Agence spatiale canadienne
6767, route de l'Aéroport
Arr. de Saint-Hubert
Longueuil (Québec)
J3Y 8Y9

Canadian Space Agency
6767 Route de l'Aéroport
Borough of Saint-Hubert
Longueuil, Québec
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Notice to Industry for Space Resource Activities and Regolith Management development capabilities in Canada

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1. Purpose of Notice

The Canadian Space Agency (CSA) is providing this Notice to Industry to engage the Canadian terrestrial and space sectors to participate in stakeholder engagement activities to provide input towards the planning of future developments in space resource activities that provides the maximum benefit to Canada.

The objectives of this Notice are the following:

- To encourage organizations to express interest and provide contact information, potentially useful for future stakeholder engagement activities
- To identify all potential participants with the appropriate background and area of expertise, including outreach to stakeholders in non-space and space sectors with relevant expertise

Responses to this Notice must be submitted in writing in accordance with the guidelines contained herein, and information collected will be processed at the discretion of the Government of Canada.

This Notice is neither a call for tender nor an RFP. No agreement or contract will be entered into based on this Notice. The issuance of this Notice is not to be considered in any way a commitment by the Government of Canada, nor as an authority to potential Respondents to undertake any work that could be charged to Canada. This Notice is not to be considered as a commitment to issue a subsequent solicitation or award contract(s) for the work described herein. Finally, this Notice is not to be considered as a commitment on any part of the scope of work described.

Sensitive or proprietary data is neither required nor requested. Responses must not include any sensitive information not intended for public release.

Responses to this Notice may be in one of the official languages of Canada, French or English.

2. Background Information

To support future decision-making, and through the Lunar Surface Exploration Initiative (LSEI), the CSA is examining options for Canada's next major infrastructure contributions to the lunar surface. These efforts seek to identify areas where Canadian expertise can deliver high-impact, visible, and mission-critical contributions while fostering innovation,

economic growth, and international collaboration. Canada's established strengths in resource exploration, mining, robotics, autonomous systems, artificial intelligence, and geospatial technologies position the country to play a leading role in enabling sustainable lunar surface operations.

As exploration missions extend farther from Earth and increase in duration, reliance on Earth-supplied resources becomes increasingly challenging and costly. Future lunar and planetary exploration architectures will require the ability to identify, extract, process, store, transport, and utilize resources available in the local environment. Collectively referred to as In-Situ Resource Utilization (ISRU), these capabilities are expected to become foundational enablers of sustained human and robotic exploration beyond Earth orbit.

Potential lunar resources of interest:

- Solar energy
- Oxygen from regolith
- Bulk regolith
- Water in the form of Ice
- Metals (including Fe, Ti/ilmenite, Al, Si)
- Helium-3*
- Rare earth elements*

  *Resources not considered for near-term / mid-term time horizon

Various resources may be transformed into products that support critical mission functions such as life support, surface construction, logistics infrastructure, energy storage, radiation shielding, and propellant production. By reducing dependence on Earth-based resupply, ISRU capabilities will increase mission resilience, enable longer-duration operations, and support the development of a sustainable lunar economy.

Key capability areas:

- Resource Prospecting and Characterization
- Excavation, Regolith Management and Surface Preparation
- Processing and Extraction
- Feedstock and Consumables Production
- In-Situ Construction and Manufacturing
- Storage and Transportation
- Recycling and Waste Management

Additional context for each capability area including needs and potential enabling elements provided in Annex A.

Constraints and Assumptions

The following constraints and assumptions are applicable:

1) Terminology – Where this Notice refers to a “capability”, the intention also concerns the interests and expertise of the respondent’s organisation, including within the relevant non-space domains, including terrestrial and marine applications.
2) Benefits to Canadians – Recognizing the various expertise across Canadian industry and academia, Canada seeks to leverage capabilities embedded in traditional non-space and space sectors to collaboratively develop exploration technologies that deliver scientific, technological, and socio-economic benefits for Canadians, while enhancing Canada's international competitiveness and strategically positioning Canadian capabilities within future exploration activities.
3) Exploration Environment Considerations – Capabilities should consider the effects of lunar and planetary exploration conditions, including dust, radiation, vacuum, reduced gravity, temperature extremes, illumination cycles, and more. While an immediate interest is for the lunar south polar region, potential applicability to other locations on the Moon and on Mars should be recognized.

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3. Response to Notice

Respondents should complete and submit Annex B – Respondent Information Feedback Form.

Canada will have the discretion to accept responses submitted after the closing date.

Closing Date and Time

The closing date and time for the Notice to Industry is September 20, 2026 at 2:00 PM Eastern Daylight Time (EDT).

