

Sustainable Minerals Institute

Strategic Plan 2019-2021



THE UNIVERSITY
OF QUEENSLAND
AUSTRALIA

CREATE CHANGE



Creating change for a sustainable future



The Sustainable Minerals Institute's (SMI) vision is to find solutions to the complex problems – facing the environment, humanity and the economy – on the path to sustainability.

As society seeks to create a sustainable future, the global demand for minerals will continue to increase. While the resource industry is working to meet this increased demand, it is also reshaping itself to reduce its impact on communities and the environment.

At SMI, we are creating change through research discovery and collaborative global initiatives and consortia. We are working collaboratively with industry and research partners bringing both depth and breadth of expertise to our research and consulting work. We are training the next generation of industry and community leaders through Higher Degrees by Research and through a growing number of professional development programs. This Strategic Plan outlines our priorities and goals over the next three years.

The conversation has shifted from 'making mining sustainable' to 'mining's role in sustainable development'.

Sustainable Minerals Institute

The University of Queensland's Sustainable Minerals Institute is a world-leading research institute committed to developing knowledge-based solutions to meet the global sustainability challenges facing society.

The work of SMI is transdisciplinary, independent, impartial and rigorous. Our research integrates the expertise of production, environmental, social science, and health and safety specialists to deliver sustainable resource development and train the next generation of industry and community leaders.

SMI is comprised of six research centres and a Centre of Excellence in Chile. In addition to the depth of expertise within each Centre, SMI has developed five 'cross-cutting' Strategic Research Programs to address these global challenges.

Strategic Research Programs

**Unlocking Complex
Orebodies**



**Transformational
Learning**



**Digital
Mining**

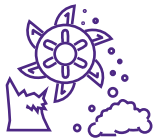


**Transforming the
Mine Lifecycle**



**Governance and
Leadership**

Research Centres



**Julius Kruttschnitt
Mineral Research Centre**



**Minerals Industry Safety
and Health Centre**



**The International Centre
of Excellence in Chile**



**W.H. Bryan Mining and
Geology Research
Centre**



**Centre for Mined Land
Rehabilitation**



**Centre for Social
Responsibility in Mining**



**Centre for Water in the
Minerals Industry**



Introduction

SMI's Strategic Plan sets out the path to develop the transformative people, technologies and approaches needed to tackle the major challenges to sustainability. The Plan will inform future operational and budget decisions, and drive activities across the Institute.

The Strategic Plan is informed by, and aligned with, The University of Queensland's Strategic Plan 2018 – 2021.

Operating Environment

The resources sector is recovering after a protracted downturn. The need to address climate change is driving an increased demand for resources that will reduce the global carbon footprint. There is renewed optimism for the resource sector's future across industry, society and governments, driven by technological innovation and the prospect of mining operations embracing 21st century ideals of trust, transparency, diversity and inclusivity to improve the lives of all people.

The resources sector continues to operate in a complex environment that requires creative and sustainable solutions to its environmental, social and resource supply issues.

The ability of SMI to achieve its vision and strategic plan is impacted by the cyclical nature of the resources sector. This makes it difficult for the University to maintain funding for the long term research needed to create change in the sector.

UQ, as a top 50 university, is well placed to continue co-creating solutions to these challenges.

Machinery at Chuquicamata, Chile. [Copper, gold mine]



The University of Queensland Strategic Plan 2018 – 2021

OUR VISION

**Knowledge
leadership for a
better world.**
Create change.

LONG TERM OBJECTIVES

Transforming students
into game-changing
graduates who
make outstanding
contributions and
address complex
issues with a global
perspective

Developing a diverse
community of
knowledge seekers and
leaders who embody
a One-UQ culture
and use collaborative
partnerships to connect
and co-create

Delivering globally
significant solutions
to challenges by
generating new
knowledge and
partnered innovation

MEDIUM TERM STRATEGIC FOCUS AREAS

1

Transforming our student
experience through a flexible,
integrated and partnered
learning environment

2

Enhancing our high quality
research by improving our
capacity to collaborate to
achieve greater impact

3

Building engaged and
strategic partnerships with
a broad range of local and
global networks

4

Committing to activities
that attract, support
and retain a diverse and
inclusive community of high
achieving staff and students

5

Building an agile, responsive
and efficient university
operation

6

Diversifying our income
streams and managing our
resources to establish a
sustainable financial base

SMI strategic activities within UQ focus areas





1

Transforming our student experience to a flexible, integrated and partnered learning experience

