MINING®
Saudi Arabia

Your Gateway
Into KSA Mining




#FMF26

#Miningsaudiarabia

Dear Readers,

It is with great pride that we welcome you to the first issue of Mining Saudi Arabia, a platform launched at a defining moment in the Kingdom's transformation.
Mining in Saudi Arabia is no longer a supporting sector; it is emerging as one of the strategic pillars of the Kingdom's economic future. Under Saudi Vision 2030 and the Vision 2040, mining has been positioned as the third pillar of industry, unlocking an estimated SAR 9.4 trillion in mineral resources and creating unprecedented opportunities across exploration, development, services, technology, and investment. From critical minerals powering the global energy transition to expanding gold, copper, and phosphate projects across the Kingdom, the scale of ambition is remarkable. Regulatory reforms, world-class geological mapping, infrastructure investment, and global partnerships are accelerating growth at a pace the region has never witnessed before. Mining Saudi Arabia exists to connect this dynamic ecosystem including miners, investors, service providers, policymakers, innovators, and all those interested in the sector both locally and internationally. Through insights, field stories, technical advancements, and investment perspectives, we aim to contribute meaningfully to shaping the future of mining in the Kingdom.

We are not only documenting this transformation.
We are part of it.

Mining Saudi Arabia Team

www.miningsaudiarabia.com

MINING Saudi Arabia

Digital mining intelligence and networking. We're publishing from the land of opportunities where mining businesses canscale.

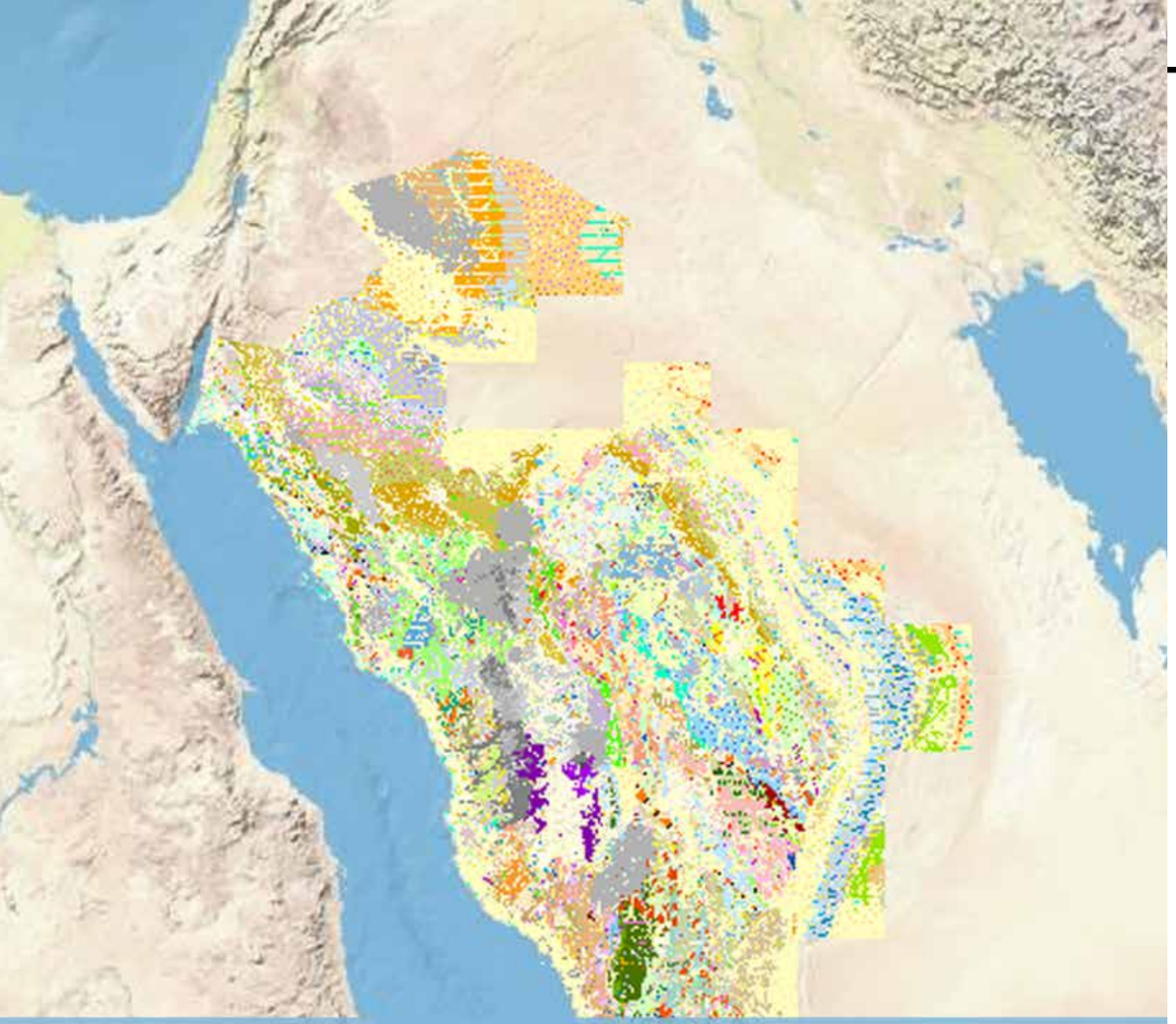
Scan Me

**Farhaa S Abdelhaq**
Buinsess Editor

**Nourhan Fouad**
Content Manager

**Mohamed Dawood**
Art Director

@mining-saudi-arabia @miningSaudiArabia @ksamining



# Saudi Arabia:From Ancient Geology to a Global Mineral Super Region

Saudi Arabia's mining potential starts with its geology. The Kingdom is built on two major geological provinces that together create one of the most promising mineral landscapes in the world: the Arabian Shield in the west and the Arabian Shelf (Platform) in the east.



## Understanding this foundation helps explain why Saudi Arabia is emerging as a global mining hub:

## The Arabian Shield

### (AS) The Mineral-Rich Backbone

The Arabian-Nubian Shield is considered the northern part of a major mountain-building movement extending across northeastern Africa forming the core of the supercontinent Gondwana at the end of the Precambrian era.
This movement resulted from the movement of continental plates and the fracturing of the Earth's crust, leading to the separation of the continents into their current form. This intense geological activity created fractures, faults, and volcanic systems the same conditions that are ideal for forming mineral deposits.
Today, the Arabian Shield hosts:

- Gold
- Copper
- Zinc
- Silver
- Nickel
- Rare and critical minerals

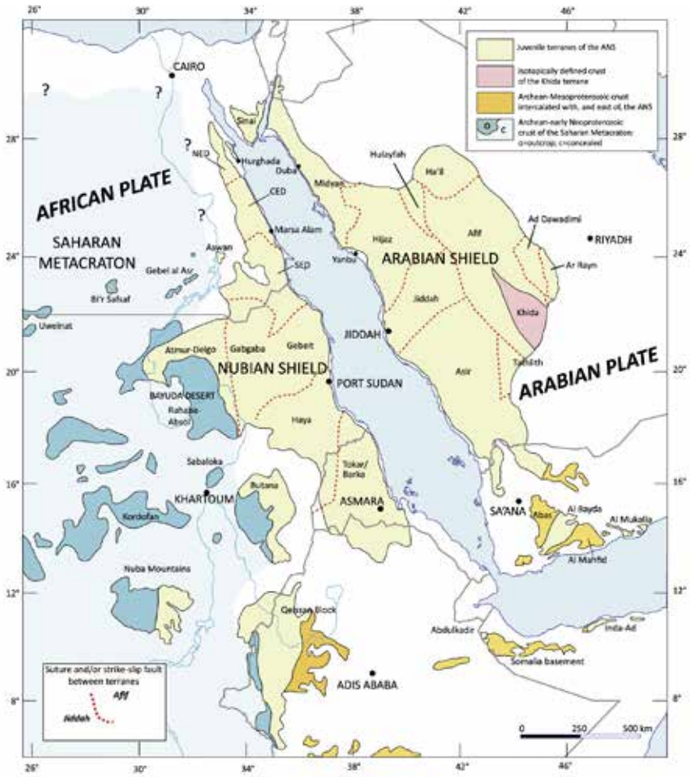
Many of Saudi Arabia's active and planned mining projects are located within this geological province. From an investment perspective, the Shield represents high exploration potential and long-term growth opportunities, particularly in critical minerals supporting global energy transition demand.

## The Arabian Shelf Energy and Industrial Minerals Platform

Unlike the hard crystalline rocks of the Shield ,this region lies to the east of the Shield and consists of a thick sequence (>5km) of sedimentary layers (sandstone, limestone, shale) that accumulated during the Paleozoic, Mesozoic, and Cenozoic eras. These layers dip eastward toward the Arabian Gulf, overlying the basement rocks. While globally this type of geology is famous for oil and gas, in Saudi Arabia it also offers opportunities in:

- Industrial minerals
- Phosphate deposits
- Limestone for cement and construction
- Silica sand and other raw materials

This makes the Arabian Shelf strategically important not only for hydrocarbons but also for downstream industries, manufacturing, and infrastructure development.



# Areas of Mining Potential in Saudi Arabia

Saudi Arabia's mining sector is not just growing, it is transforming. Under Vision 2030, mining has been identified as the third pillar of the Saudi economy. This has triggered a wave of regulatory reform, geological surveying, foreign investment, and technology adoption across the Kingdom. From early-stage exploration in remote desert areas to advanced industrial processing facilities, the entire mining value chain is being modernized. A Sector Moving at Speed Mining companies in Saudi Arabia are entering a new phase of development. Key changes include:

- Adoption of modern exploration technologies
- Digitized geological databases
- Increased drilling activity
- Greater focus on efficiency and cost optimization
- Stronger environmental and safety standards

The Kingdom is also aligning mining development with global sustainability expectations, working to reduce emissions, improve operational efficiency, and support responsible resource development. This balanced approach growth with responsibility is attracting serious international interest.

# Strategic Location, A Growing Super Region

Saudi Arabia is increasingly positioning itself as a mineral super region at the crossroads of Asia, Africa, and Europe. Its geographic location alone gives it a natural trade and logistics advantage, but what truly strengthens this position is the combination of modern infrastructure, advanced industrial cities, major ports on two coasts, and strong energy capacity. The Kingdom is no longer seen only as a mining destination for raw material extraction. It is evolving into a regional hub for refining, processing, and value-added mineral production supporting complete value chains rather than exporting raw resources.
At the same time, clear investment regulations, modernized licensing systems, and competitive business frameworks are making it easier for international companies to enter the Saudi market through partnerships and joint ventures. Today, local and global stakeholders are working together to scale mining and mineral projects that align with both market demand and sustainability goals, reinforcing Saudi Arabia's ambition to become a true mining super region. The Arabian Shield: A Proven Exploration Province
One of the strongest foundations behind this transformation is the Arabian Shield, which covers roughly 14% of Saudi Arabia's land area. Within the Shield:

- 35 mineralized belts have been identified
- 15 belts are classified as sulfide belts
- Many contain Volcanogenic Massive Sulfide (VMS) deposits

VMS systems are globally recognized as important sources of copper, zinc, gold, and silver. Their presence confirms the strong geological potential of the western part of the Kingdom.
Importantly, Saudi Arabia has made more than 80 years of geological and geochemical data available through a centralized digital portal. This level of transparency significantly reduces entry barriers for exploration companies and investors. In practical terms, this means:

