



МОНГОЛ УЛСЫН ШИНЖЛЭХ УХААН
ТЕХНОЛОГИЙН ИХ СУРГУУЛЬ



RioTinto

MINING RESEARCH GRANT

OPERATION
GUIDE FOR
MINING
RESEARCH
GRANT

2022



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This operation guide is followed to award research grants provided under the joint project by Oyu Tolgoi LLC, Rio Tinto Mongolia and Mongolian University of Science and Technology, “Generating Mine Geotechnical Engineers and Establishing International Research Center”

ONE.NEEDS AND AIMS FOR IMPLEMENTING MINING RESEARCH GRANT

- 1.1 **Rationale and needs for implementing the research grant:** To train engineers required for the mining sector, a leading sector of the Mongolian economy, and to develop geological and mining research, the Memorandum of Understanding between the Mongolian University of Science and Technology (MUST) and Oyu Tolgoi LLC was signed on April 19, 2019 and a tripartite “Cooperation Agreement” between Oyu Tolgoi LLC, Rio Tinto, Mongolia and MUST was signed on April 1, 2021. Under this collaboration agreement, ‘Generating Mine Geotechnical Engineers and Establishing International Research Center’ Project has been launched for implementation in 2021-2025. One of the initiatives of the project is the provision of a Mining Research Grant to facilitate joint university-industry research in addressing key issues facing the mining industry.
- 1.2 **Purpose:** This operation guide provides the framework that governs the partnership between Oyu Tolgoi LLC, Rio Tinto Mongol LLC and the Mongolian University of Science and Technology (MUST). The aim of the partnership is to create new knowledge by jointly supporting research aimed at solving problems in underground mining and ultimately improve the efficiency, safety, and stability of the mining industry. To achieve this goal, the following objectives must be met:
 - 1.2.1 Propose solutions to key issues facing the Oyu Tolgoi mine through the application of new techniques and/or technologies;
 - 1.2.2 Provide funding for research and development at MUST and build capacity for effective research;
 - 1.2.3 Support research and development cooperation between MUST, Oyu Tolgoi LLC, Rio Tinto Mongol LLC and other stakeholders (such as foreign research institutions);
 - 1.2.4 Develop cross-sectoral research that will contribute to Mongolia's mining sector.

TWO. ELIGIBILITY

- 2.1 Applies to faculty members, researchers, and graduate students from MUST, and those who collaborate with them to conduct research, including academics from foreign and domestic universities, researchers from research institutions, engineers and technicians of Oyu Tolgoi LLC and Rio Tinto Mongol LLC and other interested parties.
- 2.2 The principle investigator participating in the Mining Research Grant (hereinafter referred to as the “MRG”) must be a full-time professor and lecturer at MUST and must submit a project comprising of a team made up from personnel as specified in 2.1 of this operation guide.

THREE. DEFINITION OF TERMS

The terms used in this operation guide are defined as follows:

- 3.1 **Research Grant:** Funds to be transferred from Oyu Tolgoi LLC, Rio Tinto Mongol LLC and other parties to finance the research project;
- 3.2 **Steering Committee:** The Steering Committee of project “Generating Mine Geotechnical Engineers and Establishing International Research Center” that will guide the operation of Mining Research Grant;
- 3.3 **Working group of MRG:** The working group responsible for reviewing the project proposals in accordance with the guidelines, obtaining recommendations from a panel of experts, and submitting a proposal to the Steering Committee on whether to award a grant and review the

progress and final reports of the awarded projects

- 3.4 **Review Panel:** A team of external experts who are able to evaluate the research grant proposals submitted to the research grant according to certain criteria, to advise the Steering Committee on whether to award a grant;
- 3.5 **Academic Council:** The council specified in Article 4.6 of the Regulation of MUST, which is responsible for monitoring and discussing the progress and final outcomes of the project, and making recommendations;
- 3.6 **Working Group of MUST:** a working group established by the order of the director of MUST, with the task of implementing the collaboration agreement "Generating Mine Geotechnical Engineers and Establishing International Research Center";
- 3.7 **Secretariat of MRG:** Specialist responsible for managing relations relating to the implementation of the Mining Research Grant;
- 3.8 **Research Grant Budget:** Amount of funding approved for the year;
- 3.9 **Research Project:** Assignment of research work clear the objectives, expectations and deliverables to be undertaken by the research project team.

