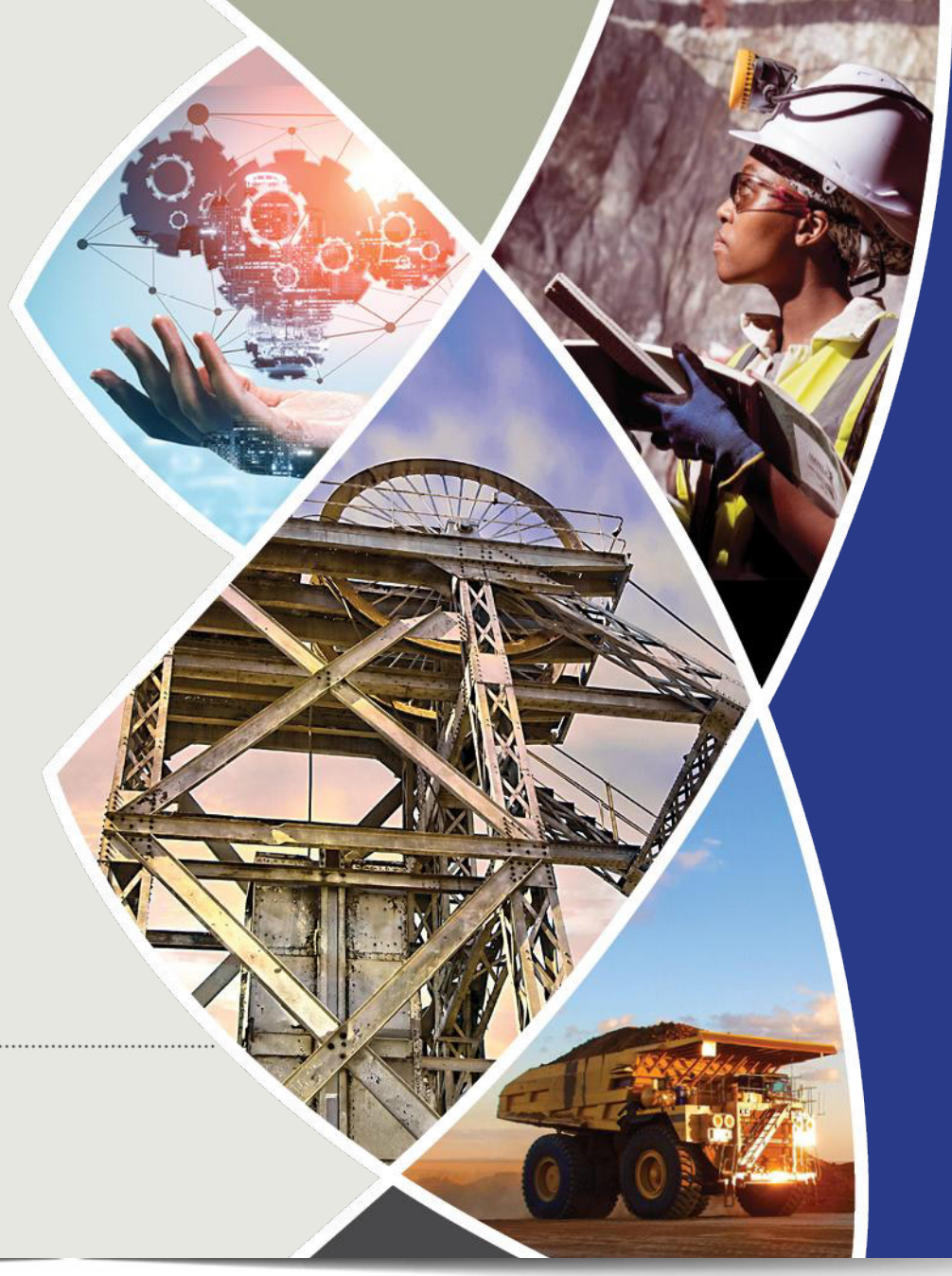
MANDELA MINING PRECINCT
MINDS FOR MINES

SATCAP 2025
INDUSTRY SUMMARY REPORT



science, technology & innovation
Department:
Science, Technology and Innovation
REPUBLIC OF SOUTH AFRICA

MINERALS COUNCIL
SOUTH AFRICA

CSIR
Touching lives through innovation

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SATCAP Focus

The SAMERDI Successful Application of Technology Centred Around People (SATCAP) programme aims to understand the effects, impacts, and challenges of mining modernisation on people in the sector, exploring how stakeholders relate to technologies and to one another while supporting the Environmental, Social, and Governance (ESG) agenda.

Modern mining processes, technologies and systems will have impact on people in mining, and the ripple effects of mining modernisation on livelihoods, relationships, and the socio-political environment, within which mining operates, needs more understanding

SATCAP purpose: Understand the impacts of mining modernisation on people, technology use, and relationships in the sector, while supporting the ***ESG agenda.***

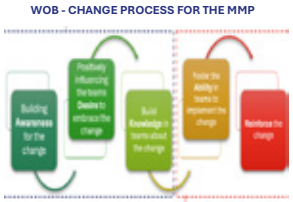
Key drivers for SATCAP

- **People-centricity:** Examines how modern systems, processes, and technologies affect workers, communities, livelihoods, organisational structures, and the broader socio-political environment.
- **Stakeholder concerns supported:**
  - Potential job losses and changes to work due to modernisation
  - Inclusive stakeholder participation in the modernisation journey
  - Balancing people, planet, and profit under ESG
- **Shared value approach:** Enable people-centric modernisation
- **Stakeholder inclusion:** Taking stakeholders along in mining modernisation
- **Co-creation and collaboration:** Linking outputs, stakeholders, and partners across work packages and MMP Programmes to maximise collective impact.

