

Introduction to New Development in Space Resource Activities in Korea

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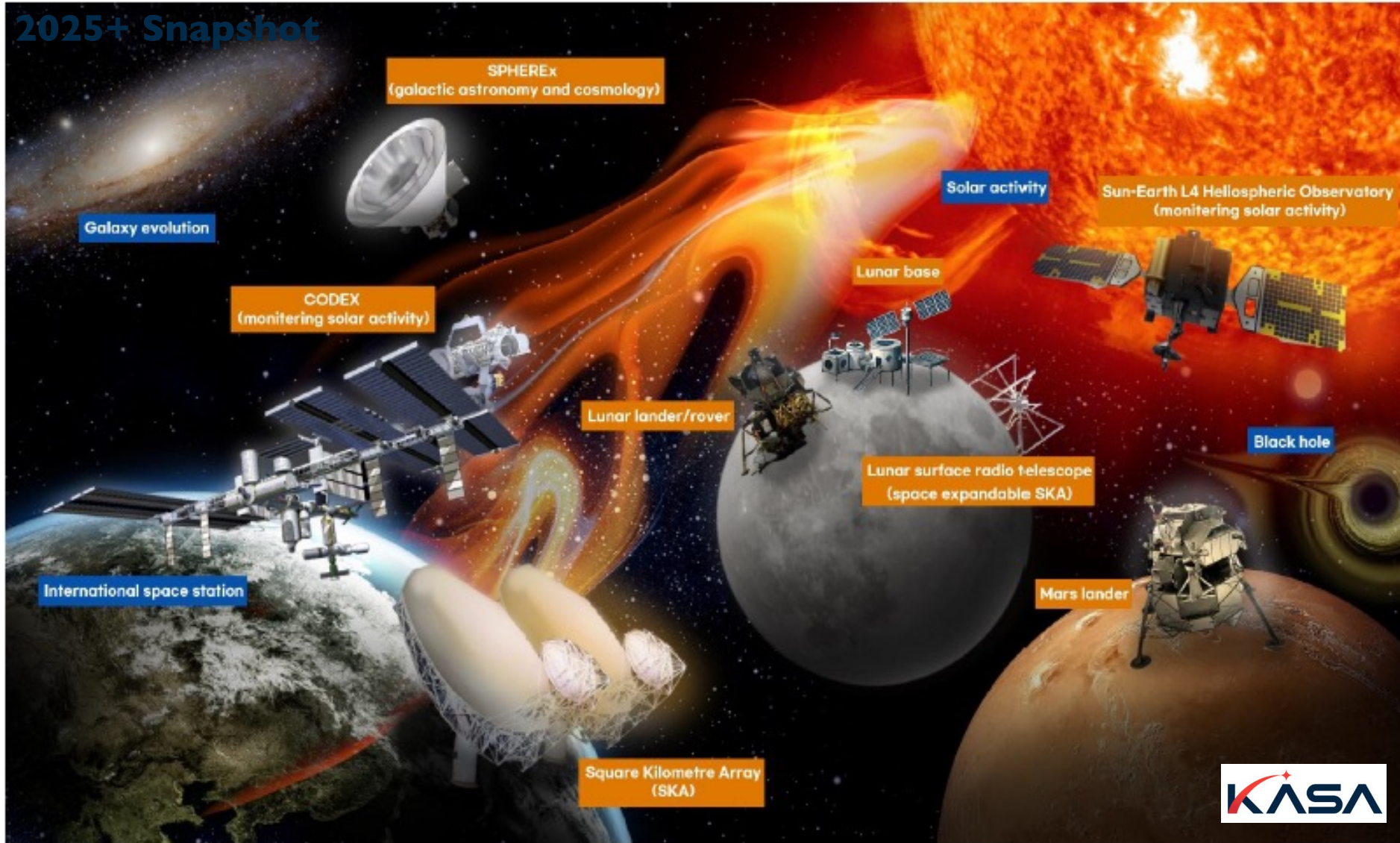
**Space Resources Exploration and Utilization Center
Korea Institute of Geoscience and Mineral Resources**



Space Science Exploration Strategic Plan



2025+ Snapshot



Korean Missions for Planetary Explorations



❖ Lunar Exploration

○ Korea became the seventh nation* to successfully enter lunar orbit and carry out a lunar mission. It is currently pursuing the independent development of a lunar lander, with the goal of a soft landing by 2032.