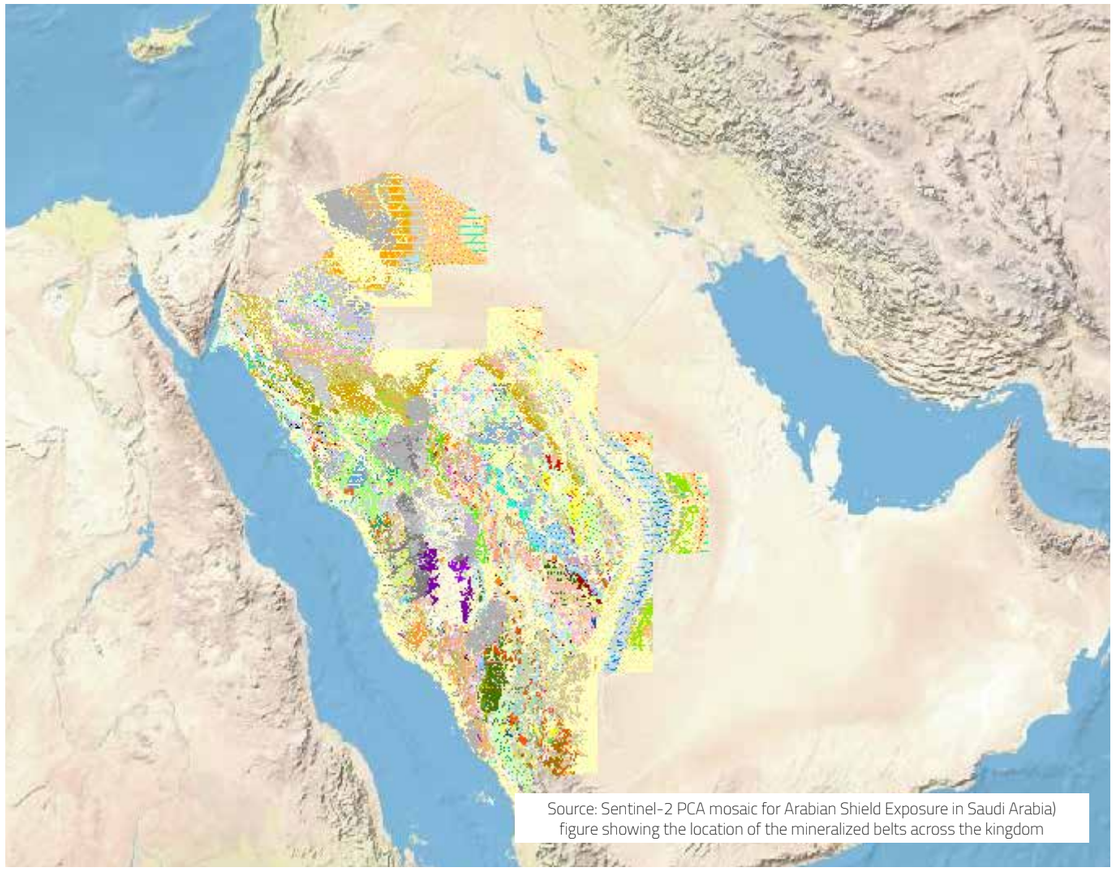
- Geological risk is lower
- Data is accessible
- Target areas are already defined
- Exploration can move faster



MINING Saudi Arabia

# A Long-Term Growth Story

Saudi Arabia's ambition is clear: to become a leading global player across multiple mineral value chains.
The geological foundation is strong. The regulatory environment is improving.
The investment momentum is building. For exploration companies, service providers, technology firms, and investors, the opportunity is not only in discovering minerals but in participating in the development of a fully integrated mining ecosystem.



Source: Sentinel-2 PCA mosaic for Arabian Shield Exposure in Saudi Arabia) figure showing the location of the mineralized belts across the kingdom

**Dr. Magdy Abdallah**
Managing Director at Arab Prospectors

ARAB PROSPECTORS

# From Drill Rig to Deal Table: WECO and Abdullah Al-Qedheebi,the CEO at the Heart of Saudi Arabia's Mining Transformation

Riyadh - From 0 to 75 employees, to 13 drilling rigs, to 700% revenue growth, all in two years. These aren't startup fairy tales. They're the cold, hard metrics behind Wealth Economics company for Mining (WECO), led by Abdullah Al-Qedheebi, the Qassim University business grad who traded spreadsheets for being a superstar CEO of a company providing exploration drilling and other geological services and never looked back.

> "I see myself first and foremost as a field technician and practitioner rather than a pure administrator"
>
> Abdullah Al-Qedheebi
> CEO of WECO Mining

states with characteristic directness. "Being on-site and possessing a comprehensive technical understanding forms the absolute foundation of any successful management decision within the mining sector.' When Vision 2030's earlier reforms started opening up Saudi Arabia's mineral resources in 2007, Al-Qedheebi became part of one of the nation's initial international mining service companies as a drilling supervisor, beginning with the basics of Diamond Drilling and Reverse Circulation drilling. The progression was surgical: supervisor to drilling manager to mining projects manager, touching on exploration, development, and operations. "Finance, logistics, transport I did those all', 'says Al-Qedheebi

## WECO's Formation in 2023: Technical Mastery Demands Independence

In 2025, Al-Qedheebi first introduced the Reverse Circulation drilling methodologies service characterized by rapid penetration rates and adaptive execution approaches that were compatible with the multinational mining firms' production and quality. Wealth Economics Company for Mining (WECO) was formed not simply out of entrepreneurial ambition, but rather out of a calculated response to these limitations in operations. "After accumulating extensive field experience, operating within restrictive corporate boundaries became unnecessary', 'Al-Qedheebi recalls. "Although financial viability certainly influenced the decision, a genuine passion for exercising leadership responsibility under independent command served as the primary catalyst'.'

## Comprehensive Mining Lifecycle Capabilities

As a fully integrated service provider across the mining value chain, Wealth Economics Company for Mining executes exploratory drilling operations involving Diamond Drilling, Reverse Circulation, Air Core drilling, and Grade Control methods. In addition to providing geological and exploration consultancy services, WECO uses advanced Geological models, provides mine planning and operational support, and drilling for blasting. Al-Qedheebi asserts that these capabilities align directly with Saudi Arabia's Vision 2030 mining objectives. "We strengthen the mining value chains from exploration and mining to the sustainable production of minerals and metals', 'he continues.

## Strategic Partnership with Arab Prospectors Company

A significant strategic partnership has been established between WECO and Arab Prospectors Company (APCO). Al-Qedheebi explains that this partnership has evolved organically over decades from the foundation of respect and operational experience between the two parties. As part of its specialized geological analysis and consulting services, APCO provides comprehensive geological consulting services with extensive experience in the Arabian-Nubian Shield. The combination produces complete project delivery solutions spanning geological survey, exploration drilling, and full exploration services implementation and execution. "No technical detail escapes coverage', 'Al-Qedheebi emphasizes, creating a seamless service continuum that eliminates client coordination across multiple vendors, a one-stop-shop solution

## Operational discipline: ESG Integration

Environmental, social, and governance requirements are woven throughout WECO's operating principles as opposed to being treated as external compliance obligations. A representative operational practice illustrates this commitment: vegetation present on project sites is relocated scientifically by company-funded, fully documented means using protective crates or jute containers for transport to designated preservation sites. This is more of a culture than a compliance checklist, according to Al-Qedheebi.

## 2026 Strategic Forecast

Al-Qedheebi anticipates calendar year 2026 as "a defining period for WECO's development trajectory,' noting substantial strategic advancements planned across multiple dimensions. Wealth Economics Mining advances Saudi Arabia's USD1.3 trillion mining sector development objectives by offering a broad range of services, developing targeted strategic partnerships, and implementing a disciplined operational strategy. Al-Qedheebi's professional evolution from drilling supervisor in 2007 to contemporary industry leadership reflects the specialized technical knowledge, operational disciplines, and calculated strategic focus characterizing the Kingdom's emergence as an important international mining participant.

# Darkstone Masters Structured Scaling in Kingdom's Mineral Renaissance

Riyadh - Darkstone Arabia Ltd. is emerging as one of the companies defining the next era of mining in the Kingdom during a decade that has witnessed transformation, diversification, and industrial growth.

The company has quietly evolved from providing professional geological and mining services to becoming a strategic exploration and mining investor under the leadership of CEO Haytham Ahmed, reflecting Saudi Arabia's growing desire to realize the full potential of the Arabian Shield.

As Ahmed explains, Darkstone today is more than just executing projects. In terms of revenue, Darkstone reports commitments of SAR 232 million across geological and mining services, along with SAR 98 million from infrastructure operations. Yet beyond revenue, the company is gaining traction due to the company's positioning.

## Strategic alliances

Darkstone recently formed a partnership with Sinoma CDI, one of the world's largest construction companies. It is known in Saudi Arabia for landmark projects such as Umm Al-Qura Cement Factory, Eastern Province Cement's process line, and major phosphate developments. By combining global mega-project execution capability with local operational expertise, it will be able to target what industry observers call "one of the region's most significant gold mine developments of the future.' This alliance is strategically positioned to deliver large-scale gold mine construction projects with international standards of quality, safety, and operational excellence, as Vision 2030 accelerates mining sector expansion.

This alliance is strategically positioned to deliver large-scale gold mine construction projects with international standards of quality, safety, and operational excellence, as Vision 2030 accelerates mining sector expansion. Darkstone's technological modernization program also pushes beyond construction. By bridging traditional civil execution with smart mining infrastructure, the company advocates for integrated digital systems, such as SCADA optimization and advanced safety monitoring platforms for heavy equipment fleets. As part of its strategic alliance with MineralsAI, Darkstone is integrating artificial intelligence into exploration processes. Before excavation begins, high-precision 3D geological modeling, AI-driven resource estimation, and equipment diagnostics reduce uncertainty.

According to Ahmed, artificial intelligence has become a "necessity.' "We are transforming field operations into data-driven decision systems. Digital intelligence supports drill targets, equipment movement, and safety parameters.' Large-scale mining projects aim to eliminate guesswork, increase efficiency, and strengthen operational certainty, he notes.

Structured Growth with Governance Darkstone's expansion strategy is guided by a centralized Project Management Office (PMO), supported by strategic advisory oversight. Risk assessment, cost control, budget forecasting, and operational analytics are integrated into a structured growth framework that governs both current operations and new investments. The model reflects disciplined scaling rather than opportunistic expansion, a hallmark of companies transitioning from contractors to long-term industrial stakeholders. Diversified Capabilities Support Vision 2030 Our Group Core Divisions Mining, Exploration & Geological Services: Comprehensive exploration program management, RC and diamond drilling, geotechnical monitoring, geological studies, and resource modelling. Industrial Operations & Maintenance: Full-spectrum engineering, mechanical, and electrical services designed to maximize plant efficiency and uptime. Industrial Construction & Civil Works: Turnkey infrastructure delivery, from site preparation and earthworks to civil installations across multiple sectors. Solar Division: End-to-end solar construction solutions that support Saudi Arabia's sustainability and Vision 2030 goals In early 2025, Darkstone Group was honored by the Saudi Ministry of Commerce, through its Monshaat program, as one of Saudi Arabia's fastest-growing companies, in direct support of Vision 2030's economic diversification objectives. I write this as a paragraph without changing much

> "We are investing in the future of the Kingdom's minerals"
>
> Haytham Ahmed
> CEO of Darkstone

## Structured Growth and Diversified Capabilities

In early 2025, the Saudi Ministry of Commerce recognized Darkstone Group as one of the country's fastest-growing companies in support of Vision 2030's economic diversification goals as part of its Monshaat program. Darkstone's expansion strategy is powered by a centralized Project Management Office (PMO), assisted by strategic advisory oversight, where risk assessment, cost control, budgeting forecasts, and operational analytics are integrated into a structured growth framework that governs current operations and new investments. As a company transitions from contractors to long-term industrial stakeholders, it demonstrates disciplined scaling rather than opportunistic expansion, according to Ahmed. Darkstone's core divisions include "Mining and Exploration & Geological Services',' which offers comprehensive exploration program management, RC and diamond drilling, geotechnical monitoring, geological studies, and resource modelling. "Industrial Operations & Maintenance' ' provides full-spectrum engineering, mechanical, and electrical services designed to maximize plant efficiency and uptime; "Industrial Construction & Civil Works' ' delivers turnkey infrastructure from site preparation and earthworks to civil installations across multiple sectors; and the "Solar Division' ' handles end-to-end solar construction solutions that advance Saudi Arabia's sustainability and Vision 2030 goals.