- 1.1** Develop strong linkages with Faculties through teaching support and involvement in curriculum review and design processes
- 1.2** Secure and support a diverse pipeline of students through development and implementation of a student strategy, targeting key stakeholder groups and scholarship schemes
- 1.3** Design and deliver new UQ programs for professionals working in key roles within the industry, including flexible micro-credentials under UQ's new alternative credentials framework
- 1.4** Provide opportunities for students to participate in site-based applied research through a placement program



2

Enhancing our research impact by improving our capacity to collaborate

- 2.1** Continue to strengthen our discipline base in our Centres
- 2.2** Develop and promote the transdisciplinary programs under the One UQ framework
- 2.3** Build a collaborative network of leading minerals and sustainability research institutions
- 2.4** Formalise and develop activities through research consortia
- 2.5** Develop opportunities presented by UQ Global Engagement collaborations such as QUEx (UQ and Exeter University partnership) and UQ Indian Institute of Technology Delhi Academy



3

Building engaged and strategic partnerships with a broad range of local and global networks

- 3.1** Leverage Centre and institute advisory boards to gain external and industry insights
- 3.2** Identify, develop and formalise key partnerships at local and global level with large and mid-tier mining and METS companies and other stakeholders
- 3.3** Maintain strong relationships with regional, state and federal government departments
- 3.4** Establish collaborative activities with the responsible investment community
- 3.5** Develop and grow collaborations and networks in South America via the International Centre of Excellence in Chile (SMI-ICE-Chile)



4

Committing to activities that attract, support and retain a diverse and inclusive community of high achieving staff and students

- 4.1** Appoint leaders to all centres and programs and develop succession plans
- 4.2** Develop and articulate career pathways for staff at all levels
- 4.3** Attract talented early career and postdoctoral researchers to new capability growth areas
- 4.4** Develop external mentorship and practitioners-in-residence opportunities
- 4.5** Improve and maintain our diversity across all leadership teams, centre staff, advisory boards and student cohorts
- 4.6** Develop an Indigenous strategy covering student and staff recruitment and engagement
- 4.7** Promote wellness and health initiatives for Institute staff and students
- 4.8** Strengthen internal communication and engagement activities



5

Building an agile, responsive and efficient University operation

- 5.1** Continually improve SMI's approach to managing risks and legal obligations
- 5.2** Further develop simplified and responsive pathways to partnerships
- 5.3** Enhance collaborative spaces and group activities
- 5.4** Enhance health and safety risk management understanding across SMI



6

Diversifying income streams and managing our resources to establish a sustainable financial base

- 6.1** Increase our professional development offerings, including the establishment with UQ Business School and International partners of a global mining leadership Program
- 6.2** Build our reputation as independent high quality consultants capable of solving complex problems
- 6.3** Merge JKTech and JKMRC to consolidate research and consulting activities
- 6.4** Participate in national and international advisory and review panels
- 6.5** Develop strategy to establish a minerals for development centre
- 6.6** Secure large scale and long term research funding through CRC and ARC programs
- 6.7** Develop opportunities for long term, external support for Chairs in centres

SMI Operational Plan 2020

Transforming our student experience through a flexible, integrated and partnered learning environment

1.1 Teach into UQ Undergraduate degrees - SMI staff to participate in undergraduate teaching in at least two different courses, through building on existing relationships with Schools; work with EAIT staff to finalise SMI involvement and role in new BE/ME Mining Engineering program, and revisions to Metallurgy program

1.2 Formulate a Student Strategy - Conduct a survey of SMI current HDR's to determine marketing and communication strategies to attract a pipeline of diverse HDR's; Complete one personal profile for each Centre for a Higher Degree Researcher and an Early Career Researcher; Use social media live events to specifically raise the profile of CWiMI and CMLR; Collate and analyse data to formulate a student strategy

1.3 Offer new Professional Development courses - New Professional Development offerings developed by at least four Centres; produce a uniform suite of information for new offerings including web pages, communications plan and calendars for promotion of specific programs

1.4 Industry placements for Students - Engage with industry peers and contacts to identify further mentoring, coaching and placement opportunities for HDR's

Enhancing our research impact by improving our capacity to collaborate

2.1 Collaborations with discipline experts - Target high impact journal articles and refereed conference papers with discipline collaborators

2.2 OneUQ - Develop and promote the SMI transdisciplinary programs under the One UQ framework and continue to identify UQ research capability relevant to SMI Centres and strategic programs

2.3 International collaborations - Continue developing a collaborative network of research groups at Exeter, UBC, UCT, Uni of Columbia and Uni of Loraine focused on responsible resource development

