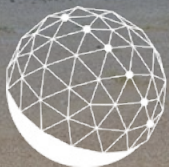


PROJECT EXEMPLAR

Making Mauritania's Mining-Rail-Port System and its Worker Communities More Climate Resilient



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KEY PROJECT INFORMATION



Country / Region

Mauritania, West Africa



Sector

Transport / Logistics Infrastructure
(Rail, Mines and Port)



Investment Value

\$467 million



Implementation Period

2024-2028



Key Partners

African Development Bank (AfDB),
European Development Bank (EIB),
Societe Nationale Industrielle et Miniere (SNIM)



Beneficiaries

150 jobs created, users of 704 km of resilient railway, communities served by electricity and water from SNIM



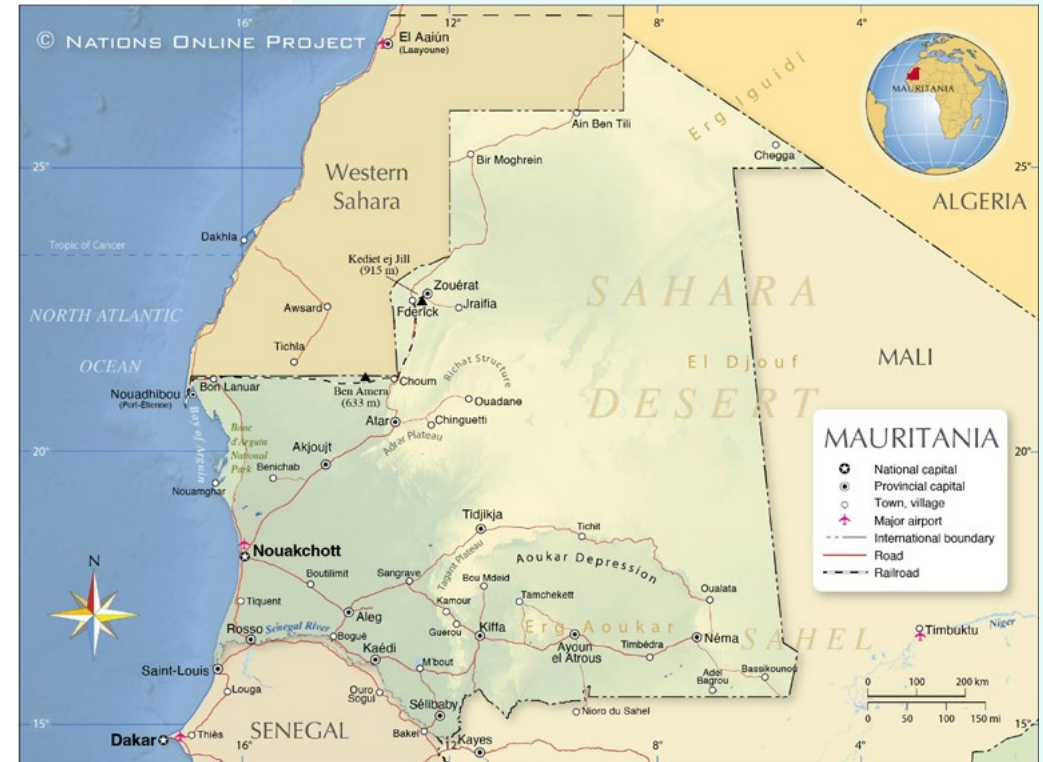
THE ADAPTATION STORY

Context and adaptation challenge

Mauritania's mining-rail-port system, led by Société Nationale Industrielle et Minière (SNIM), spans remote desert mining areas, a long inland railway corridor, and coastal port infrastructure. It operates in one of the **world's most climatically harsh environments, characterized by extreme heat, with daytime temperatures frequently exceeding 40°C, chronic aridity, episodic high-intensity rainfall, and recurrent sand and dust storms**. Climate projections indicate significant warming by mid-century, with longer heat waves and more frequent extreme hot days, amplifying risks to infrastructure performance and worker health. These hazards intersect with structural vulnerabilities such as long linear rail exposure across remote desert terrain, aging components, and limited redundancy in water, power, and transport systems.