## Human capital investment

Darkstone is also working on initiatives that nurture national talent. In addition to drilling and core logging, geology students receive hands-on experience with data modeling and database management through a field training partnership with Taibah University. "The students experience exploration from A to Z,' Ahmed notes. "We have already graduated and certified an industry-ready cohort.' As Saudi Arabia positions mining as a "third pillar' ' of its industrial economy, companies that combine technical execution, digital transformation, strategic partnerships, and local capability development are becoming increasingly important. As it stands, Darkstone Arabia is determined to become one of them.

# Tokenization of mining assets: From ore to chain

Tokenization of mining assets: From ore to chain at a time when the mining industry is under pressure to do more with less capital, accelerate project timelines, and prove ESG performance, tokenization has arrived. Studies of gold, copper and battery metals show that well-designed tokenization frameworks can reduce transfer processing costs by up to 82% and compress settlements from T+3 to near instant, all the while reducing legal and administrative overhead by 35-50% and expanding the investor pool by 1.5–3.4× compared to traditional structures. Despite their inadequacies, these figures illustrate how digital, programmable ownership can provide more efficient, global accessibility to historically illiquid mining assets.

## Tokenization strategy based on mineral specifics

There are differences in regulatory and technical requirements for tokenisation in each mineral. The highest level of AML scrutiny is placed on gold and other precious metals. These metals require institutional grade custody, quarterly serial number audits, and typically full compliance token standards, such as ERC-3643. Metals like Copper or Zinc usually follow a simpler path: they are often closer to commodity trading rules, can use ERC20 type tokens and compliance layers, and usually require batch-level audits each year. In addition to export controls and stricter environmental oversight, battery metals such as Lithium and Cobalt are increasingly classified as strategic resources. Rare earth elements are also treated as national security assets, so foreign ownership needs to be reviewed in a phased, domestic-first way.

## Fractional ownership, secondary markets and liquidity

By tying each token to a clear economic claim such as one tonne of coal in situ, one ounce of vaulted gold or a defined share of project revenues tokenization makes fractional ownership of mining assets possible. These rights are enforced through smart contracts, which allow for enforcing those rights. In the secondary market, however, tokens' true value becomes evident. In early mining token listings, it has been found that Tier1 regulated exchanges can sustain daily trading volumes of 0.9–1.3% of market capitalization with bid-ask spreads of 0.4–1.2%, while Tier2 venues, OTC desks, and decentralized exchanges have thinner volumes and wider spreads. Issuers who are successful allocate a substantial portion of their raise for professional marketmaking to keep spreads tight, to fill USD50,000 orders quickly, and to limit price volatility caused by larger sales.

## Examples of tokenized mineral assets

The use of tokenization has already been demonstrated in gold and industrial mineral projects. Santo Mining/Vegachi and Aureus Nummus Gold, for example, offer investors a fractional, revenue-linked exposure to specific gold mines via tokens or NFTs (non-fungible tokens), which have on-chain records. With Perth Mint Gold Tokens, institutional investors can combine bullion familiarity with blockchain liquidity by tying each token 1:1 to vaulted gold. First Class Metals and Valereum are both experimenting with tokenized financing over gold and battery metal assets to unlock junior miner liquidity outside bullion. Diamond bars as well as other critical minerals can be digitized through cross commodity initiatives such as Blade Labs/Diamond Standard's CARAT token, and platforms like Ayni Gold and Mineral Vault go further by tokenizing revenue streams and royalties, enabling investors to trade mining and energy cash flows. In 2024, the blockchain-in-metals-and-mining market was valued at USD27.85 billion, and by 2030 it is expected to reach USD746 billion (CAGR ~70%).Precious metals dominate (60 percent of tokenized commodities), but industrial metals are surging: Copper, Nickel, and Lithium tokens total USD75 million amid 25 percent EV battery demand growth. In mining, tokenization enables fractional ownership, 24/7 trading, and DeFi financing, slashing costs via smart contracts.



MINING Saudi Arabia

> "Last year at FMF, they were not aware of tokenization"

Micheal So
Tokenyze's CEO,

## Tokenizing the Metals Supply Chain: Tokenyze's Vision

Michael So, founder and CEO of Tokenyze, shared a vision for revolutionizing metals and minerals markets through blockchain-based warehouse receipt tokenization at the Future Minerals Forum (FMF) in Riyadh. Having managed over USD250 million in gold and silver tokens in just 14 months with USD42 million in monthly transactions, Tokenyze is one of the most active real-world asset (RWA) exchanges in the world.

## Innovation: Tokenization of warehouse receipts

A fundamental friction in the metals industry has been opacity and restricted access. For many years, trading in base metals and minerals has been restricted to insiders with direct relationships with producers, refiners, and dealers. Tokenyze solves this problem by enabling producers to "ring-fence" physical inventory and represent it as digital warehouse receipts on blockchain. Holders of these tokens have direct ownership rights to the underlying goods, opening markets for wholesalers, retailers, and even consumer fintech apps. This business model - "tokenization as a service" - is designed to be easy to use. In addition to preserving contracts and operations, Tokenyze replaces legacy ledgers with blockchain records via API. Access and issuance capabilities are provided to clients for a SaaS-style fee.

## Risk Mitigation and Compliance

As a way to mitigate and comply with mining's perennial concerns, Tokenyze uses ERC-3643 standards to implement KYC/AML controls on public blockchains. Transaction histories on the blockchain are immutable, reducing the risk of fraud like double-pledges and falsified receipts. In 2026 FMF (Future Mineral Forum), stakeholders were unfamiliar with tokenization; Michael notes that GCC stakeholders are becoming more sophisticated: Tokenyze is actively seeking a regional presence this year, amid interest from Dubai and Abu Dhabi. Furthermore, the vision includes futures settlement against tokenized receipts, banks financing inventory in real-time, and "everyone on the planet" owning fractional metals through everyday apps. The key to Tokenyze's success is rewiring: from opaque paper trails to transparent, programmable infrastructure. As metals markets digitize, this conversation signals the move of tokenization from an edge innovation to market infrastructure.

Mining Saudi Arabia I Q1/2026

# Aginco: Driving the Future of Sustainable Mining in Saudi Arabia

The hum of electric loaders and the quiet precision of automated drills tell a new story across Saudi mine sites – one where Aginco leads a movement toward cleaner, safer, smarter mining

> Saudi mining has moved from resource-led growth to knowledge-led growth. We're aligning every part of the value chain from exploration to equipment to make mining a pillar of the future economy

Faisal Sindi
Executive Director of Aginco

## A New Approach for a New Era

Saudi Arabia's mining transformation centers on three pillars: integrated value chains, digital transformation, and global supply leadership. The shift is supported by major EV and battery investments that demand cleaner, localized mineral processing. Sindi explains, "The industry is becoming smarter, greener, and more connected. Intelligent rigs now analyze rock cores in real time, and our systems are designed to get the data straight from the drill head to the geologist's tablet.' The government's leadership is a critical factor as well. The Ministry of Industry and Mineral Resources (MIM) has adopted ESG-linked licensing, meaning that sustainability and safety performance now directly determine who can operate. This has set a new standard, one that Sindi fully supports: "You can't separate profitability from responsibility anymore. The companies that will thrive in Saudi mining are those who embed ESG in everything they do.'

## Quality and Skills: The Aginco Difference

Aginco has built its reputation on delivering precision equipment and expert manpower a potent combination in a sector still developing deep technical specialization. "The biggest challenge in the Saudi mining market today,' says Sindi, "is not finding the minerals; it's finding the people and the machines that can handle high-tech systems reliably. We solve that by bringing both together world-class equipmentand world-class people.' 'Aginco's roster includes some of the most advanced names in mining innovation. Its partnership with Boart Longyear introduces 100% hands-free drilling through the LF160i and Freedom™ Loader, while collaboration with Normet delivers fully battery-electric vehicles (BEVs) for underground operations. "These technologies redefine what safety looks like',' Sindi explains. "With Boart Longyear, no one touches the rods anymore it's all automated. And Normet's electric fleets don't just cut emissions; they cut operating costs. Safety and sustainability are now productivity drivers.'






## From ESG to Human Elevation

"To us, ESG means Responsible Innovation',' says Sindi. "Every piece of equipment we import must reduce environmental impact and improve worker wellbeing'.' Aginco is pioneering new digital job roles that blend technical and analytical skills, transforming traditional mine operators into digital technicians. "We're creating a generation of miners who think like engineers and code like developers',' says Sindi. "When a young Saudi technician connects real-time drill data, that's ESG in action it's knowledge creation'.' The company's flagship "Simulator-to-Site' ' program ensures this transformation is accessible to local talent. Trainees first master equipment through VR simulators, then undergo structured mentorship via Boart Longyear's "Green Hat' ' program, before attaining Aginco certification on globally recognized systems. "Our goal is to give every Saudi trainee a technical passport',' Sindi notes. "We're not just training them for local projects we're equipping them to work anywhere in the world'.'

## Local Manufacturing and Community Trust

Beyond the workshop and mine, Aginco is also investing in local manufacturing and supplier development. Plans are underway to produce exploration accessories such as core boxes domestically, reducing import dependence and sharing technical know-how with Saudi SMEs. "We want our success to ripple through the local economy,' says Sindi. "When a local firm fabricates a part that once came from overseas, that's value creation and that's what sustainability really means'.' Adding " we welcome partnerships with SMEs that have the interest or capability in this industry. Through collaboration, it aims to build local capacity, create skilled jobs, and develop a sustainable domestic supply chain aligned with our long-term goals. He also emphasizes that community perception defines mining's long-term viability. "A community accepts mining when it sees that we're protecting the land and the people',' he explains. "Our electric loaders are quiet, zero-emission machines. They change how mining feels. It's dignity through technology'.'

## The Future A Technological Partnership

Looking ahead to 2030, Sindi sees mining evolving into a collaborative ecosystem between technology providers, operators, and local communities. "Mining will no longer be an isolated industry',' he predicts. "It will be a technological partnership between engineers and data scientists, between companies and communities'.' He believes that this partnership will be fueled by one constant: safety. "Safety drives productivity',' he states firmly. "When you protect your people, you unlock performance. That's the core of our philosophy at Aginco'.'

# Jerry Huang of Jemini Capital Reveals Mining Investment Secrets: From Undervalued Stocks to Saudi Arabia's Metals Opportunity

Riyadh - Jerry Huang, the founder of Vancouver-based Jemini Capital, brings nearly two decades of experience in junior mining across exploration, development, production, and capital markets. With gold and silver prices hitting record highs and Saudi Arabia launching a new metals exchange, his insights offer a timely guide for investors

## From Drilling Rigs to Deal Maker

For Huang, the traditional advisory model is often too detached from the risks investors take. That led to Jemini Capital nearly a decade ago. "We're a merchant advisory group," Huang says simply.

> We started with our own capital in good mining companies. Now we help them finance drilling, studies, or growth through tough markets
>
> Jerry Huang
> Director of Jemini

Think equity stakes for explorers, royalties for producers, or hybrid loans that fit the stage. It's practical help for companies too small for big banks but too promising to ignore. This "skin in the game" approach was forged during Huang's two decades in the sector, notably during a period where he helped dozens of junior explorers survive "down markets" by converting service debts such as drilling costs into value-added equity or royalties. "There was a time a company we acquired because they couldn't pay for drilling costs," he said of during time as an VP of Finance and Capital Markets at Impact Silver, a 20-year silver producer in Mexico. "We shifted focus to royalties and other structures to add value and advance projects." Today, Jemini evaluates mining stories based on net present value, resources in the ground, production potential, revenue, comparables, and market discounts.