FOUR. MANAGEMENT ORGANIZATION

- 4.1 **The Steering Committee** will oversee the implementation of the research grant, decide whether to award the grant, approve the budget, approve members to the MRG Working Group and receive the progress and final reports of research.
- 4.2 **The working group of MRG** will organize the selection of research projects and check the progress and final reports of the awarded projects.
- 4.3 **The Working Group of the MRG** will have 7 members consisting of representatives of the Mongolian University of Science and Technology, Oyu Tolgoi LLC and Rio Tinto Mongol LLC. The working group consists of two representatives from each of Oyu Tolgoi LLC and Rio Tinto Mongol LLC, and three from the Mongolian University of Science and Technology.
- 4.4 **The Working Group of MUST** shall nominate a team of experts who work for the Review Panel, based on the proposals of Oyu Tolgoi LLC and Rio Tinto Mongol LLC in each of the research areas specified in 5.1. Director of School of Geology and Mining will approve the Review Panel and make contract with each expert of the Panel.
- 4.5 A member of the **Review Panel** shall be a researcher with a doctoral degree or higher, or supervisory experts in the field.
- 4.6 **The Academic Council** will monitor the project progress every six months and evaluate by checklist according to the statement 8.4.5 of procedure for "Implementing projects, contracts and research activities at the MUST", approved by MUST Rector's decree number A145.
- 4.7 **The Academic Council of the School** which is related to the main field of the project (more than 50% of the project content) will review the progress and final reports of the research work and make recommendations and conclusions. If necessary, the review will be organized in an expanded format, involving representatives of the financier and other relevant parties.
- 4.8 **The Secretariat of the MRG** shall enter into a special agreement with the Director of the Mongolian University of Science and Technology, which shall specify the responsibilities in the agreement.

FIVE. PROJECT SELECTION

5.1 The project includes the following main areas:

- 5.1.1 Assess the effectiveness of developing an undercut overhang along the footprint to destress the peripheral excavations on the extraction level. An area must be selected - a portion of the footprint that is low risk and create an overhang with stress measurement sensors below and/or a sacrificial section of drive developed perpendicular to the undercut overhang.
- 5.1.2 Install geo4site markers (or network smart markers) around and above several drawbells to quantify the shape and rate of initial drawcone growth and also detect whether interaction is ever achieved between DPs in the same drawbell and between drawbells – (this has been attempted in the past at other mines but not for OT).
- 5.1.3 Examine the effectiveness of bunding (height) in front of drawpoints to prevent large rocks from bouncing out of the DPs into the extraction drive (this can be simulated using the old Colorado rockfall simulation software but have never seen anybody undertake this or publish this).
- 5.1.4 Develop an effective drawpoint muckpile geology and fragmentation monitoring programme that can track the composition of various rock types in the DP as well as the size distribution (suggest using a camera/scanner on an LHD or perhaps a drone or some remote controlled robotic vehicle).
- 5.1.5 Other areas of mine geotechnics

5.2 Requirements for the research project:

- 5.2.1 Project team must include professors and researchers from foreign universities, more than 2 full-time or part-time professors, researchers and staff of the Mongolian University of Science and Technology, and more than 1 postgraduate student;
- 5.2.2 Professors and researchers of foreign universities and research institutes will visit the Mongolian University of Science and Technology as visiting guests at least once during the project implementation period;
- 5.2.3 Principle Investigator will not participate in more than one and project team member will not participate in more than two projects of MRG;
- 5.2.4 The project team leader and members must not have previously violated the rights and obligations of the project contract of MRG;
- 5.2.5 The problem to be solved by the research must be clearly articulated in accordance with the announced areas, the importance of the research must be defined, and an appropriate research method selected. The outcomes of the research must contribute knowledge to industry as well as provide a solution to key OT problems areas;
- 5.2.6 The project's ability to yield patents and utility models would be considered an advantage;
- 5.2.7 Permission to transfer, or use the outcomes is imperative;
- 5.2.8 The amount of funding available to the project is up to USD 100,000 or its equivalent of MNT;
- 5.2.9 Project execution period should not exceed 24 months;
- 5.2.10 The project must be submitted in accordance with the **Research Proposal Form and Guideline** provided in the Appendix#1 to the operation guide (in case of incomplete submission, it will not be possible to participate in the selection).