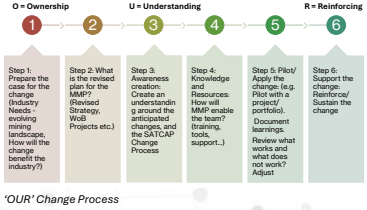
Further to note, in FY2025, there was a focus on change management for 'working on the business' to enable/ optimise the MMP revised strategy. The SATCAP Change Process was validated as an applicable process for change application.

This process was **unpacked into implementable steps** based on the MMP context, that is, into a **Change Process-Toolkit**, which provides practical guidance and structured prompts to support the MMP in consistently and contextually applying change principles across their initiatives.

For sustainability, a Change process - Toolkit has been designed, which will allow for roll-out of anticipated, future change within the MMP. This is captured in a **guideline** to enable change application by the MMP. The Change Process-Toolkit provides a structured roadmap to guide the adoption of change.



The change management process adopted by the MMP was developed around the SATCAP 3PRS Change Management Blueprint, which is deeply rooted in ADKAR (Prosci, n.d.) change principles.



'OUR' Change Process

OUR Change Process, with the acronym **OUR** representing **Ownership**,**Understanding, and Reinforcement.**

This SATCAP 2025 industry summary report, provides a consolidation of the research undertaken by the SATCAP Programme through its collaborators – for industry awareness, potential use/ dissemination.

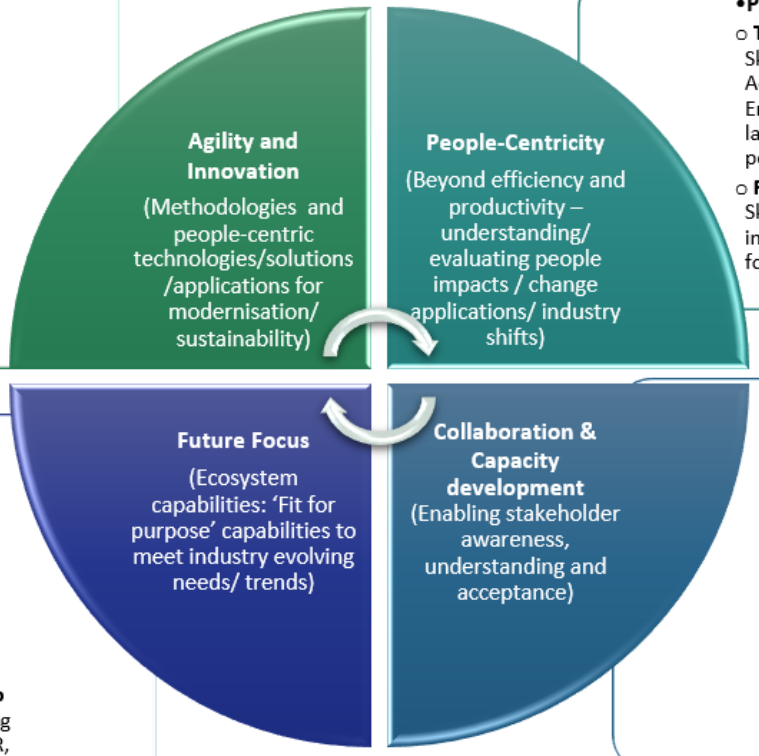
SATCAP research outputs, reports, guidelines and resources are available on the MMP Website:

https://mandelaminingprecinct.org.za/successful-application-of-technologies-centred-around-people-satcap/

SATCAP Key Pillars and Value for the Industry

SCOPE AND KEY PILLARS

•JOBS IMPACTS
- ○ Exploratory studies for enabling jobs and skills **options and opportunities;**
- ○ Identifying **existing, enabling people-centric training solutions**
- ○**Systemic approach: Integration with portfolios/ projects** through **Change process, HRLs**
- ○Support to **Circularity, ESG-related** projects



•PEOPLE CENTRICITY
- ○ **Trends maturity matrix:** Jobs, Skills and PC (Baseline, Advancements, Improvements, Enabling and embedded – for a landscape/ industry view of people impacts)
- ○ **Platform/ Mapping** for Jobs, Skills and Transformation with impacts/changes/shifts/ needs for new technologies

•SKILLS
- ○**Ecosystem capability mapping**
- ○ **Support skills (upskilling, reskilling, critical & new skills) needs, women, supervisory and leadership development** (by leveraging networks: OEMs, HEIs, CSIR, Training Suppliers etc.)

•SKILLS
- ○ **Support collaboration and capacity development**: SRCs, Post grads, Interns
- ○ Support stakeholder relationships: Unions, MQA etc.
- ○Leverage collaborators to enable sector skills and capacity development needs

VALUE

Enable mining companies with possible people-centric modernisation applications/ integrated solutions

Stakeholders (e.g. MQA, Unions, MHSC) collaboration and capacity – to support sector modernisation efforts

Emerging and existing applications/solutions identified– for benchmarking, best practice, learnings, customization by mines as per their specific contexts

Exploratory research for jobs, skills and people inclusion options and opportunities, with modernisation people-centric enabling solutions

People, technology and systems integration (HRLs, TRLs Change) Portfolios integration - for cross cutting solutions for systemic impact

Understanding the mining landscape for modernisation trends/ shifts/ impacts and changes around jobs, skills and people-centricity

Enabling future-focused skills needs

Industry needs being addressed through SATCAP research

Research vehicle: Three work packages: **Impact on Jobs** **Skills** **People-Centric Modernisation**

