEBINAR

Water Management in Mining: Managing water risk, resilience and trust across mining operations

Answers to additional questions

In this document, the panellists from the webinar jointly organised by TDi Sustainability and the Asian Deelopment Bank (ADB) answer the questions they didn't have time to address during the live event.

Christine Bryant
Senior Safeguards Specialist
Asian Development Bank

Topics: Overview, safeguards, governance and community dimensions

Question 1:
We have seen a shift in the Forestry and CSG sectors approach to Water Stewardship to a more outcome-based approach that requires monitoring of environmental health and resilience. This requires a more ecosystem-based approach and includes monitoring of state of nature as well as water security and chemistry. Do you see this happening in the mining sector?

Answer:

I think the sector is moving in that direction, although unevenly. Historically, mining projects focused more on compliance monitoring — whether discharge limits were met, whether abstraction volumes stayed within permit conditions, etc. Increasingly though, there is recognition that this does not necessarily tell you whether the wider system is remaining healthy, particularly in stressed basins or sensitive ecosystems.

The stronger projects are starting to look more at catchment context, cumulative pressures, ecological condition and resilience over time. But there is still a big gap between what is discussed at a policy level and what is consistently implemented on the ground.

Question 2:
Cumulative impacts are commonly required in some jurisdictions, for example in Australia, especially for aspects like Air Quality. The beyond the fence assessments for water is driven by multiple players, from the regulator, the miner and the consultant acting for them.

Unless the cumulative impact assessment is enforced then the quality of that assessment in the ESIA may be variable in quality. To what extent does the panel feel that the guidelines for mining companies need to be more enforceable and for the mining company to demonstrate beyond just modelling that they are not impacting water resources during operations?

Where is the balance between proponent and regulatory responsibility in encouraging positive water stewardship?

WEBINAR

Water Management in Mining: Managing water risk, resilience and trust across mining operations

Answers to additional questions

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Answer:

In practice, cumulative impact assessment quality is still highly variable. A lot depends on the quality of the baseline data, whether other users and future demand are realistically considered, and whether there is meaningful follow-through after approval.

I do think there needs to be greater emphasis on demonstrating performance through monitoring and adaptive management, not just modelling. Particularly for water, there can sometimes be too much confidence placed in model outputs despite significant uncertainty or limited baseline information. Regulators clearly have an important role in setting minimum expectations, but in higher-risk contexts lenders and investors are also increasingly driving more rigorous approaches.

Question 3: What commitments should be agreed upon directly with local communities regarding water access management?

Answer:

Commitments should be specific enough that communities understand what is being promised, how performance will be monitored, and what will happen if impacts occur. That includes access arrangements, water-quality and quantity monitoring, disclosure of results, grievance channels, contingency measures during shortages, and clear escalation if thresholds are exceeded.

Where water stress is a risk, domestic and livelihood water needs should be considered in advance, with agreed trigger levels and response measures reflected in the ESMP, water management plan and stakeholder engagement processes. A technically sound water assessment is important, but it will not be enough if communities do not trust the evidence, understand the commitments, or have a credible way to raise concerns during implementation.

Question 4: What is the best practice as to prioritising water access between the community and the mine in times of water stress?

Answer:

Best practice is to identify potential water stress scenarios and priority water uses early in project planning and assess them properly through the ESIA process, rather than waiting until shortages occur. Where community domestic or livelihood uses may be affected, these should be clearly assessed, with commitments then carried through into the ESMP, water management plans, stakeholder engagement processes and contingency procedures.

WEBINAR

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Answers to additional questions

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For the mine, this may include trigger levels, monitoring requirements, measures to reduce abstraction during periods of stress, increased recycling or reuse, and clear communication protocols with affected users. The important thing is that these commitments are translated into operational management measures and monitored during implementation.

Question 5: What does credible water stewardship look like in practice?

Answer:

I think there is sometimes a tendency to speak about water stewardship at quite a high level, but in practice credibility depends on whether water-related risks are actually influencing project decisions and operations.

That starts with having a strong understanding of basin context, other water users, seasonal variability and cumulative pressures — not just the project footprint itself. It also means being realistic about uncertainty and limitations in the available data, particularly in more water-stressed or hydrogeologically complex settings.

Credibility also depends on trust in the evidence base. A project may technically conclude that there is limited hydrological connectivity with community water sources, but if affected people do not understand or trust that conclusion, or feel their concerns have not been heard, the issue can still become a serious project risk.

Question 6: What are the speaker's views on requiring Free Prior Informed Consent by impacted Indigenous Peoples for mining projects?

Answer:

Where Indigenous Peoples may be affected, FPIC is an important safeguards issue, particularly because water, land and natural resources may be closely tied to livelihoods, cultural identity and traditional use.