Preceded by the United States, Russia, the European Union, Japan, China, and India.

❖ Mars Exploration

○ Korea plans to launch a Mars orbiter by 2035, followed by a surface mission in 2045.

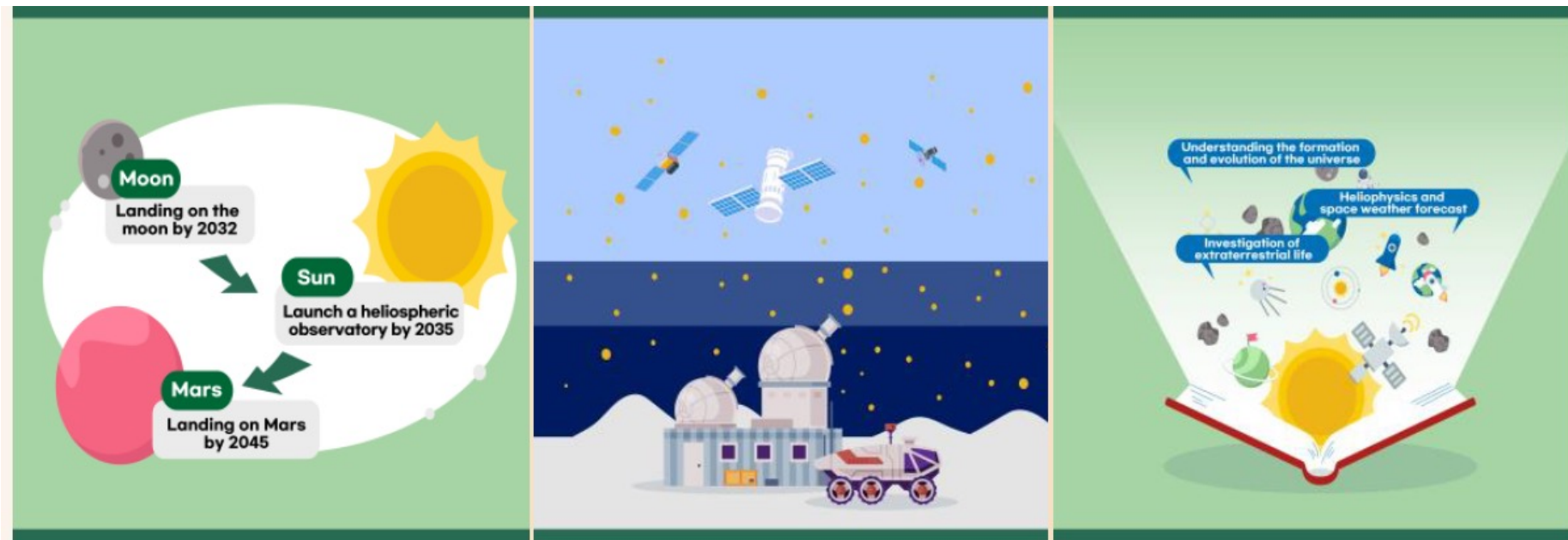
Technology development is still in the early stages.