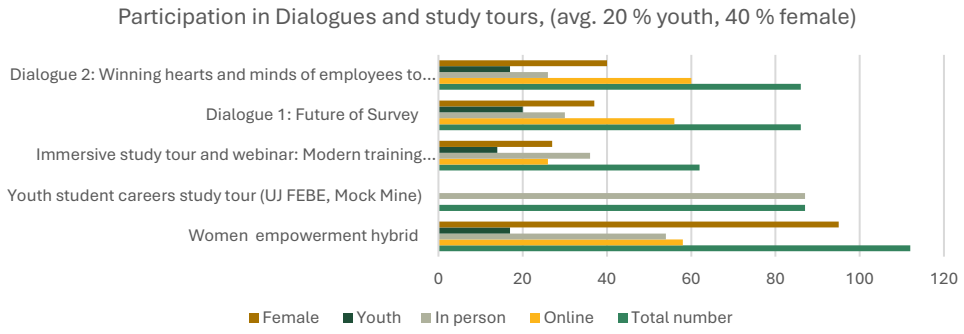
PROBLEM	FOCUS & VALUE
Mines are making strides in terms of jobs, skills & people-centricity aspects in their modernisation journey, which may not be as visible to stakeholders, with a a visualisation needed to demonstrate progression	**PEOPLE-CENTRICITY** • **To support the industry to get a sense of people impacts, changes, shifts in the sector:** •Developing a **maturity matrix focused on trends around jobs, skills and people-centricity (change applications**) allows for insights into a baseline of people impacts in mining modernisation, with progressing this further through gaining understanding of advancements and improvements; further including enabling and embedded trends, towards a landscape view, with narrative synthesis of people impacts. **Phased-in from FY2025-2027.**
A systemic approach is needed with consideration to people, technologies and systems integration	**COLLABORATION AND CAPACITY** • **Support for a systemic approach:** • **Integration (RTIMS/SATCAP/MMS) - MQA_MMP collaboration skills-related project** identified, initiated, with learnings in FY2025; and the project will be progressed in FY 2026 and finalised in 2027 **(Phased-in over 3 years).** (*Project, as a case study, has focus on developing an Exemplar LSM driven by AI methodology/ applications which will allow for the upskilling of assessors - to enable them to assess for HRLs, TRLs and Change Management - to support modern technologies deployment in South African modernising mines).* • **Stakeholder-related collaboration** (OLCF, BiLF, study tours, webinars) continue.
'Fit for purpose' capabilities are needed for the industry's evolving RDI needs/ future trends & new technologies	**FUTURE READY CAPABILITIES** •**Skills - Capabilities to meet future sector needs:** •An **ecosystem capability matrix/mapping** is initiated (Phase 1), Ecosystem capability map with **interconnected capabilities** for TRLs 7-9 (e.g. through HEIs/ SRCs/ TVETs, OEMs/ MEMSA, CSIR Clusters capabilities); To also include **synergistic ecosystem capabilities** mapped towards support for ESG/ circularity and renewables community side stream and down stream activities/ beneficiation/ entrepreneurship. •**Mapping/Platform for Jobs and Skills** needs/shifts/changes for new technologies (RTIMS/MMS integration)
4IR is impacting jobs and skills. Exploratory studies are needed to enable the industry with potential options and opportunities	**AGILITY AND INNOVATION** •**Jobs impacts**: •**Exploratory studies for jobs and skills options and opportunities**, with enabling modern solutions exemplars.

WP 1: Taking stakeholders along the inclusive and transformative mining modernisation journey

SATCAP's objective is to create awareness, understanding, acceptance and capacity building for mining modernisation. To achieve this:

- **Dialogue platforms** for Women Empowerment are held surfacing prevalent challenges in mining experienced by women. In 2025, the focus was on Gender Based Violence (GBV); and Women Progression and Advancement in mining.
- **Capacity development** for interns, SRC students, SAMYA, Trade Unions and researchers are provided through immersive study tours and webinars. For FY2025, the focus was on modern training for modern mining; and mining careers (including entrepreneurship and digital innovation options).
- **Stakeholder collaboration** efforts include leading engagement forums with MHSC, MQA, Trade Unions .
- **Exploratory research** probes into aspects that mines are grappling with. For FY2025, mines needed deeper insights into the Future of Survey in Mining; and Winning Hearts and Minds of Workers for safe behaviour–Psychological, Sociological and Digital Fatigue factors. Dialogue participants included the MQA, DMRE, Subject experts, Trade Unions, Academia, Mining companies, Mining students, amongst others.

Key metrics youth and gender inclusion for SATCAP 2025



Significant Outputs

SATCAP research outputs are disseminated at conferences and seminars, via podcasts and blogs, videos and publications - supported by collaborator involvement. Examples of some research as previously disseminated through the SAIMM Digitalisation Conference and Wits Seminar, MMP Seminars, amongst others, included research papers presentations and showcasing of tools and applications, like:

- Digital Assessment tools: Training-needs, SMME Communications, Community Social- needs, Digital Leadership Competencies Gap Assessment
- SATCAP Change Management Blueprint
- Transition of women and participation in modern mining – an industry perspective
- SATCAP ESG Tools and Dashboard
- Assessment of modern training innovations for Trainers and Supervisors
- Assessment of training innovations for renewables and waste management
- Green skills and digitalisation

WP 2.1: Collaboration Guideline (MQA-MMP) - For enabling collaborative partnerships

A collaboration process

Purpose: Creation of a process for effective inter-institutional collaboration that may inform future partnerships.

MMP and MQA have a collaboration agreement, and sought to establish a collaboration approach - to enable collaboration between a PPP and government entity.

Entities have different internal processes which may impact collaboration. A collaboration approach and process became essential for the existing partnership, and for future collaboration efforts amongst entities with similar contexts.