From a project risk perspective, it is not enough to treat this as a procedural consultation requirement. Engagement needs to start early, be culturally appropriate, and provide affected Indigenous Peoples with clear information on potential impacts, alternatives and mitigation measures.

Whether FPIC is formally required will depend on the applicable legal and lender framework, but where significant impacts are possible, weak engagement or unresolved concerns can create serious legitimacy, conflict and implementation risks for the project.

WEBINAR

Water Management in Mining: Managing water risk, resilience and trust across mining operations

Answers to additional questions

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Question 7: At what point does the precautionary principle simply override the economics of extraction in high biodiverse marine environments?

Answer:

I don't think there is a simple threshold where this becomes automatic, but the precautionary principle becomes increasingly important where uncertainty is high, ecosystems are particularly sensitive, and impacts may be irreversible or very difficult to mitigate.

In many highly biodiverse marine environments, there are still major uncertainties around ecosystem function, connectivity, recovery timeframes and cumulative effects. This makes it much harder to rely confidently on conventional impact prediction and mitigation approaches.

Where impacts cannot be credibly characterized, avoided or managed with reasonable confidence, the level of uncertainty itself becomes a significant consideration in decision-making — not just the projected economic benefits of the activity.

Question 8: Realistically, what is needed to shift towards using nature data more centrally in how corporates manage their water?

Answer:

Nature data needs to move from being mainly a reporting input to something that actually informs project design, operational decisions and risk management.

In practice, that means companies need better baseline data on ecosystem condition, water-dependent habitats and other users of the resource, but also internal systems that require this information to be considered in approvals, monitoring and management responses.

The challenge is not only collecting more data. It is making sure the data is decision-useful, linked to clear thresholds or triggers, and actually influences management responses where risks to ecosystems or water users are identified.

WEBINAR

Water Management in Mining: Managing water risk, resilience and trust across mining operations

Answers to additional questions

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Question 9: How can transboundary effects of water use be managed by the mining sector?

Answer:

Transboundary water issues are one of the more complex areas of mining impact assessment because river basins, groundwater systems and ecological impacts do not follow administrative boundaries. From a safeguards perspective, the key point is relatively simple: if a project may affect water resources, downstream users or ecosystems across a border, then those risks need to be assessed.

In practice, this can become difficult where baseline data is limited, neighbouring states have weak cooperation mechanisms, or direct engagement is politically sensitive. But that is not a reason to underscope the assessment. It means the ESIA needs to rely on the best available information — including independent studies, satellite imagery, regional hydrological data and international monitoring sources — while also being transparent about uncertainty and data limitations.

Where uncertainty remains significant, the assessment should take a precautionary approach and explain clearly what is not known, why it matters, and how monitoring and adaptive management will help address those uncertainties over time. The assessment needs to follow the water system, not just the political or project boundary.

WEBINAR

Water Management in Mining: Managing water risk, resilience and trust across mining operations

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Antti Pasanen
Senior Specialist
Geological Survey of Finland (GTK)

Topics: Technical, hydrogeology and monitoring

Question 10: Mines and mine water management also offer significant opportunities for collaborative scientific research, which is essential for reducing monitoring costs and minimizing the environmental impacts of mining. However, engaging mine operators in research collaboration can sometimes be challenging and requires building mutual trust. What do the panelists see as the most effective ways to engage mine operators in research partnerships?

Answer:

The best research partnerships usually start with a problem the operator already cares about, such as uncertainty in baseline conditions, treatment costs or monitoring efficiency. Also, in many cases the academia brings new topics to the mining companies, which were not on their agenda, but could be important in the future. In many cases the mining companies like to be ahead of regulations and invest in new research. Trust grows when research is transparent about how data will be used. Clear governance, confidentiality where needed, and visible value for both sides are essential.

Question 11: A question to Antti: how long should the pre-construction phase monitoring period be in geohydrology? One year, few years?

Answer:

One year is rarely enough on its own, because you need to understand seasonal variation and, ideally, inter-annual differences as well. It would be the best that the monitoring is started during the exploration stage and amended when the plans evolve. Given the time from the late stages of exploration to opening of the mine, the monitoring would be several years.

Question 12: Impact of climate change on mine water, how do we manage it?

Answer:

Climate change affects both water availability and water extremes, so mines need to plan for droughts, intense rainfall, flooding and changing groundwater recharge. In practice that means dynamical modelling of water balances, taking into account different local climate change scenarios, and minimum and maximum scenario modelling. Also ,extreme scenarios, that are unlikely should be modelled. The robust storage and treatment design, stress testing, and adaptive operating rulesshould be based on the modelling. The key is to design for variability, not historical averages alone.

WEBINAR

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Question 13: Field analysis of the water samples is needed in remote sites, but so far portable devices only give totals. Are they enough?