Takeaway: Deploy your own capital alongside advisory services to bridge funding gaps start with operations experience for real edge.

JEMINI CAPITAL

## Spotting Mispriced Opportunities in Junior Mining

When it comes to evaluating mining juniors, Huang doesn't bother with flashy tech-style metrics like price-to-earnings ratios. Instead, he digs into the fundamentals: net present value based on metal prices and resources in the ground, peer comparisons on exchanges like TSX or ASX, and whether a project has clear optionality toward revenue.

For Huang, the art of valuation lies in spotting disconnects. "Mining equities aren't valued like tech stocks – you don't look at P/E multiples. You look at what's in the ground,' he says. "If a company trades at a fraction of its net present value, or its peers are priced much higher, that's where we start paying attention.' ' He cites a recent U.S. gold projectpreviously a past-producing mineas an example. "At one point, gold was around USD2,500 an ounce, yet the company was trading with a market cap of USD10 million against over USD5 billion worth of contained metal. That kind of deep discount presents real opportunity when the fundamentals improve.' ' In emerging markets, such mispricing can be even more pronounced due to permitting risks, access to capital, or lack of institutional backers. "Sometimes all a company needs is credible sponsorship or a strategic investor,' he adds, "and the market completely rerates them. Huang sees opportunities in projects like metallic minerals in the U.S., Baru in Indonesia, and Sonora in Mexico. "Smaller producers now scale back to 10,000 ounces per year at USD5,000 gold, generating USD50 million in revenue on a USD20-30 million market cap. This approach eases financing through equity early on and convertible debt or prepays closer to production."





Takeaway: Seek value disconnects projects trading at fractions of their resource value. Back credible teams and look for structural financing that bridges early-stage risk to near-term cash flow.

## Optimistic Outlook on Key Metals for the Next Five Years

Jerry expressed optimism across several metals, each with distinct drivers. "Gold has reached historical highs due to declining trust in fiat currencies and U.S. national debt exceeding USD40 trillion. Every household effectively owes over USD200,000 on behalf of the government',' he said, referencing the debt clock in New York. "The 1971 decoupling of the U.S. dollar from gold under President Nixon fueled this trend, with central banks now stockpiling the metal.' ' "I've been talking about silver for more than 15 years" he said. "In 2015, the price was around 10–11 dollars an ounce, during COVID it was about 12–13USD dollars, and now it is above 30USD dollars after my recent visit to projects in Mexico. Because silver is used both in industry and as a store of valueand there is no large central stockpile like there is for goldthe market can face supply shortages more easily than gold does.' ' "Copper offers strong industrial demand for electric vehiclesrequiring 1,000 pounds per Tesla along with grids, chargers, and Saudi infrastructure projects like roads and bridges. New mines take 10 years to build, creating a supply gap',' Jerry noted. "Lithium has stabilized around USD15,000 per tonne after swinging from USD5,000 to USD80,000, driven by electric vehicle growth despite reliance on unstable producers in Argentina, Chile, and Bolivia. Strategic metals like antimony for missile coatings and rare earths for magnets benefit from U.S.-China tensions and venture capital interest in non-Chinese supply.

Takeaway: Gold: Hits records from U.S. debt over USD40 trillion. People lose trust in paper money. Silver: Best pick. Over USD30 spot. Used in factories and as treasure. Tight supplyno big vaults like gold.Copper:Shortagecoming. Every electriccar (likeTesla) needs 1,000 pounds. New mines take 10 years. Saudi roads and buildings will use tons. Lithium: Price fell from USD80,000 to USD15,000 per tonne. Still needed for EV batteries.Most from shaky countries.Rare earths:U.S.-Chinafightmakes them hot.Used in missiles magnets

## Key Lessons for Mining CEOs: Avoid Cost Traps and Build Strong Teams

After COVID, costs exploded across mining hotspots. "Inflation ran 30-50% in Mexico, Argentina, parts of Africa',' Huang warns. "Local currencies lose value fast you have to update capital expenditure studies regularly. Argentina's hyperinflation forced people to stuff cash into walls just to buy bread or beer before pesos vanished.' ' Financing requires balance. Use equity raises for exploration cash. For construction, mix debt, royalties (a percentage of future output), or prepays (sell metal forward at a discount). In down markets, avoid heavy dilution just to cover fixed costs like lawyers, auditors, or exchange fees. "Those eat USD200,000-USD500,000 yearly,' he notes. In hot markets like now? "Raise as much as possible. Funding windows close suddenly.' ' Teams make or break outcomes. "Choose management where insiders own more shares than outsiders – that shows skin in the game, and they work harder',' Huang stresses. He points to Orla Mining's leaders, former Barrick veterans. "They raise capital in any weather and execute. Hired professionals on salary alone? They might earn bonuses, but lack the same drive since it's not their personal money at stake.' ' "Financing works best as a mix: equity for exploration, debt, royalties, and prepays for development. Avoid over-dilution in down markets just to cover fixed costs like listings and legal fees. In strong markets, always take the money-windows close quickly,' he advised

Takeaway: Blend funding sources; prioritize insider-owned teams; raise aggressively in hot markets

## Saudi Arabia's Metals Exchange: A Boost for Local Investors

"Any new metal exchange is great, especially for an emerging market like Saudi and the Gulf,' Huang said. During his two Saudi visits, Huang realised family offices in Saudi had limited knowledge of North American shares, even as the local Tadawul exchange grows. "Retail investors prefer familiar names over foreign listings,' he said. Saudi Arabia stands at the cusp of a mining transformation. "There's a lot happening,' Huang acknowledged, "Saudi's no-tax system where government support reaches citizens directly frees up capital that family offices and retail investors can now deploy easily through the new exchange.' "Move beyond U.S. tech giants, physical bullion storage, or Netflix stocks. The exchange opens doors to liquid mining shares,' Huang emphasized. "Saudi Arabia can capture the upside from rising metals, and exit positions swiftlywithout operational headaches or complex private deals.' As Vision 2030 accelerates, Saudi Arabia evolves from oil dominance to a diversified metals hub. "Broaden your view of what you can buy and invest in',' Jerry concluded. "The exchange enables trading in riyals during local time zones, much like Shanghai's gold market reduced the need for physical storage.

# Reward Minerals Limited Showcases sulphate of potash (SOP) technology and Saudi Ambitions at FMF 2026

At the Future Minerals Forum (FMF) 2026, Reward Minerals CEO Lorry Hughes shared insights into the company's technology, growth strategy and expanding interest in the Middle East during an interview with Farhaa A. Shah of Mining Saudi Arabia.

## Innovative SOP Processing Technology

Reward Minerals has developed a proprietary technology designed to recover sulphate products, seawater and salts from reject materials. This approach allows valuable minerals to be extracted from waste streams, reducing environmental impact while improving overall extraction efficiency. The technology is particularly focused on producing high-purity Sulphate of Potash from brines, a key fertilizer used in agriculture. By maximizing recovery from materials traditionally considered waste, Reward Minerals aims to address both sustainability and supply challenges within the fertilizer and critical minerals sectors.

## Expansion Plans in Saudi Arabia and the GCC

Reward Minerals is positioning itself at the intersection of food security, critical minerals, and climate advantage – and sees the Gulf as a natural next chapter in its growth story. According to Hughes, the climate, infrastructure, and strategic focus on mining in Saudi Arabia and the wider GCC make the region well-suited for Reward Minerals' expansion plans. For Reward Minerals, the FMF forum provides visibility for its technology and a gateway to conversations around regional collaboration in critical minerals development. While the company's core assets are based in Australia, Hughes emphasized that partnerships in the Middle East could allow Reward Minerals to deploy its technology in new jurisdictions and support the region's growing demand for critical and industrial minerals.


Reward Minerals is an Australian-listed company (ASX: RWD) focused on the development of Sulphate of Potash (SOP) projects, primarily in Western Australia. The discussion highlighted how the company's innovative processing technology could align with Saudi Arabia's ambitions in critical minerals and sustainable resource development.

## Centralized Operational Frameworks

Reward Minerals is considering the establishment of centralized operational and coordination hubs to improve engagement with partners and stakeholders across the region.

## Decentralized Deployment of Technology

At the same time, the company is evaluating decentralized operational models that allow flexible, site-specific deployment of its processing solutions.



MINING Saudi Arabia

> "We're exploring ways to turn excess solar salts into valuable resources, transforming a major waste challenge into an opportunity"
>
> Lorry Hughes
> CEO Reward Minerals Limited

## Addressing the Challenge of Excess Solar Salts

One of the most significant challenges identified by Hughes is the excessive production of solar salts, estimated at 70–80 million tonnes. These materials are often treated as waste and present both environmental and logistical challenges. Reward Minerals is working with partners to develop solutions that enable the recovery of sulphates and potassium from solar salt waste, turning a large-scale disposal issue into commercial opportunity.

## Key Business Opportunities for Reward Minerals in Saudi Arabia

Reward Minerals is currently exploring several strategic business opportunities in Saudi Arabia including:

## Joint Project Development with Local Partners

The company is seeking partnerships to develop projects that utilize its sulphate recovery technology, enabling shared value creation and localized expertise.

## Potash and the Critical Minerals Discussion

During the interview, Hughes underscored the importance of potash, specifically potassium sulphate, within the global critical minerals conversation. Potassium sulphate plays a vital role in agricultural productivity, particularly in high-value crops. Although Saudi Arabia does not host significant natural potassium deposits, Reward Minerals sees strong potential for technology-driven partnerships and development projects that can unlock value from alternative mineral sources and industrial by-products. Price volatility is another unavoidable topic in fertilizers. Hughes is pragmatic: Reward's hedge against market swings is not financial engineering, but cost position. The company is targeting the lowest end of the global SOP production cost curve by working with an abundant waste stream and leveraging natural evaporation rather than energy-intensive production. With only around seven million tonnes of SOP produced globally and strong demand from high-value crops, he believes that occupying the lowest-cost tier will help insulate the business from cyclical price shocks

## Target Markets in the Middle East and GCC

Reward Minerals' near- to mid-term focus remains on the Middle East and GCC, particularly countries with established mineral industries and a growing emphasis on critical minerals, sustainability, and food security. The company sees strong alignment between its technology and regional priorities related to resource efficiency and agricultural supply chains.

## About Reward Minerals

Reward Minerals (ASX: RWD) is an Australian-based company focused on the development of Sulphate of Potash (SOP) resources for agricultural use. Its flagship projects include Lake Disappointment and Carnarvon Potash in Western Australia. With its proprietary processing technology and strategic focus on critical minerals, Reward Minerals aims to become a significant SOP producer while supporting sustainable mineral development globally.


إسناد
ESNAD
الشركة السعودية لخدمات التعدين
SAUDI MINING SERVICES CO.
MAADEN
معادن
MAADEN
MAADEN
MAADEN
HORAYEF MINI
Mining . Purpose . Passion

## Saudi Arabian Mining Company (Ma’aden)
### Strategic Mandate: More Than a Mining Company

Saudi Arabian Mining Company (Ma’aden) is the leading multi-commodity mining and metals company in Saudi Arabia and the largest in the Middle East. Since its establishment in 1997, the company has grown from a gold producer into a diversified mining powerhouse operating across phosphate, aluminum, gold, copper, and industrial minerals. As a strategic asset of the Public Investment Fund (PIF), which holds 65.22% of its shares, Ma’aden plays a central role in transforming Saudi Arabia’s mineral resources into what is now known as the “third pillar’ of the national economy, alongside oil and petrochemicals. Today, Ma’aden operates 17 mines and industrial sites, employs more than 7,500 people, and exports products to over 50 countries. Under its Strategy 2040, the company aims to achieve tenfold EBITDA growth compared to its 2020 baseline, directly supporting the economic diversification goals of Vision 2030.