Key insights for collaborative partnerships

- A strong foundation for collaboration between the MQA and MMP was established, with a clearly defined context – **through a MoU.**
- A project that directly supports the mandates of both institutions - with a **project of common interest identified** (Case study – Exemplar LMS system)
- Internal processes and procedures need to be followed by each partner – noting that each company **processes differ.**
- A **BiLateral Forum (BiLF) structure was established for collaboration, engagement and projects tracking**
- The BILF embeds the principles of collaboration that reflect best practices. A **BiLF Chair was appointed** – external to both parties.
- **Key practices for collaboration** include shared purpose, effective communication, relationship management, agility, digital engagement, and joint decision-making, amongst others.
- A **process flow for engagement w**as developed.
- For **funding** applications, based on their own internal governance and approval structures, the parties have agreed to **follow their own internal processes** (research partner selection, funding approvals etc.)
- If **funding** is needed for an identified collaboration project of common interest, e**ach entity funds its delivery aspect of the project, based on its core competence**, and follows its internal processes for research partners selection, contracting, project delivery etc.
- A partner may support the project with other **contributions** like review, validation or dissemination.
- Key to the collaboration is that a **'lead' be identified to lead and deliver on the project**, so that the project may be progressed with the necessary **technical/ subject expertise** for successful execution.

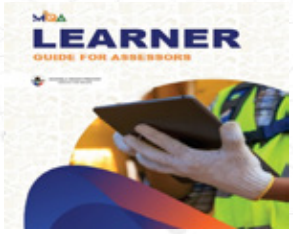
Using case study methodology:

- Identify a **best practice collaboration approach** which supports a collaboration project between key stakeholder partners
- Identify a **best practice process** that enables the successful identification and delivery of a collaboration project of common interest

Case Study: Exemplar Learner Management System for MQA (linkage from RTIMS)

To develop and exemplar Learner Management System, driven by AI methodology/ applications which will allow for the upskilling of assessors - to enable them to assess for HRLs, TRLs and Change Management - to support modern technologies deployment in South African modernising mines.

The Exemplar LMS is a platform showcasing the art of the possible in assessor upskilling, readiness evaluation, and digital learning for South Africa's modernising mining sector. The exemplar LMS integrates **artificial intelligence (AI) features, interactive content, and readiness assessment tools** to support assessors in evaluating **Technology Readiness Levels (TRLs), Human Readiness Levels (HRLs),** and **Change Management Readiness.**



Identify future, national and internal mining trends for the changing mining landscape.

WP 2.2: Ecosystem Capability Matrix and Mapping

For Phase 1, the aim of the project was to develop an ecosystem capability matrix and mapping for the MMP business.

Purpose:

The MMP has revised its strategy in an effort towards supporting industry needs as per the changing mining landscape towards mining sustainability. The SAMERDI Programmes will adopt a portfolio approach, and a key aspect is alignment and evaluating capabilities.

Methodology:

- Identify future, national and internal mining trends for the changing mining landscape.
- Identify and map the MMP programmes capabilities, including team strengths; and CSIR Mining Cluster capabilities.
- Supplement the mapping with the core capabilities of the MMP collaborator pool, as part of the MMP enabling ecosystem.
- Develop a matrix with the ecosystem capabilities vs future needs; with gaps and strengths identified.
- Provide a mapping of ecosystem capabilities in Phase 1

The considered strategic shifts for MMP to meet the industry's evolving needs:

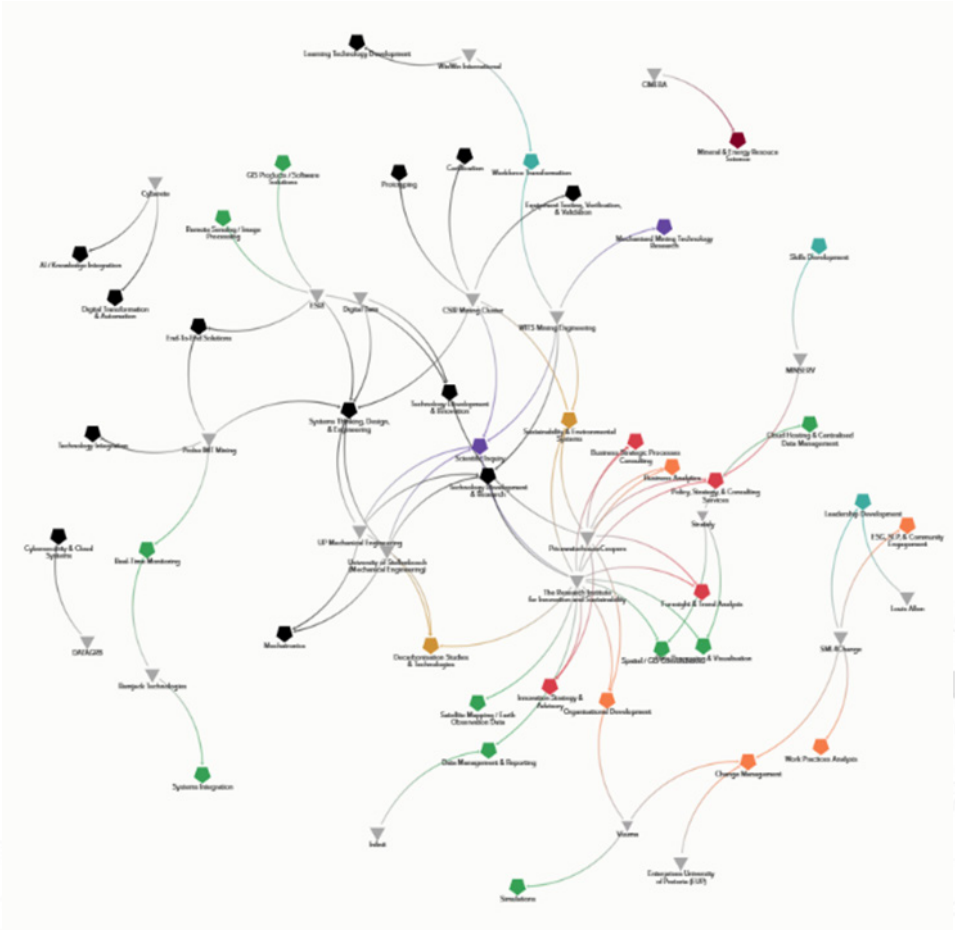
FROM	TO	WHY
Reactive approach	**Anticipatory future-focus**	Matching operating model to industry needs
Siloed research programmes	**Larger holistic research portfolios**	Efficiencies, trans and interdisciplinary, increase scale and impact, improved solutions
Point-source solutions	**Systemic approaches**	Increase innovation potential, holistic, efficient, scalable for impact, matching outputs to KPIs
Problem-solving	**Enabling innovation via information flow**	Matching operating model to industry needs
Only Narrow Reef Hard Rock (NRHR)	**Broader South African Mining Industry (SAMI) application**	Increase innovation potential, holistic, efficient, scalable for impact
Isolated equipment/ technology testing disconnected from human factors	**Two sector-wide verified assessment processes relating to (i) change, and equipment/technology**	Maximise uptake and adoption potential for SAMI, reduce SAMI costs, increase safety & productivity, improve human development