Inquiries and Responses to Notice to Industry

Inquiries and responses are to be directed to :

Solinda Phan, Canadian Space Agency

E-mail: solinda.phan@asc-csa.gc.ca

4. Abbreviations and Acronyms

3D	3-Dimension
AI	Artificial Intelligence
CSA	Canadian Space Agency
ESA	European Space Agency
GER	Global Exploration Roadmap
ISECG	International Space Exploration Coordination Group
ISRU	In-Situ Resource Utilization
LEAP	Lunar Exploration Accelerator Program
LSEI	Lunar Surface Exploration Initiative
NASA	National Aeronautics and Space Administration
RD	Reference Document
RFP	Request for Proposals
SRA	Space Resource Activities

Annex A – Capability Needs and Potential Enabling Elements for the ISRU Value Chain

A sustainable space resource infrastructure requires the development and integration of multiple ISRU capabilities across a dynamic and complex value chain. Leveraging Canadian expertise across both space and non-space (terrestrial and marine) sectors will be critical to the development of innovative and internationally relevant solutions that support future exploration objectives, while bringing socio-economic benefits to Canadians.

The following summarizes core activity areas and high-level capabilities for future ISRU systems:

a. Resource Prospecting and Characterization

- Needs: High-resolution mapping; characterization of surface and subsurface resources, including volatiles, minerals and geotechnical properties using orbital and in-situ data. Capabilities should support prospecting in challenging environments, resource assessment, site selection, and operational planning.
- Potential Enabling Elements: Autonomous survey platforms, hyperspectral sensing technologies, ground-penetrating sensors/ subsurface detection systems, AI-enabled data fusion, quantum sensing technologies, and geospatial decision-support systems. Systems should support both geoscience-driven data collection (e.g., remote sensing, in-situ analysis, sample return) and site geophysical characterization for operational activities.

b. Excavation, Regolith Management and Surface Preparation

- Needs: Management of lunar surface conditions to enable safe cargo delivery, mobility, science operations, ISRU activities, and infrastructure deployment. Initial capabilities should include geotechnical assessment, stability and compaction analysis, terrain characterization, regolith handling, material sorting and beneficiation, surface preparation, and dust mitigation. Capabilities should support teleoperation and autonomous or semi-autonomous control architectures enabling the management of surface conditions, resource handling, and in later stages sustained feedstock supply for downstream processing systems.

- Potential Enabling Elements: Advanced geosensing and detection, geotechnical characterization and stabilization solutions; probing, drilling and coring, adaptive digging; sorting and beneficiation technologies; surface preparation systems supporting cargo handling/logistics and science deployments; dust detection and monitoring; scalable bulk material handling and excavation systems. Capabilities can leverage mobility/robotic platforms (ex: lunar utility rovers) and should support operational needs in an integrated and scalable manner.

c. Processing and Extraction

- Needs: Conversion of raw regolith or ice into usable feedstocks such as oxygen, water, or metals; integration of pilot-scale processing architectures for future industrialization. This includes mechanically-efficient beneficiation of raw material, as value-added input to resource-efficient and low consumable chemical and electrochemical extraction processing plants.
- Potential Enabling Elements: Pre/post-processing and reactor units with minimal power and thermal overhead, minimized process inputs, monitored and scalable processing rates, and continuous operation under vacuum and reduced gravity. Consideration should also be given to oxygen and metallic resource extraction and refining technologies and their potential link to propulsion applications and energy storage.

d. Feedstock and Consumables Production

- Needs: Production of propellants (e.g., LOX, LH_2, CH_4), life support commodities (e.g., water, oxygen), and construction materials (e.g., sintered regolith); extraction of essential elements and minerals to support crew health, operational autonomy, and infrastructure buildup.
- Potential Enabling Elements: Chemical reactors, thermal and electrochemical processes, energy and resource management, industrial control systems, and quality assurance systems. Strategic alignment with broader propellant ecosystem development, including feasibility of using metals for propellant or energy storage applications, should be considered. Feedstock production and material validation technologies supporting in-situ construction.

e. In-Situ Construction and Manufacturing

- Needs: Infrastructure development including landing pads, roads, foundations, habitats, radiation shielding, and maintenance capabilities using local materials; on-demand manufacturing of tools and components to increase crew autonomy and equipment supportability.
- Potential Enabling Elements: Regolith-based 3D printing, cementation technologies, modular assembly systems, and robotic construction and inspection platforms. Systems should be able to operate autonomously or semi-autonomously and support the build-out of critical infrastructure in remote or unstructured environments leveraging mobility platforms.

f. Storage and Transportation

- Needs: Safe containment and efficient transfer of raw and processed materials across the lunar surface and into orbit; robust logistics for power and communication support to ISRU assets. Strategic consideration for extracted feedstock and products (consumables) and their varying degree of complexity for storage and transportation.
- Potential Enabling Elements: Cryogenic and pressurized storage, mobility systems, transfer interfaces, and thermal control systems. Solutions should integrate with space resource logistics chains, including power beaming, communication relay infrastructure, and lunar-orbit delivery and storage architectures.

g. Recycling and Waste Management

- Needs: Prioritize long-term sustainable operations; Recovery and repurposing of mission waste to reduce reliance on resupply and minimize environmental footprint; post-processed regolith management; closed-loop material usage for long-term habitation including closed-loop bioregenerative life support systems.
- Potential Enabling Elements: Compact and efficient recycling units, closed-loop processing systems, contaminant detection, and intelligent waste handling, sorting and tracking. Integration with other ISRU systems for reuse of packaging, life support byproducts, and end-of-life hardware refurbishment is essential.