## The Birth of a National Mining Champion

Ma'aden was founded by Royal Decree in 1997 with a clear mandate to develop Saudi Arabia's mineral sector. Its early focus was gold production, including operations at Mahd Ad Dahab.
In 2008, 50% of the company was listed on the Saudi Stock Exchange (Tadawul), marking its transformation into a publicly traded entity. In 2018, the Public Investment Fund consolidated government ownership, increasing its stake to 65.22%.

Following its listing, Ma'aden expanded through:

- Strategic joint ventures with global partners such as Alcoa, SABIC, Mosaic, and Barrick
- Major infrastructure investments including Ras Al Khair port and the North-South Railway
- Development of large industrial hubs such as Wa'ad Al Shamal

**57.3%**
**LOCAL CONTENT ACHIEVEMENT**

Demonstrates dedication to supporting Soudi businesses
Reached a major safety milestone and driving local economic through the implementation of growth.

**ZERO**
**TIER 1 PROCESS SAFETY EVENTS**

Reached a major safety milestone through the implementation of advanced risk·management systems.

## PIONEERING ENVIRONMENTAL STEWARDSHIP

Launched the region's first Ultra Low NOx project, reducing emissions by 77%.

## Mining as the Third Pillar of the Economy

Vision 2030 identifies mining as the third pillar of the Saudi economy, supported by an estimated USD 2.5 trillion in mineral endowment.
Ma'aden is the main driver of this ambition. The company is conducting what is described as the world's largest single-jurisdiction exploration program, covering tens of thousands of square kilometers across the Arabian Shield.

Its role includes:

- Expanding exploration licenses
- Developing integrated industrial cities
- Strengthening local supply chains
- Investing in strategic minerals

# Dual Identity: Commercial Corporation and National Strategic Instrument

**Ma’aden operates with a dual purpose.**
**As a commercial company, it manages large-scale operations across integrated value chains and competes globally. As a national instrument, it drives workforce nationalization, local content growth, and regional development. Workforce Development**

## Workforce Development

- Saudization rate above 80%
- Workforce exceeding 7,500 employees
- Saudi Mining Polytechnic
- Partnerships with King Fahd University of Petroleum and Minerals
- Mining Schools of Excellence

## Local Content and Supplier Development

Through the Tharwah Program launched in 2022, Ma’aden has increased local economic participation.

- 57.3% local content level
- Supplier development initiatives
- Increased domestic sourcing
- Use of 3D printing to reduce reliance on imported spare parts

# 2024 Financial & Operational Excellence

Reached, driven by record volumes
Delivered, the highest production
and high operational productivity.

**NET Profit**
**2.87**
**Billion SAR**
**+82%**

**Revenues**
**32.5**
**Billion SAR**
**+11%**

## Building Industrial Cities Around Minerals

Ma’aden’s strategy is anchored in two major industrial hubs that convert mineral resources into high-value products.
Ras Al Khair Industrial City
Located on the Arabian Gulf, Ras Al Khair serves as the center of Ma’aden’s aluminum and phosphate operations. It includes:

- Deepwater port
- Alumina refinery
- Aluminum smelter
- Fertilizer production facilities
- Railway connectivity

Wa’ad Al Shamal Mining City
Located in the Northern Borders region, this project focuses on phosphate production and processing. It integrates mining, processing plants, logistics, and residential infrastructure.

These cities are not only industrial complexes but economic ecosystems that create jobs, develop regional infrastructure, and enable value-added exports.

## Sovereign Backing and Global Partnerships

Ma’aden’s expansion has been supported by strong sovereign backing from PIF and global partnerships with industry leaders.
Key partnerships include:

- Aluminum operations originally established with Alcoa
- Phosphate partnerships with Mosaic and SABIC
- Copper collaboration with Barrick
- Exploration technology partnership with Ivanhoe Electric
- Heads of Terms with Saudi Aramco for critical minerals exploration

Through Manara Minerals, a joint venture between Ma’aden and PIF, the company has also expanded internationally, including acquiring a stake in Vale Base Metals.

# Ma’aden Key Assets and Subsidiaries and Ownership Percentage

| Entity or Facility Name | Primary Commodity/Activity | Ownership Percentage |
|---|---|---|
| Al Jalamid phosphate mine | Phosphate ore and concentrate | 70% |
| Al Khabra phosphate mine | Phosphate ore | 85% |
| Ras Al Khair Industrial City | Ammonia, ammonium phosphate fertilizers, alumina, and luminum | 100% (Direct/Indirect); 74.9% (MAC/MBAC) |
| Ma’aden Aluminum Company (MAC) | Primary aluminum (ingots, T-bars, slabs, billets) | 74.9% to 100% |
| Ma’aden Bauxite and Alumina Company (MBAC) | Bauxite and alumina | 74.9% to 100% |
| Mansourah-Massarah Mine | Gold | 100% |
| Ad Duwayhi gold mine | Gold | 100% |
| Ar Rjum Project | Gold | 100% (Inferred) |
| Jabal Sayid copper mine | Copper concentrate | 50% |
| Al Ba’itha bauxite mine | Bauxite ore | 74.9% |
| Wa’ad Al Shamal Industrial City | Phosphate concentrate and phosphoric acid | 85% |
| Maaden Wa’ad Al Shamal Phosphate Company (MWSPC) | Phosphate | 100% (Acquired Mosaic’s 25% stake) |
| Phosphate 3 Phase 1 | Phosphate fertilizers (DAP) | Not in source |
| Ma’aden Rolling Company (MRC) | Flat rolled aluminum sheets | 100% |
| Manara Minerals Investment Company | International mining investment (e.g., Vale Base Metals) | 51% |
| Al Madinah magnesite facilities | Caustic calcined and dead burned magnesia | 100% |
| Al Ghazalah magnesite mine | Magnesite ore | 100% |
| Aluminium Bahrain B.S.C. (“Alba”) | Aluminum | 20.62% |
| Al Amar gold mine | Gold, copper, and zinc concentrates | 100% |
| Bulghah gold mine | Gold ore/dore | 100% |
| Sukhaybarat mine | Gold ore/dore | 100% |
| Mahd Ad Dhahab mine | Gold and concentrate | 100% |
| Az Zabirah mine | Low grade bauxite and kaolin clay | 100% |
| Meridian Consolidated Investments Limited | Fertilizer distribution | 100% |
| Maaden Phosphate Company (MPC) | Ammonia / Phosphate | - |
| Nimas site | Copper, silver, and gold | 100% (Inferred) |
| Wadi Al Jaww | Gold and Copper | - |
| Jabal Shayban | Gold and Copper | - |

## Resource Security and Strategic Minerals

Under Strategy 2040, Ma'aden is prioritizing energy transition minerals such as copper, nickel, and lithium.
The company continues to expand exploration activities across the Arabian Shield while investing internationally to secure access to strategic resources.

In addition:

- Ma'aden is the second-largest exporter of phosphate fertilizers globally
- Products are exported to more than 50 countries
- Advanced technologies such as satellite data and AI are used to improve exploration efficiency

## Beyond 2030: The Long-Term Mandate

Ma'aden's long-term strategy extends beyond Vision 2030.
Key objectives include:

- Tenfold EBITDA growth by 2040
- Net-zero carbon emissions by 2050
- 60% reduction in greenhouse gas intensity by 2040
- 65% reduction in groundwater usage intensity
- 25% female workforce participation target

These goals position Ma'aden not only as a mining operator but as a long-term industrial pillar for Saudi Arabia.

معادن
MAADEN






# FUTURE MINERALS FORUM


## Capital and policy

Mining projects now depend on long-term regulatory clarity. Investors look for predictable fiscal regimes and political consistency. Critical minerals are treated as strategic assets. Governments are stepping in as partners, not only regulators. Financing is increasingly tied to how projects support local development and infrastructure.

## Infrastructure first

Energy supply, transport routes, and water access are major cost drivers. Weak logistics can determine whether a project moves forward or stalls. Development institutions are prioritizing large infrastructure programs that open entire mineral regions, not just single sites.

## Talent pipeline

Workforce gaps are growing, especially in technical and frontline roles. Training models are shifting toward vocational pathways, micro-credentials, and partnerships with universities. Modern mining careers combine digital skills with operational knowledge. Recruiting from local communities is key for long-term retention.

## Customers are shaping supply

End users such as EV makers and industrial manufacturers are influencing how minerals are produced and sold. Long-term offtake agreements, volume commitments, and direct partnerships are now common. Availability now outweighs price alone. Buyers are prioritizing secure supply, multiple sourcing options, transparent chains, and lower-impact production standards.


# Mining at a Turning Point: What FMF Panels Revealed About the Future of the Sector

Conversations at Future Minerals Forum reflected a sector under pressure to deliver faster, smarter, and with greater accountability. Demand for minerals is rising sharply, yet projects are becoming harder to finance, permit, and operate. The panels focused on what must change to keep pace with global economic, technological, and energy needs.

## Technology and Recovery

Companies are focusing on getting more value from existing resources. Processing improvements, higher recovery rates, and reuse of historical waste are seen as the fastest way to increase output this decade. Many sites can raise production through better data, automation, and AI-driven optimization.

## AI in operations

AI is already used in maintenance forecasting, plant stability, supply chain planning, and exploration targeting. The barrier is not tools. It is organizational readiness, data quality, and leadership support. Adoption works best through small, fast pilots and close collaboration between engineers and data teams.

## Governance and Trust

Long project timelines require trust between companies and host governments. Stable agreements, fiscal transparency, and clear standards help reduce investment risk. Social and environmental performance directly affect access to capital.

## Overall direction

Future success in mining will be judged by more than output volumes. Projects are expected to deliver efficiency, responsible practices, local value creation, and reliable supply for global industries. Coordination between governments, financiers, producers, and customers is becoming standard practice rather than exception.

MINING Saudi Arabia

# Advertise With Us

Mining Saudi Arabia is a Saudi-focused mining media platform enabling B2B visibility across industry, investment, and government networks.


## Our Audience

| 29.8% | 10.2% | 7.4% | 3.8% | 2.8% |
|---|---|---|---|---|
| Senior Leaders | Managers | Directors | VP | CEOs |

## Industry

| Mining | Oil and Gas | Metal Ore Mining | Construction |
|---|---|---|---|
| 26.4% | 7.2% | 4.9% | 3% |

| +800K | +400K |
|---|---|
| Total Impressions | Members Reached |

@mining-saudi-arabia @miningSaudiArabia @ksamining

www.miningsaudiarabia.com

# Mining Pioneers Competition Showcases the Future of Smart, Sustainable Mining

The Mining Pioneers Competition stood out as a powerful platform highlighting how innovation is redefining the mining industry. More than a competition, it served as a global stage where breakthrough ideas turned into practical solutions addressing real industry challenges. From thousands of applicants worldwide, leading teams advanced across three critical tracks that represent the core pillars of mining's future: Smart Technology – Resource Sustainability – Safety & Security.

**First Place Winners (Grand Prize USD150,000)**

| | | |
|---|---|---|
| Smart Technology | UNCHARTED AI (AUTONOMY BEYOND BOUNDARIES) | India |
| Resource Sustainability | GeoVolt | Saudi Arabia |
| Safety & Security | OMQ | Saudi Arabia |

**Second Place Winners (Each team Prize USD60,000 )**

| | | |
|---|---|---|
| Smart Technology | Groundbreak | Italy / Switzerland / Mexico |
| Resource Sustainability | NeoMining Technologies | Pakistan / Russia |
| Safety & Security | Qaspioneers | Saudi Arabia |

The competition demonstrated that the future of mining depends not only on the availability of mineral resources, but on innovation, international cooperation, and the ability to scale practical solutions.

It showcased a new generation of pioneers guiding the industry toward greater efficiency, lower environmental impact, and safer operations.