5.3 Requirements for project team members:

5.3.1 Requirement of Project Team:

- The number of project team members is not limited, and the team members should be faculty members, scientists, researchers, staff, postgraduate students, and field engineers and technicians from foreign and domestic universities and research institutes.
- The team must include the following members.

- To employ a visiting researcher from a foreign university or research institution as a Co-Investigator;
- In addition to the principle investigator, more than 2 full-time or part-time faculty and staff members of the MUST should be involved;
- More than 1 postgraduate (master's, doctoral) students of the Mongolian University of Science and Technology.

5.3.2 Principle investigator (PI)

- The principle investigator must be a full-time employee of MUST, valid for the duration of the research project.
- The principle investigator must hold a Ph.D. qualification and higher title.
- Holding professional license or expert level certificate in the given topic would be an advantage.
- Ability to prepare reports and presentations in English.

5.3.3 Co-investigator (CI):

- Co-investigator must be a full-time or contract employee of a foreign university or research institution.
- Co-investigator must hold a relevant Ph.D.
- If the co-investigator is a researcher in foreign research institution, the institution must have a cooperation agreement with MUST.
- Active researcher who has published in high impact journals in the relevant topic (Web of Science or Scopus).
- Co-investigator must agree to support the principle investigator to work as co-investigator at MUST and visit MUST at least once during the project implementation period.

5.4 Application materials to submit:

- Principle investigator shall submit the following materials to the Secretariat of MRG by e-mail: research@must.edu.mn
 - Reference letter from a relevant School Director or department in support of applying MRG;
 - APPENDIX #1 Research Proposal Form & Guideline (Appendix 1) completed according to the Guideline.

5.5 Deadline for submission and selection of project materials:

Project materials submissions will be accepted until 28 October 2022.

5.6 Process of announcement and selection of research projects: The process of selection of research projects for the Mining Research Grant by Oyu Tolgoi LLC will be conducted in the following 4 stages.

- Step 1. Announcement of the MRG;
- Step 2. Application Submission Deadline. Secretary of MRG will receive applied proposals and get clarifications if necessary;
- Step 3. Project Evaluation
- Step 4. Final decision of Steering Committee, Announcement of Grant

SIX. FINANCING THE GRANT PROGRAM

- 6.1 Research grant funding will be used only for research-related expenses. Research costs may include, but are not limited to:
 - 6.1.1 Salaries for Investigators from domestic HEIs;
 - 6.1.2 Costs associated with laboratory testing;
 - 6.1.3 Procurement of research-related technology licenses;
 - 6.1.4 Travel costs for field research;
 - 6.1.5 Participation in research conferences related to the project research area;
 - 6.1.6 Cost of publishing research outcomes in relevant international journals and conferences (pending impact factor and intellectual property protection);
 - 6.1.7 Fees and charges associated with the use of MUST infrastructure and material resources (10%);
 - 6.1.8 All expenses related to monitoring, discussing and receiving the outcomes of the research process and final outcomes;
 - 6.1.9 All related expenses associated with visiting researchers' work at MUST.
- 6.2 Project funding will be provided based on the research team's quarterly report approved by the Working Group of MRG and half-year report on outcomes approved by the Academic Council.
- 6.3 The project team shall be fully responsible for the costs specified in 6.1.9.
- 6.4 Project start and end dates:
 - The project will start on January 1, 2023 and will last for 24 months.
 - The remaining funding will not be disbursed if the final project report is not submitted within the contract period.
- 6.5 The duration of the project and any changes to the budget shall be decided in accordance with the contract.

SEVEN. PROJECT IMPLEMENTATION AND REPORTING

- 7.1 **Research project agreement and its verification**
 - 7.1.1 The funding parties including Oyu Tolgoi LLC, Rio Tinto Mongolia LLC and others will enter into a research project agreement with MUST and the principle investigator;
 - 7.1.2 The project team will follow the procedure for “implementing projects, contracts and research activities at the MUST”.
- 7.2 **Implementation and monitoring of research projects**
 - 7.2.1 The principle investigator will formally present the project assignment, calendar plan and budget to the Academic council of the Mongolian University of Science and Technology and get approval on the research methodology;
 - 7.2.2 The Scientific Secretary (SSC) of the school to which principle investigator is affiliated to will register the information of the new project in the “Integrated Scientific Information System” within 1 month after the approval of the project contract and will be responsible for monitoring the progress and final outcomes.
 - 7.2.3 The methodological level of the project, implementation process, timing, outcomes and financial activities will be discussed and monitored by the Working Group of International Cooperation and Mining Research Grant (IC and MRG) which consists of representatives from funding and implementing parties quarterly and by the Disciplinary Academic Council of the Mongolian University of Science and Technology biannually.