Based on the ecosystem capabilities, i**nitial findings** indicate the following capability requisites, **as per the matrix below**, with recommendations – emphasis is on the high and medium capability requisites.

Capability Area	Capability	Priority	Action	Opportunity
Anticipatory future-focus	**Trend analysis & scenario planning** – to anticipate technological disruptions, evolving market needs, and scientific breakthroughs by integrating structured foresight into innovation planning and portfolio management.	High	MMP can leverage the capability of the collaborator pool for insights that will support agility in response to change.	Collaborator insights obtained through collaborator forum agenda.
	Innovation management – integrates foresight with agile innovation practices to ensure that R&D investments are both future-relevant and impact-driven.	Medium	MMP can leverage the capability of the collaborator pool to develop a roadmap for capability building in this area.	Collaborators provide focused inputs in proposals and project outcomes.
	Digital transformation and automation – enables organisations to leverage emerging digital technologies and intelligent automation to future-proof operations, accelerate innovation, and enhance strategic agility**.**	Medium	Expand the collaborator pool and enable free flow of information to support integrated development of technological solutions.	Information Flow/ Dissemination system.
Larger holistic research portfolios	**Operating model** – MMP currently operates under a hub and spoke model.	High	Review the operating model, align with best practice, and recommend efficient implementation.	Industry review of the MMP strategy and model.
	Capacity (HC and funding) - focuses on strategic workforce planning, capacity building, and adaptive funding models that align with evolving scientific, technological, and societal priorities.	High	Additional resources will enable the successful development, implementation, and management of large portfolios.	Source additional human capital / resources.
	Multi-year project focus - focuses on funding models that align with evolving scientific, technological, and societal priorities.	High	A multi-year funding model will enable programme managers to transition to larger integrated portfolios.	Secure additional funding to deliver on industry needs.

Phase 1: Ecosystem capability mapping

Using the platform Kumu, MMP Collaborators, their capabilities and sub capabilities were mapped to provide a view of collaboration opportunities that can be leveraged to effect the MMP revised strategy.



⬟	Collaborator
▽	Capability

LINK: SATCAP WP2.2 • SATCAP Collaborator Pool Capabilities Map • Kumu

This is the initial findings, as per Phase 1, and the ecosystem capability matrix and mapping will be enhanced in Phase 2 - with a focus on delivery of the RD&I mandate of the MMP to support industry changing needs in their modernisation efforts.

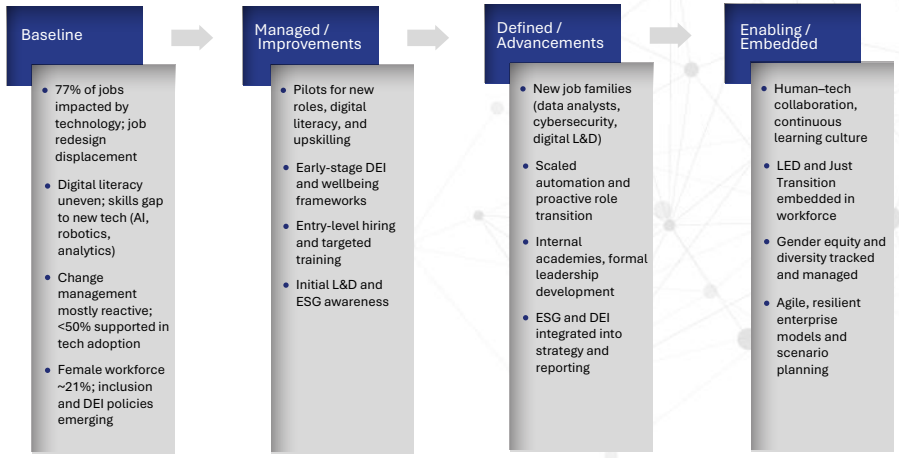
WP 3.1: People Impacts Guideline: Baseline trends maturity matrix on jobs, skills & people centric change

Building an ecosystem view of current landscape of jobs, skills and people centricity, through a maturity matrix

Methodology

- Building an ecosystem view of the current landscape of jobs, skills and people centricity in mining modernisation, through a maturity matrix
- Highlight international and local trends related to jobs, skills and people centric change
- Matrix populated with baseline trends
- Maturity matrix with people-modernization **baseline trends** (MQA, MCSA, Mines n=2, Trade Unions) around new jobs, new skills and people-centricity (change for technology adoption) (Phase 1 of 3)
- Showcase people-centred applications/ solutions that exist/ are emerging / being used on mines – for mines

Phased approach: Maturity matrix trends– Jobs · Skills · People-centric change



Key recommendations for mining companies

Based on the engagement with stakeholders and mining companies during phase 1, the following recommendations were made for mining companies to consider during mining modernisation:

Jobs

Adopt a deliberate, integrated workforce transformation strategy that is closely aligned with operational modernisation, replacing fragmented or reactive approaches to workforce development.

Develop and implement structured, sequenced capability-building pathways to close the widening gap between current workforce skills and those required for new OEM technologies.