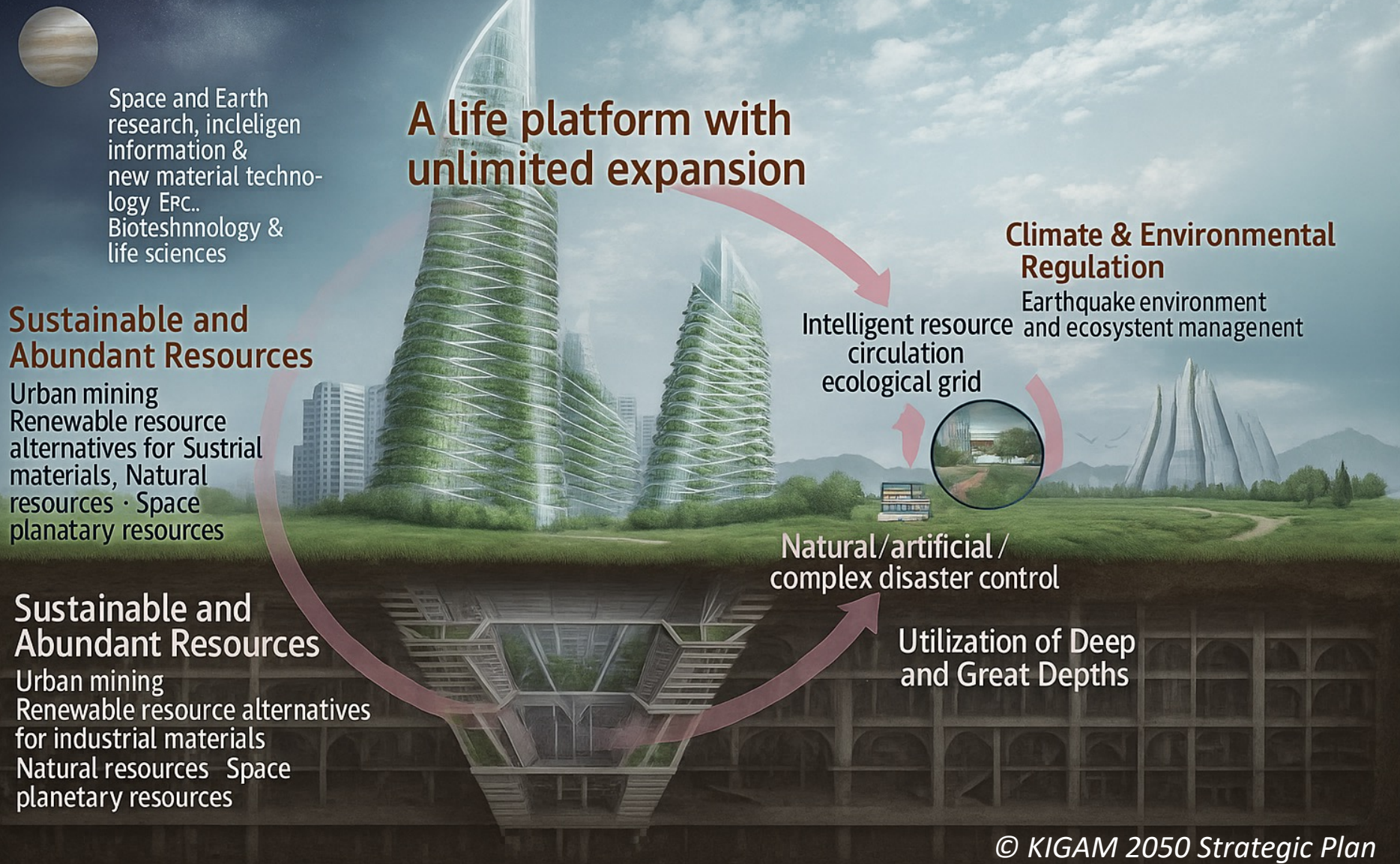
❖ Exploration of Other Planets and Small Bodies