# GeoVolt Turns Mining Waste into Value, Pioneering Saudi Arabia's Circular Mining Future


RIYADH, In the heart of the Saudi desert, mountains of mining waste are gaining new life. GeoVolt, a young Saudi innovator, has found a way to "flip the script "transforming phosphogypsum, once an environmental challenge, into an industrial treasure used in sectors from energy storage to microchips.

> It all started from a contradiction we couldn't ignore
>
> Rayan Al Bassami, CEO of GeoVolt

On one hand, huge volumes of phosphogypsum were being stored as waste. On the other, industries were paying to import high-purity calcium sulfate. So we asked why not transform what we already have?''

## The Alchemy of Purifiction

Phosphogypsum is a byproduct of producing phosphoric acid. For every ton of acid made, several tons of this powdery residue are left behind. GeoVolt's proprietary technology removes impurities and applies controlled heat to achieve purity levels above 99.5%. **"Our approach is simple in principle but advanced in execution,' explains Al Bassami. "**We clean, stabilize, and upgrade phosphogypsum until it becomes a valuable material again. What starts as waste ends up powering high-tech industries'.' The system is modular, integrating directly with mining facilities to process waste at the source. It recycles over 80% of its water and operates with optimized energy efficiency.

> We wanted to build something that makes both industrial and environmental sense
>
> Rayan Al Bassami, CEO of GeoVolt

GeoVolt

"Geoscience Engineering Optimized for Value, Output, Longevity, and Transformation"

- Founded: 2023
- Team: Faisal Awad,CFO, Ziyad Khalid, CMO, Eng Abdullah Almuzaiel, CTO
- Founder: Rayan Al Bassami CEO
- FMF Track: Resource Sustainability
-Funding: Cash-flow positive; seeking USD 8–10M scale-up
-Milestone: 1st place FMF award + USD 150K grant
- Vision: Global leader in circular mining materials





> For us, sustainability isn't just a checkbox, it's the core business model
>
> Rayan Al Bassami, CEO of GeoVolt

## Global Demand & Economic Impact

The purity of the material determines its usability. At ≥99.5%, it becomes essential for sensitive applications. "Our primary customers include battery manufacturers, semiconductor companies, advanced chemical producers, and specialized industrial laboratories,' 'Al Bassami notes, adding that this purity "dramatically increases its market value.' '

GeoVolt's project is already cash-flow positive, boasting a three-year payback period and an internal rate of return (IRR) close to 39%. To reach full industrial scale, the company projects USD 8–10 million in required investment.

"We're open for investment", says Al Bassami with confidence. "Our plan is to blend strategic equity with project debt and sustainability-linked funding. We'd love to partner with national champions like Ma'aden, because our goals align, transforming the mining sector into a source of long-term sustainability and prosperity.'


## A Vision for 2030

Recently awarded first place in the "Resource Sustainability" track of the Future Minerals Pioneers Awards, GeoVolt aligns with Saudi Vision 2030 by localizing advanced manufacturing. "Demand is growing globally, particularly in Asia, Europe, and North America," says Al Bassami. "By converting mining by-products into high-value materials, we're contributing to the circular economy. This isn't about managing waste. It's about redefining what value looks like in mining."

# Saudi's USD2.5 Trillion Untapped Deposits Need Faster Discovery.

UNCHARTED AI
AUTONOMY BEYOND BOUNDARIES

## Enter Uncharted AI Space-Tested Robots for Vision 2030 Mining

Imagine Mars rovers scouring Saudi Arabia's deserts to uncover the Kingdom's next trillion-dollar mineral strike. That's the bold vision behind Uncharted AI a cutting-edge deep-tech startup founded by space robotics experts who just clinched first place at the Future Minerals Pioneers Awards.

Founded: March 2025, Team Size: 2 co-founders + engineers, **Founders: Vivek Shankar Varadharajan, PhD CTO & Co-Founder, Pradyumna Vyshnav, CEO & Co-Founder**, FMF Track: Digital Transformation Funding Status: Pre-seed (Antler India); seeking seed round, Key Milestone: 1st place FMF Pioneers Vision: 6X faster exploration globally


Drawing from battle-hardened autonomy systems designed for Moon bases and underground Mars habitats, Uncharted AI is adapting those extreme environment technologies to tackle Saudi Arabia's massive untapped deposits. Their platform combines AI-powered data analysis with robotic ground-truthingperfect for the remote, GPS-denied terrains where human teams struggle to operate safely and efficiently.

> We came to Saudi Arabia expecting to learn, not to win

Pradyumna, co-founder and CEO of Uncharted AI

But the judges immediately saw something special in our full-stack approach: sophisticated processing of existing geological datasets, fused with robotic surveys that deliver real-time validation in conditions too harsh for human operators.

## Fixing a Broken Exploration Workflow

Today's mineral exploration is still largely manual, slow, and fragmented. Geologists may spend months stitching together drone imagery, soil samples, and geophysical surveys, often processed in separate software tools with little feedback between field reality and predictive models. This leads to resurveying the same ground, long cycles to first discovery, and drill decisions made under high uncertainty.
Uncharted AI tackles this with a closed-loop exploration engine built on three pillars. First, autonomous ground platforms carry multi-sensor payloads into harsh, GPS-denied terrain, collecting dense, repeatable data without requiring large teams to remain on-site for months. Second, AI models fuse that robotic data with satellite imagery, drone surveys, hyperspectral scans, and decades of historical records to identify high-potential targets and highlight uncertainty zones. Third, precision targeting closes the loop by triggering fresh robotic surveys where models most need ground truth, so humans validate, models learn, and the cycle accelerates.

> Exploration today is like assembling a puzzle with half the pieces missing. We're building the system that finds the missing pieces and tells you where to look next

Pradyumna, co-founder and CEO of Uncharted AI





Unlike hardware-heavy competitors that build proprietary rovers, Uncharted AI treats hardware as interchangeable. Their perception and autonomy stack is deliberately platform-agnostic, integrating with a spectrum of robotsfrom premium U.S. systems at around 200,000USD dollars to cost-effective Chinese platforms near 20,000USD dollars and Indian-built vehicles in the 25,000 to 50,000USD dollar rangewhile modular sensors are tailored to each geology, including ground-penetrating radar, portable XRF, hyperspectral cameras, and environmental payloads. "Hardware is a commodity,' Vivek explains. "Sensors exist off-the-shelf. What mining needs is intelligence that works across platforms and learns from every deployment.'

## Pilots in India and Australia, Saudi Next

Founded March 2025, Uncharted AI quickly launched pilots. In India, they partnered with the Ministry of Mines on bauxite exploration in Maharashtra and Chhattisgarh. Robots + ISRO hyperspectral data narrowed thousands of km² to high-potential zones. **"Geologists spend months in the field. We cut that to weeks,' says Pradyumna.** Australia hosts advanced confidential pilots with majors. Phase 1: AI reprocesses existing drone/remote sensing data to reveal new drill targets. Phase 2: Robots resolve uncertainty at drill pads and heritage sites. Result: 12–15 year campaigns now hit first insights in ~2 years at 50% lower cost.

## Exploration as a Service, Not Capital Equipment

CFOs often wary of deep-tech costs find a solution in Uncharted AI's Exploration-as-a-Service. By shifting the burden from CapEx to OpEx, miners pay for exploration outcomes rather than expensive hardware. This model mirrors hiring a drill rig: the company provides the robots, while the client gets the data. In remote regions like Australiawhere a 10-person geology team can cost USD5 million annuallythis autonomous approach slashes overhead and improves safety. However, the biggest saving isn't labor; it's precision. By using robotic "ground truth'' to map uncertainty, Uncharted AI eliminates the dry drill holes that silently waste millions of dollars.''

> Everything claims AI in mining. Deploying in real conditions, showing clear ROIthat's what separates signal from noise.

Dr. Vivek Shankar Varadharajan Co-Founder and CTO of Uncharted AI

## Saudi Arabia: Pioneers Win & Ecosystem Entry

"We didn't expect first prize,'' Pradyumna admits. "What stood out was our end-to-end visionAI processing existing data PLUS robots delivering fresh ground truth.'' The win brought a USD150K grant and access to Saudi's unified mining ecosystem: government, Ma'aden, SGS, and global players.

**"No other country operates at this national scale' Vivek marvels.** Saudi's USD2.5T untapped depositsphosphate, gold, battery metals, rare earthsnow top their priorities. They're eager to co-design deployments with Ma'aden and SGS for desert geology and Vision 2030 localization.

Tania Llieva

Principal Geologist - Mineral Exploration & Resource Estimation

RUMYANA DAVIDSON

Strategic & Board Advisor

Rana Abdullah Zamai

Chairwomen, Saudi Arabia

# Women in Mining

Across Saudi Arabia, women are stepping into mining as geoscientists, engineers, data specialists, ESG leaders, financiers, and policy shapers-proving that the sector is no longer a male-only domain.

"Women in Mining" section shines a spotlight on the pioneers and rising talents across Saudi Arabia and abroad who are redefining what a career in mining can look like. Each profile highlights a woman's professional journey, the challenges she has overcome, and the impact she is making on projects, teams, and local communities. By sharing their experiences, we aim to inspire more women to consider roles across the mining value chainfrom fieldwork and operations to research, innovation, and leadership.

Through interviews, case studies, and on-the-ground stories,





**Rana Abdullah Zamai**

Chairwomen, Saudi Arabia

Chairwoman of the Board, Women in Mining Association Saudi Arabia Rana Abdullah Zumai is also serving as the Journal Editor in Chief - Head Of Corporate Communications and Knowledge, Saudi Geological Survey with extensive experience in leadership, communications, and industry partnerships, she champions women's advancement across Saudi Arabia's mining and industrial sectors. Previously, Zumai led corporate communications at Nesma Co. Ltd. and managed operations and partnerships for Nesma Embroidery. She is also a Qaderoon ambassador, columnist for Al-Yaum, and member of the Qiyadat Global Georgetown Leadership Program Zumai holds a B.Sc. in Microbiology from King Abdulaziz University and an M.A. in Corporate and Marketing Communications from IE University. Rana has played a defining role in shaping the narrative of women's inclusion in Saudi Arabia's mining transformation under Vision 2030

## Leading Women in Mining

### Tell us about your journey leading Women in Mining? What advice would you give young Saudi women joining the mining profession?

My journey with Women in Mining came naturally from my professional path. I have always believed that Saudi women belong in strategic sectors, including miningnot as a special case, but as capable professionals. When we started, the focus was not on numbers, but on building credibility: creating a platform where women can develop real skills, access opportunities, and be taken seriously within the industry. Leadership in mining requires patience, technical understanding, and resilience, and Saudi women have shown all three. My advice to young Saudi women is to focus on competence first. Learn the field, understand the operations, and don't be afraid of technical environments. Growth comes from experience, not comfort. Be consistent, seek mentors, and trust that your presence in this sector is part of a bigger national transformation.

## Building a Network of Change

### The Women in Mining Association connects how many professionals? How did it start? What programs do you offer?

Women in Mining Association connects a growing network of professionals across mining, minerals, policy, academia, and industry partners. It started with a simple idea: ensuring that women are prepared and positioned to contribute meaningfully to Saudi Arabia's mining transformation under Vision 2030. Our programs are practical and industry-focused. They include awareness initiatives, specialized training, leadership development, mentorship, and strategic partnerships that translate into real exposure and career opportunities.For junior women, the first year should be treated as a learning year. My advice is to be present, ask questions, participate actively in programs, and seek guidance early. The value of the association grows with engagement.

## Empowering Women Through Policy

**Who are your key supporters in Women in Mining? What did they do differently, and how can women engineers proactively identify good support and sponsorship opportunities?**

Our key supporters are organizations and leaders who understand that inclusion strengthens performance. What they did differently was move beyond encouragement and into actionby opening access, supporting training, and trusting women with responsibility. For women engineers, support becomes meaningful when it leads to growth. Look for leaders who are invested in development, not just visibility. Be clear about your goals, demonstrate commitment, and don't hesitate to ask for opportunities. Sponsorship is built on trust and performance over time.