Skills alignment

Establish intentional talent pipelines for emerging, highly specialised job families (e.g., Data Analysts, Cybersecurity Specialists, GIS-enabled Environmental Modellers, digital Learning & Development practitioners), ensuring the sector is prepared for the demands of a modern, technology-driven environment.

Invest in renewable energy and hydrogen technologies to drive job creation and innovation.

AI

Accelerate digital and technical skills development, focusing on automation, AI, and advanced processing technologies.

Proactively shape and support local labour markets through Local Economic Development (LED) strategies, leveraging modernisation to create downstream and side-stream employment opportunities.

Strengthen community resilience through entrepreneurship, agriculture, and beneficiation initiatives.

Embed gender diversity targets in recruitment and training pipelines, and leverage technology-enabled roles to actively improve inclusion, particularly for Women in Mining and employees with disabilities.

Develop strategic leadership capacity to manage modernisation and climate transition effectively.

Key findings from Phase 1: Baseline trends on jobs, skills and people centric change

JOBS

- Mining modernisation primarily should drive job augmentation and redesign, rather than widespread job losses.
- Successful transition requires structured role transition planning and deliberate talent pipelines for new specialised roles (e.g. data, cybersecurity, GIS and digital learning roles).
- Digital transformation is disrupting traditional jobs in a context where employment creation remains critical.
- The rise of green jobs and decline of physically intensive roles highlight both job displacement risks and new job creation opportunities in the sector.

SKILLS

- The mining sector needs a deliberate, integrated workforce strategy aligned with operational modernisation, rather than ad-hoc upskilling and isolated training.
- The industry faces significant skills shortages and talent attraction challenges, particularly among younger generations, with critical roles remaining hard to fill.
- Reskilling, upskilling, and new skills development are essential to turn these challenges into opportunities and to enable adoption of new technologies.
- A growing skills gap between OEM technology requirements and current workforce capabilities requires structured, sequenced capability-building pathways.
- Digital literacy and digital leadership are critical enablers of successful digital transformation.

PEOPLE CENTRIC CHANGE

- **Employment and inclusion impacts:** Mining modernisation stimulates downstream and side-stream jobs (e.g. renewable energy, waste management, advanced agriculture, smart machinery maintenance).
- A deliberate workforce strategy allows mines to proactively shape local labour markets. Technology-enabled roles also improve inclusion of Women in Mining and people with disabilities.
- **Need for effective change management:** Successful mining modernisation in South Africa depends on structured and effective change management.
- **People-centred systems approach:** Modernisation must integrate **people, technology, and processes,** with strong attention to human readiness and human factors.

HUMAN READINESS AND SKILLS

- **Human Readiness Levels:** Measure workforce preparedness through reskilling, digital literacy, and adaptability for mechanised and automated mining environments.
- **Skills transition:** Proactive reskilling frameworks and transferable, lifelong skills are essential to help workers move into digitally enabled roles and remain relevant.

CHANGE MANAGEMENT FRAMEWORK

- **Regulatory context:** In 2025, the Mine Health and Safety Council (MHSC) introduced a mandatory Code of Practice for Change Management, requiring structured, standardised, risk-based change processes.
- One of the suggested methods recommended in the COP is the SATCAP Change Management Blueprint

SATCAP CHANGE MANAGEMENT BLUEPRINT:

- Aligned with the MOSH Leading Practice Adoption System and ADKAR principles.
- Supports safe adoption of modern technologies by combining human readiness with practical change processes.

CRITICAL SUCCESS FACTORS FOR CHANGE MANAGEMENT

- Clear digitalisation and technology roadmap.
- Review of lessons learnt from previous digitisation initiatives.
- Assessment of existing organisational resources and capabilities.
- Strong governance for digitalisation and modernisation (policies, rules, procedures).

Showcasing people-centred solutions

Mines requested that SATCAP should 'not reinvent the wheel' but showcase people-centred solutions that exist/ emerging / being used on mines for their benchmarking, tailoring, and potential application- as per their specific needs and contexts.

Mine Mentor Exchange Programme

Implementing Mine: Sasol, Afrimat

Need: Lack of workplace ready graduates entering mines

Solution: People centric, experiential, skills & behavioural based mentor programme
Enablement: Work ready graduates, experiential learning and mentor networks

Benefits: Scaled training, increased retention of recruits, targeted interventions.

Winder VR

Implementing Mine: Sibanye-Stillwater

Need: High-risk winder operation

Solution: High-fidelity DC winder VR with Teach/ Assess modes Enablement: Safe repetition & emergency muscle memory

Benefits: Fewer incidents, faster readiness, trusted training.

LMS access optimisation

Implementing mine: Harmony Gold

Need: Training centre backlogs

Solution: Workstation/ mobile LMS access for admin/support

Enablement: Self-paced onboarding & safety training

Benefits: Freed capacity for technical teams, better compliance & auditability vis use of LMS.

BehavIQ

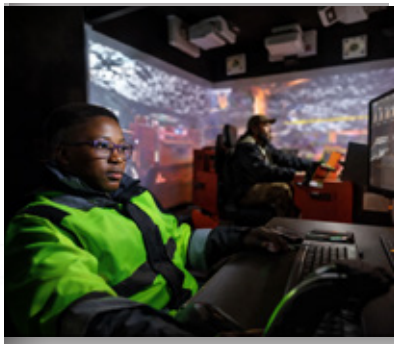
Implementing Mine: First Quantum Minerals

Need: Behaviour-linked incidents

Solution: Behavioural insight & performance analytics, coaching programme

Enablement: Digital Competency Passport, nudges safer habits

Benefits: Fewer incidents, fair transparent develop-ment, community stability.



LMS enhancements

Implementing Mine: Impala Bafokeng Platinum

Need: Varied digital literacy & language barriers

Solution: AR/VR, animation, LMS with tailored self-assessment

Enablement: Fit-for-learner modules, reduced training time

Benefits: Higher first-time pass rates, improved productivity & safety.