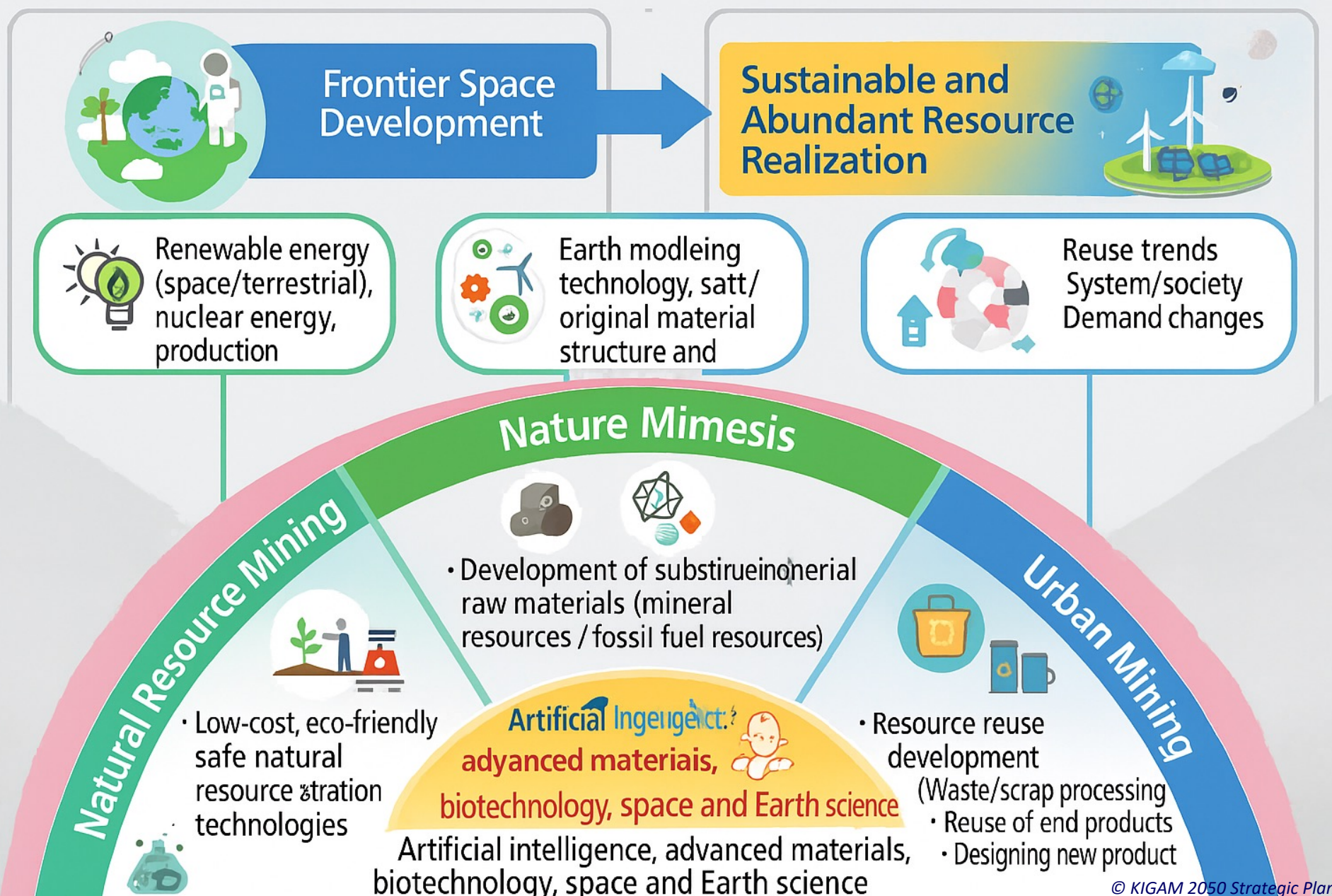
○ Korea has no prior experience in planetary or asteroid exploration, and there remains a substantial capability gap compared to leading countries.

❖ International Collaboration Opportunities !!!