Climate-induced rail interruptions also affect corridor communities that rely heavily on train services for access to food, healthcare, markets, and employment, with disproportionate impacts on vulnerable households in isolated settlements.

Without systematic adaptation, these pressures threaten service reliability, asset lifespans, occupational safety, and regional socio-economic resilience.



What was GCA's role?

The investment project is led by Société Nationale Industrielle et Minière (SNIM), with financing support from the African Development Bank (AfDB) and the European Investment Bank (EIB), and focuses on the critical mining-rail-port corridor linking Zouérate to the Port of Nouadhibou. SNIM, Mauritania's second-largest employer and one of Africa's largest iron ore exporters, plays a uniquely central role in the corridor economy, owning the mining, rail, and port assets linking Zouérate to Nouadhibou, and providing water, electricity, housing, healthcare, and schools for worker communities along the route. **GCA provided targeted technical assistance through a comprehensive climate risk assessment, quantifying direct physical impacts alongside indirect operational and socio-economic risks across the mining-rail-port system and surrounding communities.** This included appraising cost-effective adaptation options, spanning engineering, nature-based, and institutional measures, using cost-benefit analysis.

GCA delivered two targeted resilience workstreams to strengthen both workforce protection and community resilience. First, to protect workers, GCA developed **occupational health and safety (OHS) guidelines** focused on heat-related risks across operations. Second, GCA **mapped socio-economic vulnerabilities** in Zouérate and Nouadhibou to identify at-risk populations and critical social assets, and delivered stakeholder engagement and capacity-building masterclasses on climate-resilient public-private partnerships (PPPs) and OHS standards.

Results and impact

The climate risk assessment translates historical climate data and future projections under RCP4.5 and RCP8.5 into implications for SNIM's assets, workforce, and corridor communities. By 2031-2060, average temperatures are projected to rise by +1.5°C to +3°C, with extreme heat and intense rainfall emerging as the dominant drivers of operational disruption and asset degradation. Extreme heat, defined in this assessment as maximum temperatures above 46.5 °C, reduces equipment performance and increases health and safety risks for workers. Despite low annual rainfall, short periods of intense precipitation can cause flooding and damage to rail infrastructure, particularly where drainage is limited. Sand and dust storms accelerate mechanical wear, reduce visibility, and increase maintenance demands, while coastal assets in Nouadhibou face growing exposure to sea-level rise, storm surge, and marine corrosion.

By linking projected hazards with asset exposure and vulnerability, the assessment quantified potential economic losses and highlighted the wider social impacts of logistics disruptions on communities reliant on SNIM systems for access to water, energy, food, healthcare, and markets. These insights informed **recommendations to prioritize adaptation actions aimed at strengthening long-term asset performance and supporting workforce wellbeing and community resilience**, including reduced service interruptions and enhanced reliability along the 704 km railway corridor.



Rail infrastructure, SNIM, Mauritania (credit: GCA)

INDICATOR	RESULT / TARGET
Direct and indirect losses	Without adaptation, mid-century climate projections under RCP8.5 indicate temperature increases of about 2-3 °C. Direct infrastructure losses, primarily driven by extreme precipitation, sand and dust storms, and localized landslides, could lead to repair or replacement costs of 10-40% of asset replacement value in high-risk cases. Indirect losses may arise from service interruptions to rail, mining, electricity, and water systems, typically lasting several hours to around 24 hours, and rarely exceeding 96 hours.
Benefit-cost ratios (BCR) of adaptation investments	The prioritised adaptation options were identified as economically feasible (BCR > 1). Climate-safe occupational health and safety is also economically feasible (BCR > 1) across all hazards, delivering reduced downtime and improved corridor reliability.