Significance of research and potential impact for mining

Visualisation of modernisation impacts and workforce resilience

- Supports ESG and inclusive growth agenda
- Understand trends in job creation/loss, new roles (including SMMEs & green sectors)
- Identify upskilling, reskilling, and digital/green skills need in sector
- Explore people-centric change: human readiness, modernisation, inclusion, ESG and adoption

Phase 2 considers enhancing of the baseline trends maturity matrix, with improvements, advancements, enabling and embedded trends.

Additional emerging, existing and best practice people-centred solutions/ applications will be included to enable mining companies with modernisation efforts.

WP 1: Capacity Development - Modern training for modern mining

The purpose of the study tour and webinar was capacity development for researchers, interns, SAMYA members, SRC students, and Trade Unions.

Methodology

- Study tour with immersive AR and VR applications
- Delegates experienced an empowering hybrid webinar session - with panellists from academia, industry, unions, youth and digital training specialists
- Discussion focused on digital skills of the future, core skills for the future and art of the possible training

Several areas where modern training can have an immediate impact are:

- Targeting the improvement of knowledge and technical skills
- Improving maintenance know-how
- Developing equipment/ technologies operation skills
- Leveraging the latest digital tools and innovations for enabling safe improved production

Participant feedback

There are various technologies and methods that can contribute to upskilling of miners. There is however need to align qualification standards with technologies. Technology is becoming more mobile.

Findings

- Integrate immersive and digital learning technologies (VR/AR, simulations) into all mining training programs to improve safety and readiness.
- Expand training access via mobile and modular platforms to reach rural youth in mining communities.
- Mining requires practical, targeted, multimodal, and just-in-time learning experiences, socially reinforced and embedded into the flow of work.
- Integrate compliance, culture, and capability in one seamless learning journey.
- Need campaign-based initiatives that align training with future mining needs – focus on automation, digitization, ESG, and data analytics.
- Ensure training drives transformation by meeting Skills Development Act and Mining Charter skills development requirements with measurable impact.
- Embed sustainability and safety in all training initiatives.
- Adopt Immersive & Gamified Training - shift from compliance-based tick-box training to experience-based, interactive learning.
- Embed Training into Workflows - Use an overlay approach where learning is continuous, contextual, and directly linked to day-to-day operations.
- Leverage VR & AI for Risk Prevention - Expand use of VR hazard simulations and AI-powered predictive analytics to strengthen safety and decision-making.
- Strengthen Soft Skills Training - Incorporate scenario-based simulations for emotional intelligence, conflict resolution, and teamwork in mining contexts.
- Expand Training Accessibility - Deploy portable training solutions to reach remote mine sites and community spaces.
- Continue offering multi-language translations to ensure inclusivity.
- Measure Impact Continuously - Use pre- and post-assessments in both technical and soft skill modules to track knowledge retention and behavioural change.
- Integrate Community Development - Extend training beyond employees, equipping local communities with digital, safety, and entrepreneurial skills for shared value creation.

WP 1: "Her Story" - Women Empowerment: Gender inclusion, diversity and transformation; and Women progression in mining

SATCAP hosted a Women Empowerment session to surface the issues facing women, around GBV and Women Inclusion, and through other women experiences and insights, to empower women.

Key issues highlighted in the session included:

Gender Based Violence (GBV)

- GBV remains a pervasive issue affecting both women and men in mining
- Need to address GBV prevalence through attitudinal shifts and organisational change management, including wide diversity training targeted at men
- Enhancing the organisational culture for safe reporting and non-victimisation
- Need for effective confidential reporting and resolution mechanisms

Women Inclusion and Progression in mining modernisation

- Facilitate inclusion of more women in operational roles by adoption and investment in new technologies which break traditional limitations for women and enable safer, more flexible work environment
- Leverage partnerships with professional bodies and universities to align curricula with the needs of women in mining
- More support and engagement in mentorship and leadership development programmes can address the issue of low representation of women in leadership

Key recommendations for mitigation against GBV

Inclusion in dialogue and sensitisation and cultural transformation:

- Get men meaningfully involved
- Link mine and host communities as mutually reinforcing
- Address social and behavioural norms
- Advocate for male involvement and tripartite collaboration (labour, state, employers)
- Men feel vilified and untrained – need emotional and educational engagement
- Emphasis on moving from compliance to cultural transformation

GBV survivor support -mitigation measures and incidence management:

- Ongoing sensitisation within whole workforce
- Increase in reporting and resolution – need to unpack the narrative
- Safe reporting channels
- Urged for practical, victim-centered responses (e.g., "GBV drive-through" support hubs).
- Improve operational readiness and mandatory steps when incidents occur

Key recommendations for progression of women in mining

Expand skills development:

- Include small-scale miners in training and capacity-building
- Incorporate digital, ESG, and climate-resilient competencies
- Support scaling of mentorship and career progression for women

Improve gender data collection and initiatives:

- Disaggregate data by gender, mining scale (formal/informal), and role to present a more inclusive view
- Address gaps in reporting from exploration and junior mining

Transition from policy to action:

- Transform gender equality policies into measurable implementation plans
- Set inclusive, trackable targets across the mining value chain

Support diverse career paths for women:

- Promote mentorship and progression for women across all levels – from geologists to community-based miner

Recognise innovation from the ground up:

- Empower grassroots initiatives to support tools and sustainability efforts

Foster inclusive dialogue:

- Continuously include women's voices from all backgrounds in policy and practice development

https://www.youtube.com/watch?v=VTyEP0Obcs0

WP 1: Exploratory research - Dialogue on the ‘Future of Survey in Mining’

The future of mine survey is critical for the industry.

Methodology

- Literature review by academia to identify key issues and inform themes in the dialogue
- Dialogue session with mixed panel academia, industry, examination bodies and digital specialists
- Defined research questions for Phase 2

Paper - Initial Recommendations:

Curriculum & Training Reform

Universities and industry must update surveying education and WIL to include geomatics, data science, and automation so graduates are prepared for modern mines.