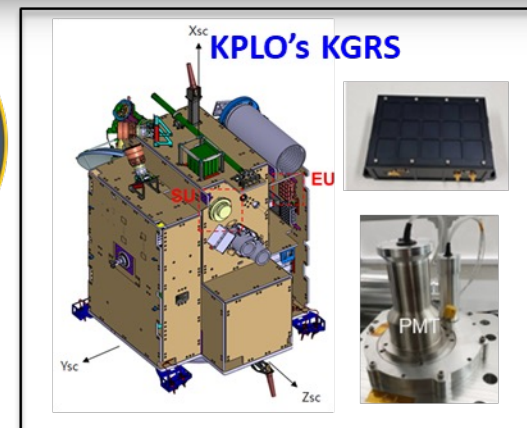
- Moon
- Mars
- Asteroids





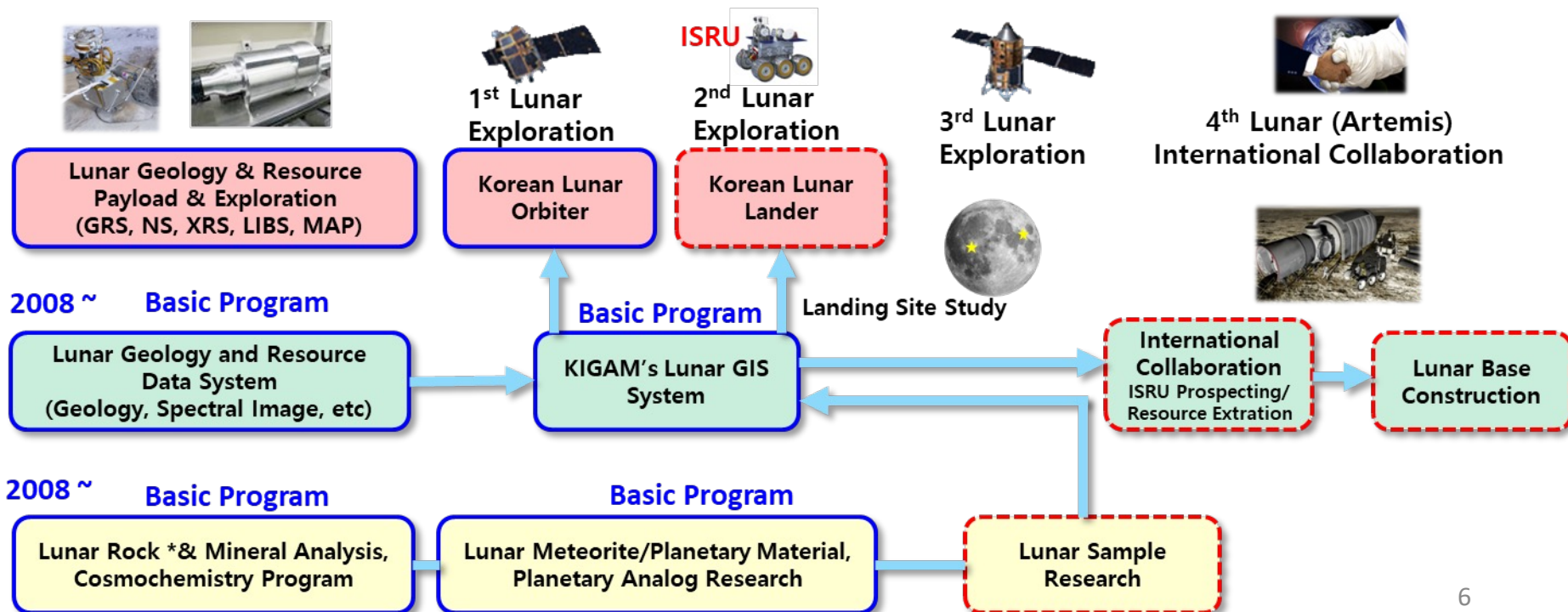


- Payload Development (2015-2018)
 - ✓ GNS for Lunar Geology & Resource (EM)
- KPLO Gamma-Ray Spectrometer (2016-2022)
 - ✓ Geology & Resource Prospecting
- Korean Lunar Explorer (Lander) (2031)
 - ✓ Volatile Extractor (Selected), LGSAS(LS, GNS, MAP)(proposed)

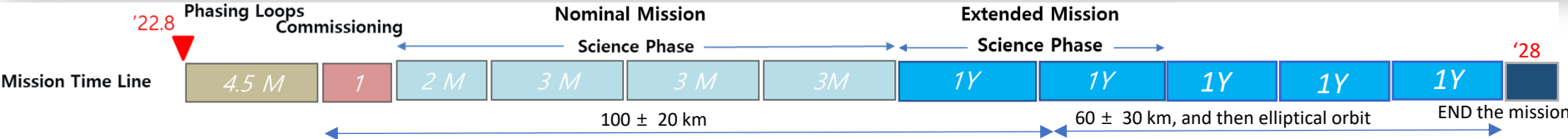
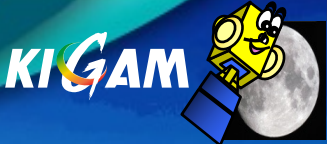