- 7.2.4 Principle investigator will enter information on the progress and outcomes of the project into the “Integrated Research Information System” biannually, along with the Academic Council's report.
- 7.2.5 The working group of IC and MRG will compile reports on ongoing projects, discuss with the Steering Committee the projects that have violated the rights and obligations of the contract, and make the necessary decisions.

7.3 Project team roles and responsibilities and deliverables.

- 7.3.1 The project team is responsible for carrying out the performance tasks and research project-related activities in a highly professional manner as outlined in the contract.
- 7.3.2 The research team shall report to the sponsor on a semi-annual basis together with the report of the Academic Council on the implementation of the performance assignment and financing report specified in the agreement to the funding party and receive the next stage of funding.
- 7.3.3 The research team will receive funding and implement the research according to the schedule specified in the contract.
- 7.3.4 If necessary, the project implementation team is obliged to report on the project progress and outcomes within the timeframe specified by the financier.
- 7.3.5 The project implementation plan, organization, and division of responsibilities of the team members will be decided jointly by the Principle Investigator and Co-Investigator.
- 7.3.6 The principle investigator is responsible for the successful implementation of the project, leading the academic and management of the project, signing contracts with the funding and implementing organizations on behalf of the research team.
- 7.3.7 The principle investigator represents the research team and liaise with the funding and implementing organizations on all project issues. Together with the co-investigator, he / she will be responsible for the outcomes and reports of the research project.
- 7.3.8 The co-investigator is responsible for directing the research and development of the project. He/she is not entitled to liaise with funding party on behalf of the research team, but will be responsible for the outcomes and reporting of the research project together with the principle investigator.
- 7.3.9 In case of additional funding to the grant specified in 5.2.8, provided by the organization which co-investigator is affiliated to, the allocation and disposal of expenses shall be decided jointly by the principle investigator and co-Investigator.

7.4 Reporting of the final outcomes of research project and closure

- 7.4.1 The principle investigator will submit a final report confirming that the research project has been completed, that there are no further deficiencies, that payments have been completed. The final report should discuss how the project's expectations have been met and the impact of the project.
- 7.4.2 The final outcomes and report of the research project will be discussed at the meeting of the disciplinary academic council of the MUST expanded by MRG Working group (including representatives of MUST, Oyu Tolgoi LLC, Rio Tinto Mongolia LLC).
- 7.4.3 Based on the conclusions of the meeting mentioned in 7.4.2 and the financial report certified by the Finance and Accounting Office of the MUST, the Working Group of the MUST will submit a letter to the Steering Committee to hand over the project report.
- 7.4.4 Prior to the expiration of the contract, the research team will submit a report on the project's operational and financial performance to the funding party. Submitting a copy of the act to the Working group of the MUST will complete the process of submitting the final report.
- 7.4.5 Based on the decision of the Steering Committee, the parties confirm that all payments are made, the project activities are finalized and the final report is accepted.

- 7.4.6 Closing of the project entails that the parties to the cooperation agreement on “Training of engineers in mining geotechnics and establishment of an international research center” will accept the report of a research project and confirm that all payments have been completed. The final disbursement will be based on the contracted budget.
- 7.4.7 Data storage: The project outcomes and information of the completed project will be registered in the “Integrated Scientific Information System” by the working group of IC and MRG and will create an electronic archive.
- 7.5 Issues related to project selection, contract signing, and project monitoring are regulated by **Appendix No. 2** of this operation guide (**Project selection, grant contract, and monitoring of implementation**) and other issues of implementation not covered in the operation guide will be regulated by the financing agreement.

EIGHT. MISCELLANEOUS

- 8.1 Any amendments to the operational guidelines are to be reviewed and agreed on by the Project Steering Committee based on the proposals of the parties.
- 8.2 Conflicts and disputes related to the implementation of the Project shall be resolved by the courts of Mongolia in accordance with the relevant legislation of Mongolia.