2.4 Research Consortia - Establish contracting and secure funding for new Consortia including the Mine Energy Management and Decarbonisation Research Consortium and Coarse Particle Flotation Research Consortium

2.5 QUEX and IITD activities - Develop a collaboration activity with Exeter academics on resources in the new energy economy; continue to seek joint students with UQIITD

Building engaged and strategic partnerships with a broad range of local and global networks

3.1 Advisory Boards - Ensure all Centres and the Institute Advisory Boards have members from a diverse group of stakeholders able to contribute significantly to SMI's strategic direction and impacts

3.1 Strategic Advice for MISHC - Re-establish an Advisory Board for MISHC to review and advise on the research and strategic engagement and direction of the Centre

3.2 New partners - Identify new and potential mid-tier and METS partners and deliver presentations of SMI Centre and Strategic Program capabilities

3.3 Government relations - Develop a review document of existing government and potential partnerships to expand on current activities and highlight new opportunities

3.4 Ethical Investors - Initiate further engagement with the responsible investor community to undertake at least one collaborative activity in 2020

3.5 South American Focus - Identify priority partners in South American countries of interest, and build the business case for the investment in developing research collaborations with longevity

Committing to activities that attract, support and retain a diverse and inclusive community of high achieving staff and students

4.1 Centre Leadership - Undertake recruitment of the CMLR and JKMRC Director roles

4.2 Career development - Academic supervisors will use the P3 tool in setting performance expectations for academic staff; provide professional development opportunities in leadership for Managers at HEW 8 plus

4.2 New Leaders - Actively identify potential leaders in the current staff cohort, and provide opportunities for their development including acting in leadership roles when opportunities arise

4.3 Succession Planning - Attract talented early career and postdoctoral researchers to new capability growth areas

4.4 Mentoring - Each Centre Director to develop a mentorship and practitioners-in-residence plan

4.5 Diversity and Inclusion - Improve gender equity, diversity and inclusion in the SMI and Centre Advisory Boards in 2020 against 2019

4.6 Indigenous Scheme - Work closely with industry partners to develop an indigenous fellowship scheme to provide indigenous employees the opportunity to

conduct research and attend professional development courses at UQ

4.7 Workloads - Proactively address work load and work/life balance issues identified by staff through the VOICE survey

4.8 Internal Communications - Strengthen internal communications through more regular Centre and All-Institute meetings

4.8 Staff Engagement - Establish an SMI Engagement Committee to drive engagement and social activities to enhance culture and build a sense of community

Building an agile, responsive and efficient university operation that reflects a One-UQ culture

5.1 ICE Chile - Appoint advisory committees to the governance structure of SMI-ICE-Chile

5.1 Understand Legal Obligations - In collaboration with UQ Legal, Insurance, Research Partnerships Office and the Graduate School, hold a workshop for SMI staff to better identify and understand key UQ and stakeholder requirements when negotiating contracts

5.2 Managing Key Partnerships - Identify and appoint professional and academic staff to manage key research partnerships; identify agreements requiring further standardisation to reduce legal review requirements; continue to promote the use of the Umbrella Research and Consulting Agreements

5.3 Develop a Facilities Strategic Plan - Better understand the contribution of SMI's facilities to research and learning outcomes by developing a strategic plan for the use, management, and SMI's future needs

5.4 Improve Staff Wellness - Hold an institute-wide fatigue awareness session

5.4 Travel safety - Improvements to travel safety, especially to higher-risk locations, by translating risk assessments into a toolkit for travellers and for supervisors & managers

5.4 Risk management knowledge - Improvements to risk management knowledge and information in SMI through GMIRM training.

5.4 Improve HSW Systems ICE Chile - Support the further development of health, and safety risk management procedures, training and awareness for SMI ICE Chile staff

Diversifying our income streams and managing our resources to establish a sustainable and independent financial base

6.1 Professional Development growth - Develop and promote an integrated PD program involving all Centres; redesign and deliver a Mining Leaders program in partnership with UQ Business School

6.2 Consulting Activities - Capture feedback relating to SMI consulting activities and use to improve delivery, marketing, operations and quality of the service

6.3 JKTech Merger - SMI and JKTech staff and Boards work to merge the two organisations structurally and culturally, and communicate this to stakeholders; complete a brand refresh

6.4 Panels and Reviews - Academics seek and accept opportunities to participate in national and international advisory and review panels to enhance reputation

6.5 International Development - Deliver at least three programs in partnership with UQID and ICTE; develop a strategy and funding proposal for the establishment of a Minerals for Development Centre