**What is the one company policy change needed to support more women? Can you give examples of successful women miners working in different aspects of the industry?**

One critical policy change is ensuring equal access to field experience and clear career progression pathways. Women need the same exposure and development opportunities to grow into leadership roles. Today, Saudi women are contributing across the mining sector working in operations, exploration, sustainability, safety, project management, policy, and investment. Their success is a result of capability and opportunity aligning.

## Building the Future Workforce

**By 2030 Mining will need 25,000 more Saudi professionals. If you could design a "Women in Mining Fast-Track" program, what would the 90-day curriculum look like? How can corporations support more women in mining?**

A fast-track program must be practical and aligned with employer needs. The first 30 days would focus on mining fundamentals, safety, and field readiness. The second 30 days would emphasize applied learning through site exposure, technical problem-solving, and sustainability practices. The final 30 days would prepare participants for employment through on-the-job experience, leadership skills, and direct engagement with employers. To corporations, my message is clear: investing in women is an investment in the future workforce. Support comes through training sponsorship, internships, fair field access, mentorship, and long-term development pathways. When companies commit to inclusion, they strengthen the entire sector.



MINING Saudi Arabia

**RUMYANA DAVIDSON**

Strategic & Board Advisor

# Breaking Ground: Women in Mining - An Exclusive Interview

This interview captures the raw voice of a trailblazing mining business development experta multilingual lawyer turned dealmaker, executive with Women in Mining Montreal, Canada and pioneer eyeing Saudi exploration ventures

## The Unexpected Entry

**What inspired you to start on the business side of mining many years ago? How did you get into it?**

"Before the Libyan Revolution, I was working on a railway construction project. When the conflict began and I lost my job, an oil company recruited me to help expand their mining division. While I am a lawyer by trade, they also hired me because of the languages I spoke - Arabic, French, English, and Spanish, which allowed me to cover nearly the entire African continent. The defining moment of my career was a project in Sudan. My instructions were simple: "Go there and stay until the job is done'.' My role quickly evolved beyond legal work into communication and high-stakes negotiation. I found I could build connections rapidly and, more importantly, look past what people were saying to identify what they actually needed.

## Joining the Women in Mining Movement

**How did you get involved with Women in Mining in Canada?**

"When I moved to Canada few years ago, I attended PDAC, world's premier mineral exploration and mining convention, Inspired by the experience, I reached out to the Montreal chapter of Women in Mining (WIM) to volunteer. Today, I serve on the executive committee, where I manage social media, communications, and partnerships. Our mission is to make women in the industry visible; we provide them with speaking platforms, introduce them to key stakeholders, and create vital networking opportunities to ensure they are seen and heard by the industry at large.

## Real Barriers Women Face

**What are the biggest challenges for women in mining, from your experience? How about biases on the job?**

The barriers for women in mining start long before the job site. It begins with a societal nudge away from the sciences or heavy industries, labeling them as "men's work'.' In a class of fifty, you are often one of only two women visible enough to be invited to every party, yet constantly fighting to be taken seriously as a peer. Once in the workforce, the bias becomes a daily grind. Whether it's being asked to get coffee instead of doing your work or facing subtle doubts about your capabilities, these microaggressions are as prevalent in the West as they are anywhere else. Remote work only amplifies the struggle. While travel might be simpler for many men, it's an emotional hurdle for mothers. Then comes the "career-killer' ' choices: pregnancy and maternity leave, which many still view as a lack of commitment. Globally, the story is similar but the pressures vary. In the Middle East, brilliant female graduates often vanish from the market after marriage because society or a husband deems a 500-man mine "no place for a woman'.' This leads to a vicious cycle: employers hesitate to invest in female talent, expecting them to drop out. Even in Canada, where the industry is 80% male, we face a wall of invisibility. Just two years ago, a board member admitted he didn't even know we existed. Changing this industry isn't just about policy; it's about proving we are more than just "the wives of miners' ' at the lunch table we are the professionals driving the project forward.

## Policies and Progress

### Does corporate policies like mentorship or flexible work actually help?

" In Canada, diversity policies and webinars are often mandated for licensing and corporate government, but they frequently end up as "paper tigers' -formal on the outside, but hollow in practice. While budgets are assigned, the industry often resists quotas, viewing them as "free tickets' ' for women rather than a search for talent. This is frustrating for those of us who prioritize merit above all else. The depth of this disconnect became clear just two years ago when I presented to the board of a major mining association. The room was almost entirely men. After I finished, one board member remarked, "This is so interesting, we didn't even know you existed. We thought 'Women in Mining' just referred to the wives of miners organizing social lunches and dinners'.' My own experience in North Africa-working in a conservative Muslim region-was a testament to pure merit; I was hired and respected because I got the job done, not because of a mandate. I believe that showcasing successful women is far more effective than any quota. The data consistently shows that diverse teams simply perform better. To drive change in regions like Saudi Arabia, we need to educate the industry for example through value-driven webinars and real-world stories. By featuring global profiles of women in technical and business roles, we aren't just checking a box we are maturing the industry's data and strengthening its ESG standing.

## Advice for the Next Generation

### What would you tell young women wanting a business-side career in mining?

The first step is overcoming imposter syndrome; that nagging feeling that you don't know enough to belong. When I entered this field, I had zero industry experience. I wasn't hired for a mining engineering degree; I was hired because I was a lawyer who spoke the right languages. They didn't expect me to be an expert on day one, and they won't expect it of you either. The truth is that your skills are more transferable than you think. Whether it's signing agreements, navigating tender procedures, or negotiating high-stakes deals, these tasks are universal. If you've worked in construction or oil, transitioning to the business side of mining isn't a leap it's a pivot. Both industries are built on the same foundations of extraction, exploration, and logistics. Be open to shifting your path. In many cultures, like in Saudi Arabia, there is often pressure to stick to a single, traditional career. But real success often lies in the middle. Don't look at a career change as starting from scratch; look at it as reframing. My "legal' role was really business development in disguise. List your universal skills, find a coach to help you reframe your narrative, and just apply. The industry needs your perspective more than it needs you to have a decades-old mining certificate.

## Saudi Plans

### What's next for you in Saudi?

I am launching a new venture in Saudi Arabia to support license owners who have the land but lack the roadmap to develop it. Many people hold mining licenses without a clear idea of how to unlock their value; my team and I provide that bridge. We bring in technical experts, Canadian QP geologists who get on the ground to "sniff the stones',' take samples, and conduct the essential initial exploration report. We transform raw land into a clear business case, helping owners understand the true potential of their asset so they can decide whether to invest, find a partner, or sell. My own experience in North Africa-working in a conservative Muslim region-was a testament to pure merit; I was hired and respected because I got the job done, not because of a mandate. I believe that showcasing successful women is far more effective than any quota. The data consistently shows that diverse teams simply perform better. To drive change in regions like Saudi Arabia, we need to educate the industry for example through value-driven webinars and real-world stories. By featuring global profiles of women in technical and business roles, we aren't just checking a box we are maturing the industry's data and strengthening its ESG standing.





**Tania Llieva**

Principal Geologist - Mineral Exploration & Resource Estimation

A mining geologist with over 30 years of experience, Tanya Ilieva specializes in mineral exploration, geological interpretation, and GIS applications, primarily in Canada. Her research focused on Cretaceous/Tertiary boundary fossils in the Varna area at the University of Mining and Geology in Sofia, Bulgaria. Mining companies can rely on her expertise to estimate and explore resources. She is based in Toronto, where she contributes to the analysis of geological data and the planning of mineral project development.

## Roots by the Black Sea: A Childhood Fascination That Ignites a Lifelong Career

### Dr. Ilieva, let us begin at the very beginning how did your deep-seated passion for geology first take root, and what led you to pursue it?

Dr. Tania Ilieva: As a high school student in Burgas, a coastal city in Bulgaria nestled along the shimmering Black Sea shores, where I studied natural sciences and math, my love for natural sciences truly blossomed. Although most of my relatives urged me to channel my energies into more predictable and secure fields like economics or medicine, professions they viewed as stable and office-bound, I could never reconcile myself to the notion of spending decades confined to a single desk in a static environment. Instead, I yearned for a career that promised perpetual motion, intellectual discovery, and intimate communion with the earth's dynamic geology, which ultimately drew me to apply for and gain admission to the prestigious University of Mining and Geology. There, I immersed myself in the study of mineral exploration and mineralogy, captivated particularly by the allure of glittering crystals and ores. Shortly after graduation, I married and welcomed a child just one month later, necessitating a three-year maternity leave, after which I ventured into exploration work alongside my husband in the same professional group.

## The Changing Face of a Geologist's Day

### How has a geologist's typical day transformed across Bulgaria, Canada, and your international postings,

Depending on where you are and what you do, geologists have different routines. However, in Bulgaria, they follow an eight-hour structure starting around 7 o'clock with early morning visits to drill sites. By interacting with night and day crews, I can check core recovery rates, issue warnings about survey needs, diagnose recovery shortfalls, log cores, process incoming data, manage urgent emails, conduct quality control and assurance, and liaise with labs - all before the day concludes, whereas in Canada, it's an 8-to-12-hour shift, escalating to 12-hour marathons (from 7am to 7pm, punctuated by breaks) for remote projects, with email triage, 3D modeling, report drafting, and flexible overruns to avoid disruptions to workflow, as interrupting complex tasks like modeling often demands triple the time to resume momentum the following day.

## Balancing Family and Fieldwork

**Reflecting on your three decades in the industry, what have been the most profound challenges you've encountered, particularly those uniquely confronting women?**

One of the greatest challenges for women in exploration geology is balancing its demands with family life, especially when remote sites require long absences from home, a reality I found unsustainable after childbirth. I pivoted to city-based technical roles, gaining skills in GIS, 3D modeling, and data processing to prioritize family while staying in geology. This shift proved timely, as AI and automation have since shifted the field toward data handling, creating opportunities for women in analytics. Additionally, interpersonal dynamics in male-dominated environments can be challenging, particularly when younger female geologists oversee veteran crews. Success requires clear, respectful communication to foster collaboration. For me, family always takes precedence, which led me to embrace computational upskilling to enrich my expertise without compromise.

## ESG: From Principles to Practicalities

**What is your unvarnished assessment of ESG practices in exploration?**

ESG efforts must go beyond lofty talk to practical actions. The real focus should be on preparing frontline teams with research into local customs and work cultures to build mutual understanding. Many ESG discussions are abstract, missing simple steps like improving ergonomics to prevent back strain, using trucks instead of ATVs for safety, building better roads, and hiring locals to create lasting community ties. Initiatives like camp doctors serving nearby villages show more impact than just meeting employment quotas.