Climate hazards, impacts, and prioritised adaptation measures:

KEY CLIMATE HAZARDS	IMPACTS ON INFRASTRUCTURE, SERVICES AND USERS	PRIORITIZED ADAPTATION MEASURES
 Extreme heat	Infrastructure: Rail deformation, equipment overheating, accelerated asset degradation. Services: Operational slowdowns and outages. Communities: Elevated heat stress and productivity losses.	Heat-resistant materials and technical specifications; improved ventilation and cooling in facilities; strengthened electrical systems to manage higher cooling demand; climate-safe work practices; hydration and rest protocols; appropriate PPE; adjusted shift patterns during peak heat; routine health monitoring and surveillance; emergency response procedures for heat-related illness
 Extreme rainfall and flash flooding	Infrastructure: Rail washouts, ballast contamination, flooded pits and access roads. Services: Transport and power interruptions. Communities: Temporary isolation and disrupted access to essential services.	Upgraded drainage capacity; stabilized embankments; improved runoff management around rail alignments and operational zones; protection of sensitive electrical and mechanical installations; improved access routes for severe weather
 Sand and dust storms	Infrastructure: Accelerated wear of mechanical and electrical components. Services: Reduced visibility and higher maintenance needs. Communities: Degraded air quality and service reliability.	Windbreaks and sand encroachment control; reduced wear through protective enclosures; improved ballast management; stronger inspection and maintenance routines; enhanced monitoring tools to support timely operational responses
 Extreme winds and swell	Infrastructure: port shutdowns and coastal asset exposure (Nouadhibou port) Services: Disrupted exports and logistics. Communities: Indirect impacts through supply chain interruptions.	Strengthened readiness for extreme winds and swell; improved maintenance and protective systems; targeted coastal protection where justified

KEY LESSONS

LESSON

1

Treating infrastructure resilience as both an economic and social priority strengthened the case for adaptation



Nouadhibou, SNIM, Mauritania (credit: GCA)

WHAT WE HAVE LEARNT

SNIM's railway is more than an export corridor: it underpins the functioning of an integrated mining-rail-port system and supports worker communities that depend on SNIM for housing, water, electricity, healthcare, and schools. Viewing resilience through both an operational and social lens strengthened the case for adaptation by highlighting risks to assets, workforce retention and community stability.

Extreme heat, flooding, and sand encroachment were identified as key threats, accelerating infrastructure degradation while also contributing to health impacts, service disruptions, and growing displacement pressures. Treating workers and their families as 'critical assets', alongside rail, mine, and port infrastructure, helped position climate resilience as essential to sustaining productivity, maintaining staff, and preserving continuity across the full iron ore supply chain.

REPLICABILITY

This approach is replicable for other resource corridors by mapping dependencies between infrastructure, workforce wellbeing, and essential services. Early, continuous engagement with operators and communities, combined with attention to displacement risks and service reliability, can strengthen investment cases by linking asset resilience to economic performance and social outcomes, particularly in climate-exposed and remote settings.

LESSON

2

Worker health and safety is a resilience intervention not a separate social add-on

WHAT WE HAVE LEARNT

Worker protection emerged as a core operational resilience measure. Extreme heat directly affects safety, performance, and productivity, making occupational health central to maintaining reliable operations across SNIM's infrastructure system. Rising temperatures increase the likelihood of heat stress, fatigue, and errors, particularly during physically demanding tasks, with knock-on effects for equipment handling, maintenance quality, and service continuity. Integrating climate-safe work practices into routine operations will help position workforce wellbeing as essential as the infrastructure itself, supporting stable output during peak-heat periods.

REPLICABILITY

This approach is replicable to other climate-exposed industries by embedding heat-risk management within formal occupational health and safety systems, supported by regular training, monitoring of heat conditions, and clear response protocols. Treating workforce health as an operational priority, not a parallel social activity, can strengthen productivity and reduce climate-related downtime in resource and infrastructure corridors.



Man with camel in Sahara desert Mauritania (credit: GCA)

Actionable insights for MDBs

THEME	INSIGHTS
Workforce as core element of the system	Integrate worker health, safety, and productivity into MDB climate risk screening, technical design, and financing conditions, including support for heat-safe work protocols, training, and monitoring systems, recognizing labor availability as a critical driver of operational continuity, OPEX stability, and overall investment performance.
System-wide resilience	Move beyond single-asset adaptation to corridor or value-chain assessments, so MDBs can capture cascading risks that affect service reliability, OPEX escalation, and economic returns.
Climate resilience embedded in safeguards and OHS	Use MDB safeguard policies and financing conditions to require climate-safe work practices and heat-risk management, reducing heat-related downtime, accidents, and protect operational performance.



Railway tracks, SNIM, Mauritania (credit: GCA)



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