6.6 Longer term funding - Submit three ARC Linkage applications in 2020 across several Centres; deliver CoE milestones and leverage on these activities; if the TiME CRC is successful undertake the necessary contracting and design work to establish a new CRC venture with a key node at UQ; focus on developing a strategy for securing longer term Complex Ore Bodies funding; formalise the Global Research Consortium on Tailings and secure funding to begin activities

6.6 ICE Chile structure - Transfer ownership of SMI-ICE-Chile from JKTech to UQ and convert the primary function to Research & Development

6.7 Funding for Chairs - Develop a proposal to fund world's first Chair in Mining and Social Performance and submit application for a UNESCO Chair in Mineral Resource Governance; seek strategic backing from UQ, and funding sources

SMI Research Centres

Centre for Social Responsibility in Mining

The Centre for Social Responsibility in Mining (CSRSM) focuses on the social, cultural, economic and political challenges that occur when change is brought about by mineral resource extraction.

Core strengths - community engagement and development, agreement making, mining and resettlement, business and human rights, cultural heritage management, natural resources governance

New initiatives - developing improved data visualisation tools and Apps to “supercharge” the contribution of social sciences in creating change for responsible resource development; meeting new demand for professional development programs across different formats

Mining Industry Safety and Health Centre

The Minerals Industry Safety and Health Centre (MISHC) conducts research in occupational safety and health, risk management, and human factors. The results and findings of this research are used in postgraduate and continuing education programs and consultancy services.

Core strengths - risk management, human factors, spontaneous combustion management, particulates, emergency and incident management

New initiatives - human aspects of automation, safety and health diagnostics, transformation leadership in safety and health

Julius Kruttschnitt Mineral Research Centre

The Julius Kruttschnitt Mineral Research Centre (JKMRC) is an internationally recognised provider of applied research in mineral processing and metallurgy, and postgraduate education. The Centre's staff have worked in close partnership with global mining companies for almost 50 years and have a reputation for delivering innovative research outcomes that are widely adopted across the industry.

Core strengths - comminution, flotation, classification, numerical model simulation of equipment, process control, step change separation technologies

New initiatives - big data analytics and model-informed process control, dynamic modelling, flotation chemistry, coarse particle flotation, energy and emissions analysis, high voltage comminution, microwave dewatering

W.H. Bryan Mining and Geology Research Centre

The W.H.Bryan Mining & Geology Research Centre (BRC) has a reputation for practical innovation and leadership in geology applied to the entire mining value chain. With a diverse range of geoscientific and related expertise, the Centre is focused on delivering industrial research solutions for active and future mines.

Core strengths - applied discovery, waste characterisation, deposit knowledge, mineral supply and risk

New initiatives - knowledge transfer and promotion of cross disciplinary capabilities, geostatistics, artificial intelligence and machine learning applied to mining and exploration, mining optimisation, underground mass mining

Centre for Mined Land Rehabilitation

The Centre for Mined Land Rehabilitation (CMLR) addresses the environmental challenges of the minerals industry by translating scientific results into practices that continually improve mine rehabilitation outcomes.

Core strengths - Geochemistry, plant science, soil science, acid and metalliferous drainage, remote sensing, hyperaccumulators, environmental chemistry and toxicology, colloid and interface science

New initiatives - ecological engineering of metal mine tailings and residues, risk based regulations, landform architecture and planning, arsenic pathways, new minerals value chain through reprocessing, tools development, low CO2 initiatives, tailings settling and drainage, eco systems, rehabilitation, digital mine

Centre for Water in the Minerals Industry

The Centre for Water in the Minerals Industry (CWIMI) researches sustainable water management in the mining industry, including engineering, environmental and social challenges.

Core strengths - mine site hydrology, mine site water balance, soil science, regional water use, water accounting, water risk management, water quality and aquatic ecosystem impacts, data visualisation, groundwater contamination

New initiatives - climate change on water resources, closure planning and beneficial post mining land, water data visualisation, hydrological modelling for mining regions, groundwater management and recharge, tools development

International Centre of Excellence in Chile

The International Centre of Excellence in Chile (SMI-ICE-Chile) is a collaboration between SMI and the Production Development Corporation of the Chilean Government (CORFO). The purpose of the Centre is to support the advancement of the Chilean mining industry and Chilean society through collaborative projects and initiatives that deliver improved productivity and enhanced sustainability outcomes.