Answer:
Portable devices are useful for rapid screening and operational decisions, but they are usually not enough on their own for full compliance or detailed hydrochemical interpretation. They should sit within a tiered monitoring system, supported by laboratory analysis, QA/QC and periodic calibration. The question is not portable versus lab, but what each is fit for.

Question 14: How to realise a water balance and what are the limitations of groundwater modeling in mining

Answer:

A water balance starts by quantifying all inflows, outflows, storage changes and reuse across the site in the wider catchment context. The water balances should be modelled with different scenarios. Groundwater models are valuable, but they are only as strong as the data, assumptions and conceptual model behind them. Their main limitations are uncertainty, scale effects and the temptation to treat model output as more precise than it really is.

Question 15: What type of recycling methods are currently available for the industry to reduce freshwater consumption?

Answer:

Common recycling approaches include reclaiming process water from tailings facilities, thickening and filtration, pit water reuse, treatment and recirculation, and in some cases dry stacking to reduce water demand. The right option depends on ore type, chemistry, climate and cost. The most effective systems combine several methods rather than relying on one technology alone.

WEBINAR

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Question 16: What are the data types used, how is uncertainty communicated/incorporated into water risk assessments under climate variability?

Answer:

Good assessments combine hydrological, hydrogeological, hydrochemical, climate, ecological and operational data. Uncertainty should be shown explicitly through ranges, scenarios, confidence levels and sensitivity testing, not hidden behind single-point outputs. Under climate variability, scenario-based planning is particularly important because non-stationarity makes historical trends less reliable.

Question 17: Mine dewatering use/optimisation?

Answer:

Mine dewatering should be optimized against both operational need and wider water impacts. That means understanding drawdown cones, timing, reuse opportunities, discharge quality and downstream receptors, then adjusting pumping accordingly. In some cases, better sequencing and water reuse can reduce both energy costs and environmental pressure. There are a multitude of methods for mine dewatering, both open-cast mining and underground, such as, dewatering galleries and ponds, pumping from boreholes outside the excavation etc. Dewatering is also important safety factor. High water contect at the excavation walls may lead to collapses.

Question 18: Maybe touch on mine closure and water management - risk of artisanal miners on water management?

Answer:

Closure is often where water risk becomes long-term and less visible, especially if treatment liabilities persist or informal mining later disturbs the site. Closure planning therefore needs to start already during the exploration period and need to be continuous throughout the life of mine. It should also include post-closure water quality and access risks, and consider realistic land-use scenarios. In post-closure there may not be personnel on the site and maintenance of active water management methods, such as pumps, may be difficult or absent. Therefore, the water management should be gravity-driven and very robust. The post-closure period, in the sense of natural sciences, may be thousands of years and it is unlikely there will be the mining company managing the site. Where artisanal mining is likely, that should be treated as a design and governance issue, not an afterthought. In artisanal mining, it is usual, there are several excavations close to each other and old, flooded excavations may flood to active excavations. This is similar to old mining regions in Europe, but the excavations tend to be mapped to reduce the risk.

WEBINAR

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Answers to additional questions

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Question 19: What are some of the best available techniques employed?

Answer:

Best available techniques depend on context, but often include water-efficient processing, high-rate thickening, lined storage, seepage collection, dry stacking where feasible, fit-for-purpose treatment and real-time monitoring. The best results come when these are integrated into site design from the outset. Retrofitting works, but it is usually more expensive and less effective. The modelling of both the water balance and different natural conditions is highly recommended. Also, the gravity-driven water management reduces the problems caused by equipment failure.

Question 20: What are the challenges around wet tailings and water management? Share best practices of battery materials mining.

Answer:

I assume the question doesn't concerne wet covers of tailings. Wet tailings raise several water challenges: seepage, stability, reclaim efficiency, treatment needs and vulnerability to extreme rainfall. The tailings are affected by the forces of the nature, increasing the oxidation and erosion before covering. Best practice includes strong water balance control, robust embankment and seepage design, high monitoring intensity, and maximizing reclaim to reduce freshwater demand. Battery materials are no different than other mining. The mined minerals have their effect on the design of the water management and especially water treatment, but the local conditions and geology are more governing.

WEBINAR

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Nutan Zarapkar
Managing Director
Protiviti Global India

Topics: Implementation, delivery, supply chains and business case

Question 21: What would be the business case when talking about water pollution? It's pretty clear when talking water quantity but not so sure about quality.

Answer:

The business case for water quality is often underestimated because the costs appear later and in different parts of the business. Poor quality can trigger treatment costs, production disruption, permit breaches, liability, reputational damage and loss of social licence. In other words, managing quality protects cash flow, not just compliance.

Question 22:What strategies can be applied to support a mind shift at a mine from water management to water stewardship?