## Mining, Perception, and Public Trust

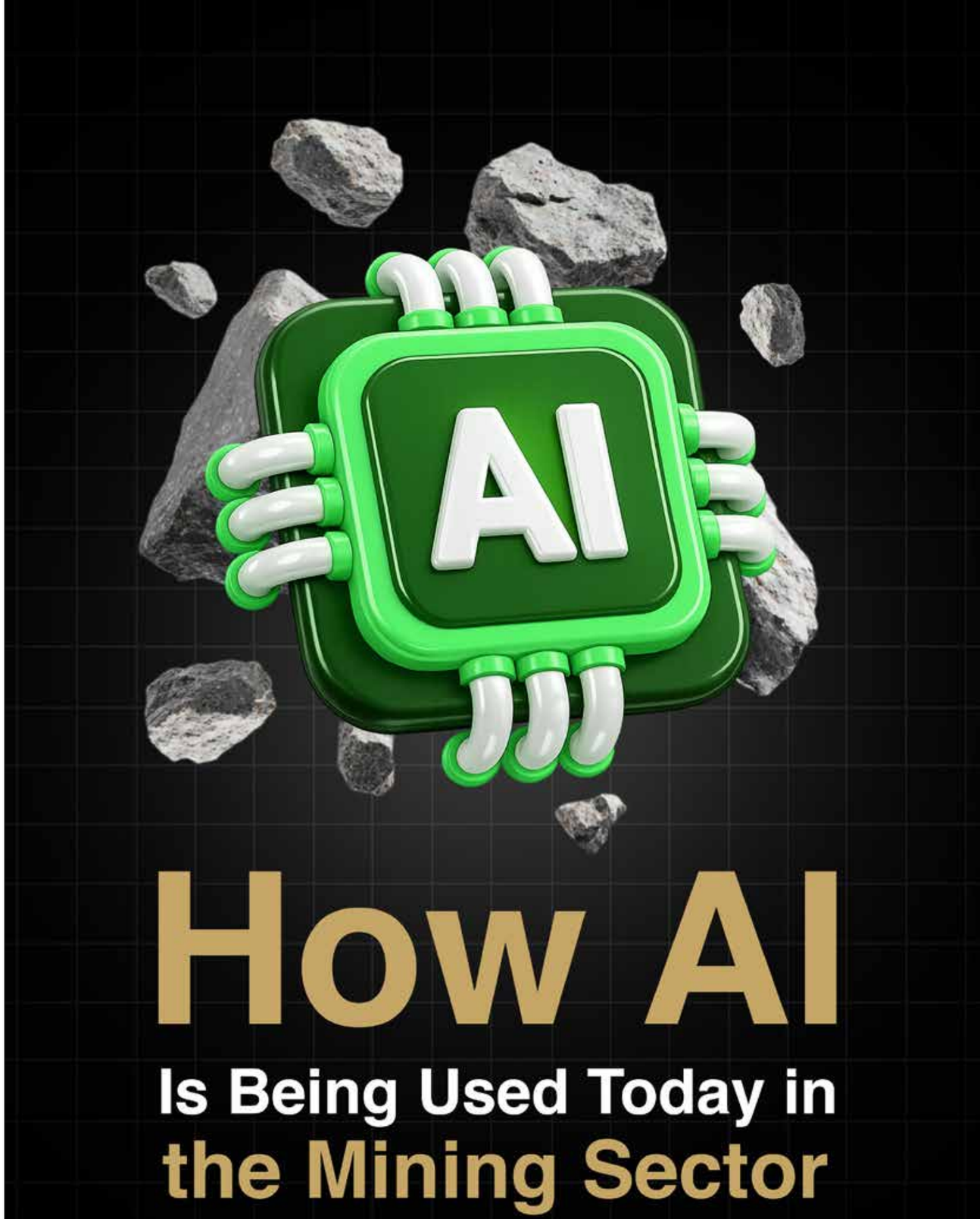
**From your perspective, what drives such strong public opposition to mining in some regions?**

Many people oppose mining because of misinformation. Activist groups use emotional messages, like showing old, inactive pits and saying they're cyanide-filled, without knowing the science. It's easy for mining to get a bad reputation because the public doesn't know what's harmful versus what's standard practice.


## On Energy Transition and theFuture of Geology

**Your thoughts on mineral trends amid energy transitions, and your advice for governments, companies, universities, and young people**

governments, companies, universities, and young people Minerals are vital for energy transitions, but favoring gold over rare materials like lithium slows progress. This requires strong policies and investor confidence. Young people can get into geology by getting upskilled in GIS and AI, doing co-ops to explore career paths, and adapting to roles like consulting, modeling, and geotechnics. Geology is a field that is enduring despite technological advances. Governments should support grassroots drilling, universities should enhance industry collaboration and upgrade skills, and companies should focus on maximizing by-products. My advice would be to stay curious and flexible. The field is changing rapidly with technology, GIS, and data analytics playing huge roles in exploration now. Don't fear the transition from research to consulting or from one country to another. Every step adds to your skill set and perspective. Most importantly, never lose your sense of wonder at the natural world. That's what keeps us going.




# How AI Is Being Used Today in the Mining Sector

During one of the panel sessions at the Future Minerals Forum, industry leaders discussed how artificial intelligence is already being applied across the minerals sector and where it is making a practical difference today. The conversation focused on real operational use cases rather than future possibilities. AI is currently being used in supply chain management to ensure that parts and consumables are available in the right location at the right time. In equipment services, digital copilots support technicians by providing instant access to procedures, machine information, and technical guidance, helping them learn new technologies faster. From an operator's perspective, AI supports several functions. In exploration, structured databases and data analysis tools help teams organize large volumes of geological information and improve decisions about where to drill. In operations, AI-based control systems support process stability and make it easier to reach and maintain operating set points. In office environments, AI reduces time spent locating and organizing data and allows teams to focus more on analysis. Exploration was described as a stage with significant uncertainty and extremely large volumes wof subsurface data. AI is used when data volumes exceed what can be interpreted quickly by people alone. It does not replace geological knowledge but supports it and increases confidence in exploration decisions. In mineral processing, operations run continuously, and reducing unplanned stoppages is a priority. AI tools use operational data, including older records that were not previously analyzed in detail, to support process optimization and production improvement. Project development is also changing. Instead of strictly linear handovers between exploration and engineering, parametric designs linked to orebody models allow activities to progress in parallel. This approach shortens timelines while managing risk. AI and automation reshaping the work of exploration geologists, especially for women and young professionals entering the field


> AI is not replacing geologists; it is reshaping what a geologist's day looks like. Instead of spending all our time in the mud and cores, more of our value now comes from how well we can interpret, validate, and guide the models. The industry is shifting from "boots-only" to a balance of boots and bytes, and that opens doors for people who are strong in GIS, 3D modeling, and data analytics
>
> Dr. Tania Ilieva
> a geologist with over 30 years of experience

" for many women, this has created space to build stable, city-based careers without losing connection to exploration. The key is to treat AI as a powerful assistant, not a black boxgeology still provides the critical context, the constraints, and the common sense that keep the algorithms honest," she added. But what about speed and adoption? Technologies evolve quickly, and projects can become outdated in a short time. Adoption in a traditional industry requires change management and leadership support. Starting in areas where business leaders are motivated and curious was described as an effective way to build momentum.AI was also described as something that should be approached through long-term collaboration rather than treated as a one-time purchase. Ongoing learning and acceptance that not every initiative will succeed immediately are part of the process. The discussion showed that AI is already part of daily work in different parts of the minerals value chain and is being used to support exploration, operations,maintenance, and project development.

**Dr. Salem Algharbi**

Energy, AI Expert I Technical Leader I Mentor

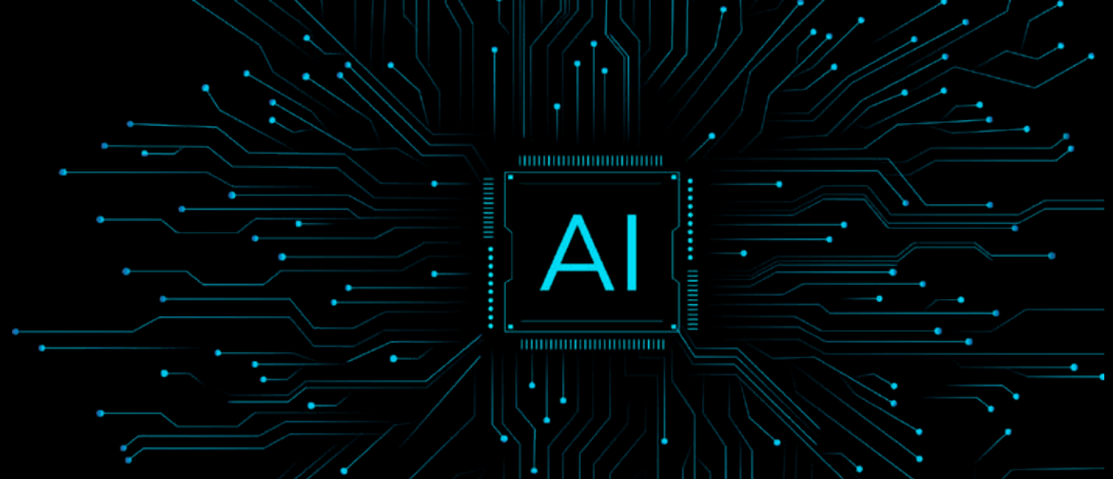
A distinguished expert at the intersection of Energy and Artificial Intelligence, Dr. Salem Algharbi brings a rare multidisciplinary perspective to the industry. With a foundational background in Petroleum Engineering and computer science/optimization, he earned his Ph.D. in Energy and AI, positioning him at the forefront of the sector's digital transformation. As a prolific contributor to the field, Salem has authored, co-authored, or chaired over 70 technical articles and publications, establishing himself as a thought leader in AI-driven energy solutions. Beyond his technical research, he is a deeply committed community leader, actively participating in Energy, ML, and Data Science circles. Salem is particularly passionate about mentoring and knowledge sharing, dedicated to coaching the next generation of engineers and tech experts to navigate the "blue ocean" of opportunities in the modern energy landscape.

## Blue Ocean: Why AI is the "Must-Have" Engine for Saudi Mining

There is a new titan emerging at the center of Saudi Arabia's economic transformation. Compared to its predecessors, the mining sector does not have decades to mature, like oil, gas, and petrochemicals. It has been proclaimed the Kingdom's "third pillar," destined to stand alongside the historical titans of oil, gas, and petrochemicals. As the industry races against a clock of global demand and a shortage of specialized professionals, it must work diligently. Dr Salim AlGharbi believes that the only way to win this race is to aggressively adopt Artificial Intelligence.

## A Pillar in the Making

It is the intention of the Kingdom to develop mining as the third economic pillar. According to Dr Gharbi, "Although oil and gas have been operating here for more than 80 years, mining is just beginning. We are hoping for this sector to grow as rapidly as oil and gas. In order to bridge that gap and overcome the global shortage of tools and talent, we must rely heavily on technology. Artificial intelligence is not a luxury it is a necessity," he explains with enthusiasm.


## Resolving the "Garbage In, Garbage Out" data dilemma

While there has been a lot of buzz surrounding AI, the Dr Gharbi cautions that it is only as effective as the strategy behind it. He advocates a "problem-first" approach rather than following trends. It is the classic "garbage in, garbage out" scenario that determines the success of an artificial intelligence model" Dr Gharbi cautions. "We should ask ourselves before developing or purchasing a model: "What is the impact?" and "Why do we need this?" Technology should not be developed just for its own sake. It is imperative to have a clear purpose before the technical side is applied, but too often people rush to provide a solution before they have fully defined the problem, " he further cautions.

## The Challenge of "Niche" Data

The complexity of mining data is one of the largest challenges. It is more than just numbers on a spreadsheet; it is an intricate puzzle of satellite imagery, sensor readings, and deep-earth drilling. "Mining is unique," according to Dr Gharbi "You can't just tweak an algorithm used by Facebook and TikTok and use it for mining. We need niche solutions. The most important aspect, however, is that developers communicate directly with engineers and geologists. Building trust is the most challenging part of the process. We aim to create a model that does more than just process code but also replicates the intuition and expertise of a seasoned geologist." It is possible to reduce the time required for discovery by as much as 75% if these models are successfully implemented, he reveals. Currently, the intersection of artificial intelligence and mining is a "blue ocean." While other tech sectors are saturated, mining is uncrowded. There are far more AI companies focused on Mars or outer space than there are focused on mining yet the earth beneath our feet is where our true treasure lies." As the Kingdom opens its arms to global tech talent, the message is clear: the future of Saudi wealth isn't just in the ground it's in the code that helps us find it.

MINING®
Saudi Arabia


# Your Gateway
# Into KSA Mining