The Centre uses a partnership model that actively engages with Chilean industrial partners and local universities to develop human capital, and build and deliver innovative and impact-focussed research through knowledge and technology transfer to industry and society.

Core strengths - With the benefit of the network and pathway to SMI-Australia: social responsibility, health and safety, complex orebodies, energy efficiency, digital transformation, water management, integrated waste management, mine closure

New initiatives - Cobalt recovery, water recovery from tailings, pyrite microencapsulation, improving safety culture, smart water supply systems, participatory monitoring, circular economy, clean technologies, addressing climate change impacts

Transdisciplinary programs

Complex Orebodies

The Complex Orebodies program focuses on the supply of resources needed for a sustainable future by unlocking ore deposits that are unviable due to low grades or other technical challenges, or inaccessible due to political unrest, social outrage and/or environmental barriers.

The major challenge for new mine discoveries is increasing exploration costs and decreasing discovery rates, meaning new discoveries alone will not meet future demand. Grades are decreasing in mines currently operating and are even lower in undeveloped mines, and the quest to overcome this by economies of scale is reaching the limit of effectiveness.

With access to researchers across UQ, this program is uniquely placed to develop the step changes in social understanding, environmental innovation, and mining and processing efficiency which will be required to allow cost effective access to these Complex Orebodies in a way that also enables sustainable development.

Research themes

- Understanding Complex Orebodies
- New technologies to reduce environmental footprints
- Understanding of social complexity relating to the social impacts of mining
- Energy and efficiency – developing transformational technologies to counteract higher costs and lower grades
- Variability and flexibility – moving on from economies of scale through better understanding of orebody variability feeding into selective, flexible processing

Governance and Leadership

The Governance and Leadership in Mining program is a cross-cutting research agenda to find and share knowledge solutions to the big sustainability challenges posed by global mineral extraction and use.

Almost two decades ago the Global Mining Initiative and the Mining, Minerals and Sustainable Development Project put sustainable development on the minerals sector's agenda. Now that the United Nations Sustainable Development Goals are mainstream and a renewable energy transformation fuelled by minerals is well underway, it is time to reconsider the role of mining and minerals in sustainable development and the effectiveness of various change processes.

Research themes

- Rethinking the role of minerals in a sustainable world
- The effectiveness of governance and leadership approaches at catalysing sustainable development outcomes from mineral extraction and use
- Innovations in multi-stakeholder governance, corporate governance and meta-governance
- Artisanal and small-scale mining and the SDGs.
- Responsible mineral supply chains
- The changing role of the investment sector and civil society in driving sustainability
- A network of mineral-focussed universities as change-makers for sustainable development

Transformational Learning

The over-arching objective of the Transformational Learning program is to develop capabilities across all stakeholder groups to deliver responsible resource development through innovative and world-class education and professional development activities. We work alongside SMI's Centres and Strategic Research Programs, as well as with other UQ units, to design and produce learning activities that translate SMI's research outputs into effective industry outcomes.

The range of activities include bespoke corporate executive-level programs, as well as skills-based graduate level courses and practitioner programs tailored to corporate and regional contexts. The ability to learn from experience remains a significant challenge for industry, and therefore a particular focus is to incorporate realistic and engaging scenarios and experiences that deliver better learning outcomes.

Digital Mining

The Digital Mining program is being developed in collaboration with UQ's Faculty of Engineering, Architecture and Information Technology (EAIT).

Initial work to develop this program has focused on drawing together digital applications, technologies and approaches to enhance, enable and support research undertaken across the SMI and the broader UQ environment.

Transforming the Mine Lifecycle

The Transforming the Mine Lifecycle program is accelerating mining-facilitated sustainability outcomes by delivering integrated solutions that link across the different stages of the mine lifecycle, contributes to resilient regional development and delivers healthy post closure ecosystems and livelihoods.

Central to this is the transformation of how the mine lifecycle is conceptualised. The goal is to help mining transform from its traditionally linear process - optimised for financial return to shareholders - to one which prioritises non-market value, healthy ecosystems and livelihoods, and post-closure resilience alongside the financial market.

Program themes

- Experiential learning
- Leadership programs
- Online and blended learning activities

Research Themes

- Human factors – impact of automation
- Human-machine technology interfaces
- Data Analytics
- Model-informed / predictive process control
- Impact of automation on local communities
- System Dynamics for mine value chain analysis (jointly with UQ Business School)
- Drone and sensor technology for landscape digitisation
- Multi-scale 3D data and visualisation

Research themes

- Life of Mine planning and decision making
- Transitioning through closure
- Targeting the zero waste mine

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