Answer:

A mindset shift from water management to water stewardship at a mine can be driven by building strong leadership commitment and embedding stewardship into core business strategy, linking it to risks, community impacts, and sustainability goals. This should be complemented by proactive stakeholder engagement, working closely with local communities, regulators, and basin-level partners to address shared water challenges beyond the site boundary. Additionally, enhancing data systems, awareness, and incentives—through employee training, integration of water metrics into KPIs, and recognition of responsible practices—helps reinforce a culture that values collective water sustainability.

Question 23:What industry-standard tools allow downstream actors to monitor upstream water risks at the mine level? Any specific databases?

Answer:

Downstream actors—those located lower in the same river basin—can use simple tools like the WRI Aqueduct and WWF Water Risk Filter to understand overall water stress and risks coming from upstream areas. They can also use satellite-based platforms such as Global Water Watch to observe changes in water levels or possible pollution trends over time. In addition, looking at public disclosures or local regulatory data from the mine can provide useful insights. By combining these sources, they can get a clearer picture of how upstream mining activities may affect their water resources.

WEBINAR

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Question 24: How to implement Water Management Program in Automotive upstream value chain?

Answer:

Implementing a water management program in the automotive upstream value chain requires a clear understanding of the full upstream ecosystem, including raw material extraction, processing, and component manufacturing stages where water impacts are often the highest.

Companies should begin by mapping suppliers—especially in high-impact sectors like mining, metals, and battery materials—and prioritizing those located in water-stressed regions, followed by setting clear expectations through supplier codes and standards on water use, discharge, and compliance.

This should be supported by structured data collection and transparency through disclosures, enabling identification of hotspots and performance tracking. At the same time, organizations need to invest in supplier capacity building, particularly for smaller vendors, by providing training and technical support while encouraging basin-level collaboration.

Finally, integrating water-related KPIs into procurement decisions, incentives, and continuous monitoring ensures that water management practices are embedded across the value chain and evolve toward long-term water stewardship.

Question 25: What is the pinch point in your supply chain model? Is it SOR? Or the mining site.

Answer:

The true pinch point in a supply chain water model is typically the mining site, not the SOR (Supplier of Record). This is because mining is where water intensity, contamination risks, and basin-level impacts are the highest, and where upstream actions directly influence downstream users.

While the SOR acts as a control and engagement point for the company, it often lacks full visibility and operational control over Tier 2/3 activities. Therefore, the critical risk and intervention point lies at the mine level, with the SOR serving as an important but intermediary lever to influence practices upstream.

WEBINAR

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Answers to additional questions

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Question 26: Available watershed courses?

Answer:

Details of some courses/platforms provided below:

- **EPA Watershed Academy** – This is a real, established program by the U.S. EPA that provides free online modules, webinars, and even a watershed management training certificate.
- **Swayam (Water Resources & Watershed Management)** – A legitimate 15-week MOOC offered by an Indian university (Osmania University) with structured content on hydrology, water quality, and watershed tools, and an optional certificate.
- **FAO "Resilient Rivers" Course** – A genuine UN FAO e-learning course focused on watershed-based integrated management, with certification and practical case studies.
- **Alliance for Water Stewardship (AWS) Training** – This is a globally recognized industry training program used by corporates to implement water stewardship aligned with the AWS Standard, including supply chain aspects

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Question 27: Please discuss best practices the companies are engaging in to avoid potential environmental and reputational risks.

Answer:

Leading companies are getting more proactive: they assess water risk earlier, disclose more clearly, engage communities more consistently and connect water performance to enterprise risk. They also look beyond compliance by testing scenarios, improving contractor controls and preparing response plans. That lowers both environmental exposure and reputational surprises.

Question 28: A primary concern is understanding the costs of mitigating water quality impacts due to seepage - waste rock storage facilities.

Answer:

Seepage mitigation costs can seem high upfront, but the comparison should be against life-cycle cost and risk, not just capital spend. Early investment in design, lining, drainage and monitoring is often far cheaper than long-term treatment, remediation, delay or litigation. This is a classic case where preventive spend protects project value.

WEBINAR

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Question 29:What are the common KPIs in measuring water performance in the mining industry?

Answer:

Common KPIs include total withdrawal, recycling and reuse rates, discharge compliance, treatment cost KPIs, incidents etc.

Question 30:Which water risks are relevant and what are practical measures to implement this with suppliers (beyond CoC or audits)?

Answer:

Relevant water risks in upstream supply chains include high water consumption (scarcity risk), contamination from effluents or tailings (quality risk), regulatory or compliance gaps, physical risks from droughts/floods, and shared basin risks that affect downstream users and communities. In sectors like mining and metals, both quantity and quality risks at the basin level are especially critical because they directly impact ecosystems and downstream stakeholders. Support can be in terms of awareness generation and facilitation for them to take action on water risks.