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Annex B – Respondent Information Feedback Form

The issuance of this Notice to Industry does not bind Canada legally, or otherwise, to enter into any agreement or to accept any suggestions from respondents. Be advised that Canada reserves the right to accept or reject any or all comments received.

The objectives of this Notice are the following:

- To encourage suppliers to express interest and provide contact information, potentially useful for future stakeholder engagement activities
- Identify potential participants with the appropriate background and area of expertise, including outreach to stakeholders in terrestrial and space sectors with relevant expertise

Please provide the following information:

Contact Details from Respondent	
Organization Name	
Name of Primary Point of Contact	
Title	
E-mail	
Telephone	
Street Address	
City	
Province	
Postal Code	
Preferred Language	English ☐ French ☐
Other Information for CSA **(please attach and refer to a separate document if more space is required to respond to the below section)**	
Type of organization	Industry ☐ Academia ☐ Other _____
Describe your Canadian footprint in the relevant domain(s)	
Identify the Capability Area(s) for which you have relevant expertise	☐ Resource Prospecting and Characterization ☐ Excavation, Regolith Management and Surface Preparation ☐ Processing and Extraction ☐ Feedstock and Consumables Production ☐ In-Situ Construction and Manufacturing

	☐ Storage and Transportation ☐ Recycling and Waste Management
Elaborate on your relevant expertise (250 words max)*	
Any other topics of interest	

* The response should address some or all the following:

a) As applicable, please describe your envisioned contributions to the targeted capability needs (Annex A), and what are the potential benefits to the future of your organization?

b) As applicable, please describe your organization's capabilities / expertise that can support the targeted capability needs (Annex A) and what challenges do you envision?

Annex C – Optional Reading

Canada is expanding its role in lunar exploration as part of a broader international effort to establish a sustained human and robotic presence beyond Earth orbit. Through investments under the Lunar Exploration Accelerator Program (LEAP), the Lunar Surface Exploration Initiative (LSEI), and Canada's participation in the Artemis program, the Government of Canada is advancing technologies and infrastructure that will contribute to future lunar exploration, scientific discovery, and economic development. Budget 2023 reinforced this commitment through investments in a Canadian Lunar Utility Vehicle and expanded technology development activities to support future lunar surface missions.

Internationally, Canada works closely with partner space agencies through forums such as the International Space Exploration Coordination Group (ISECG) and is one of the founding signatories to the Artemis Accords. Global exploration strategies, including NASA's Moon-to-Mars Architecture and the Moon Base initiative, ESA’s Explore 2040, and ISECG's Global Exploration Roadmap identify a range of critical technologies required to support sustained exploration of the Moon, Mars, and beyond. These evolving exploration architectures present significant opportunities for Canadian industry to contribute strategic capabilities and infrastructure that support both national interests and international exploration objectives.

The following reference material provides additional information on the exploration context and the international demand for capabilities supporting space resources activities and ISRU.

RD #	Link	Title	Date
RD-01	http://www.asc-csa.gc.ca/pdf/eng/publications/space-strategy-for-canada.pdf	Exploration, Imagination, Innovation - A New Space Strategy for Canada	Mar 2019
RD-02	https://www.globalspaceexploration.org/?page_id=1371	Global Exploration Roadmap (ISECG)	Aug 2024
RD-03	https://www.asc-csa.gc.ca/eng/astronomy/moon-exploration/canadian-utility-rover-on-the-moon.asp	CSA Canadian Utility Rover on the Moon	Mar 2025
RD-04	https://www.minescanada.ca/en/strategic-directions/science-technology-and-innovation	NRCan Canadian Minerals and Metals Plan (CMMP)	Mar 2019
RD-05	https://www.nasa.gov/wp-content/uploads/2025/12/2025-architecture-update-for-publication.pdf	NASA M2M Architecture Update	Dec 2025
RD-06	https://www.nasa.gov/wp-content/uploads/2026/04/moon-base-architecture-users-guide.pdf	NASA Moon Base User's Guide	Apr 2026
RD-07	https://esamultimedia.esa.int/docs/HRE/Explore_2040.pdf	ESA Explore 2040	Oct 2024
RD-08	https://sci.esa.int/documents/34161/35992/1567260390250-ESA_Space_Resources_Strategy.pdf	ESA Space Resources Strategy	May 2019
RD-09	https://www.globalspaceexploration.org/wordpress/wp-content/uploads/2021/04/ISECG-ISRU-Technology-Gap-Assessment-Report-Apr-2021.pdf	Report of the ISRU Gap Assessment Team (ISECG)	Apr 2021