Regulatory Adaptation

Legal and ethical frameworks should clarify surveyors’ responsibilities in automated environments to enable safe, compliant technology adoption.

Integrated Safety & Productivity

Mines should use digital monitoring and automation to improve hazard detection while boosting operational efficiency.

Insights Phase 1

- Mine surveying remains indispensable for geospatial risk mitigation, compliance, and operational safety, yet faces systemic challenges in attracting talent, modernising skills, and integrating into an increasingly digital mining landscape.
- Addressing these issues will require strategic partnerships, policy reform, targeted training interventions, and a reimagined professional identity that positions surveyors as central to smart, safe, and sustainable mining in the 4IR
- Mine surveying positioned at the intersection of statutory compliance under two key Acts (MPRDA, MHSA) and strategic business risk.
- A key focus should be on curriculum reform and addressing gap between formal training and competency certificates; and engaging the key collaborators to ensure throughput and quality experiential training.

Proposed research questions for 2026

- What are the existing needs around the future of survey, the gaps and barriers; and what are the recommendations around these?
- Has the university and ‘tickets’ curriculum evolved with the future of surveying as a profession?
- How do we close the gap from formal education to ‘tickets’? (Bridging the skills gap to meet industry skills needs and demands)
- Who are the key collaborators, and why do they need more collaboration (around this topic)?

The research approach for Phase 2 will involve a mixed-methods data collection process, designed to build an evidence-based understanding of global mine surveying education, training, and professional pathways.

LINK: https://www.youtube.com/watch?v=chHaozjlzxI

WP 1: Exploratory Research - Dialogue on 'Winning over the hearts and minds of workers towards a safe behaviour'

Fostering safety culture and improving safe behaviour amongst employees is imperative. Key to this is understanding the influence of sociological, psychological

Methodology

- Literature review by academia to identify key issues and inform themes in the dialogue
- Dialogue session with mixed panel industry, organisational behavioural specialists, health and safety representatives and digital trainers.
- Defined research questions for Phase 2

Paper- Initial Recommendations

- Build **transformational safety leadership** that inspires, supports psychological safety, and links safety to business performance
- Use **regular culture assessments** (surveys + qualitative insights) to track progress, readiness for change, and barriers
- Implement **evidence-based fatigue management** through better scheduling, workload control, and sleep/stress education
- Develop **worker-led peer safety networks** (mentoring, observation, team initiatives) aligned with formal systems
- Ground safety strategies in **local cultural and social realities**, partnering with community stakeholders
- Train leaders in **cross-cultural communication and conflict sensitivity** to build trust
- Use **balanced metrics** combining lagging and leading indicators, including psychological and systemic factors
- Strengthen **continuous learning systems** with visible feedback loops showing how input drives improvements

Insights Phase 1

- Psychological determinants such as consequence management, decision-making under pressure, and risk perception emerged as dominant drivers of safety outcomes.
- Sociological influences, notably job insecurity, leadership behaviour, and trust, proved equally significant, reinforcing that workplace safety is shaped by collective norms as much as individual choices.
- Digital fatigue surfaced as risk category, where information overload, constant monitoring, and limited digital literacy threaten concentration and motivation.
- There is a need for integrated, people-centred strategies that balance technological modernisation with psychological wellbeing, fair leadership, and transparent communication.
- Areas to be addressed include the evolving hazard profile of modernised mining systems, enhanced psychosocial risk reporting, cultural influence on social norms, and practical measures to identify and mitigate digital fatigue.
- Some recommendations call for embedding psychosocial risk management within OHS, strengthening leadership accountability, expanding experiential training that prioritises non-technical skills and support a human factors perspective

Proposed research questions for 2026

Modernisation, Digitalisation, and Emerging Risks

How is the modernisation of the mining sector changing the nature of health and safety risks?

- In what ways are work tasks becoming more cognitive, and how is this shifting harm from physical injuries to psychological and mental strain?
- How do factors such as overstimulation, digital fatigue, and desensitisation influence risk perception and safety behaviour
- Which organisational strategies can prevent or mitigate the psychosocial consequences of automation and constant monitoring?

Reporting and Incident-Investigation Frameworks

What indicators would enable mines to detect, report, and address incidents linked to mental health, social conflict, or digital stress?

Human Systems Integration and Training for Resilience

What is needed for university and OEM training design incorporate review and reflection to build adaptive resilience for novel, unpredictable scenarios?

- What is the possible holistic approach that mining has to engage in to address safety culture from socio-technical perspective?

Ethnographical and cultural aspects influencing safe behaviour

How do local community social norms influence workplace safety behaviour?

LINK: https://www.youtube.com/watch?v=-heYDwnZLCE

WP 1: Capacity Development - Careers study tour: Focus on youth and communities in preparing for the future careers in mining

Overview of the careers study tour

Capacity building and engaging with community learners and youth with information about mining as a career, as well digital innovation and entrepreneurship.

Hosted at Department of Mining Engineering and Mine Surveying, Faculty of Engineering and Built Environment, University of Johannesburg with the Department of Mineral and Petroleum Resources Bursary Office.

Purpose: Encourage more youth to pursue mining with presentations on:

Mining as a career | Digital innovation | Future skills | Entrepreneurship
Mine survey | Mining geology | Mining bursaries

Feedback from participants

More knowledge and exposure to different paths in the mining field

Beneficial experience for learners to gain information in careers

I gained more knowledge around mining careers, mining geology and mining survey, and digital careers

I learnt that that it is possible to learn new digital skills through digital platforms

It taught me to be more open minded about the various career paths in mining, aside from just the "traditional" mining engineer or operator role

I did not know much about mining and the study tour opened my mind to new opportunities

There are a variety of choices for learners to choose from in the mining and digital innovation space

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Partners:

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