2008~ Core Technology Program

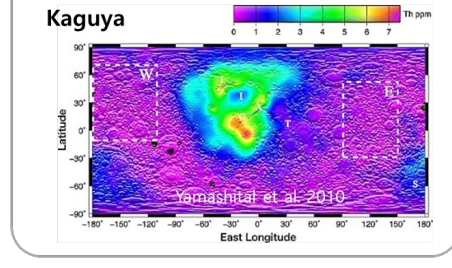
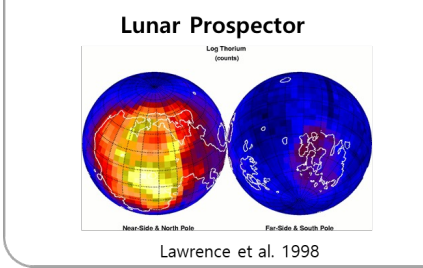
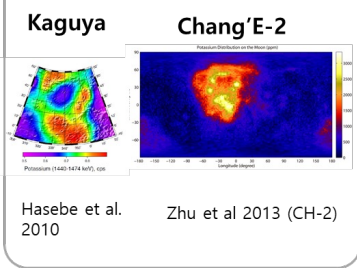
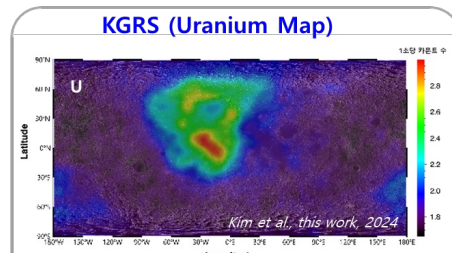
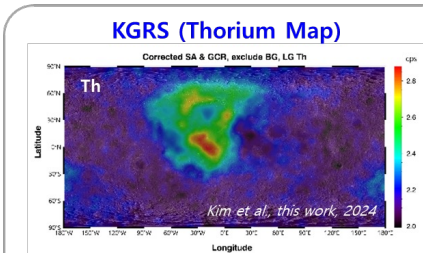
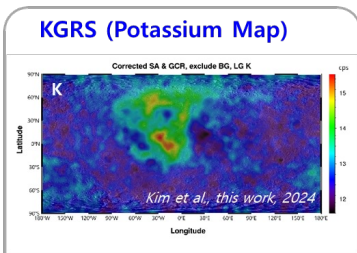
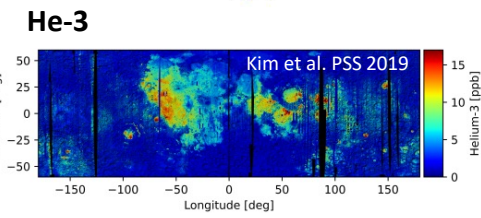
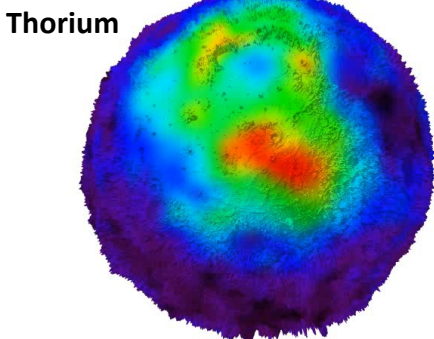
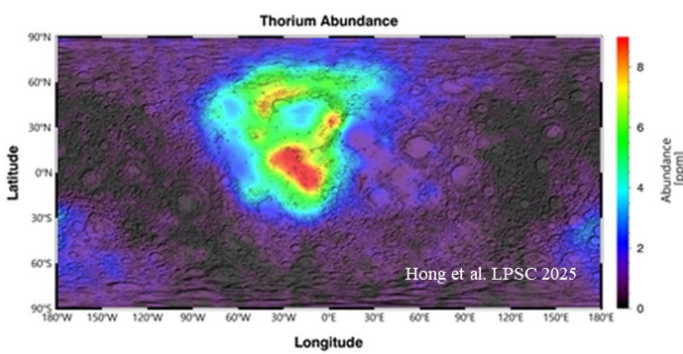
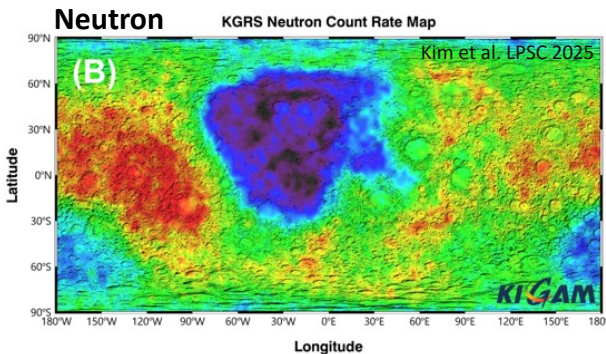
2016~ Lunar Exploration Program(KPLO)



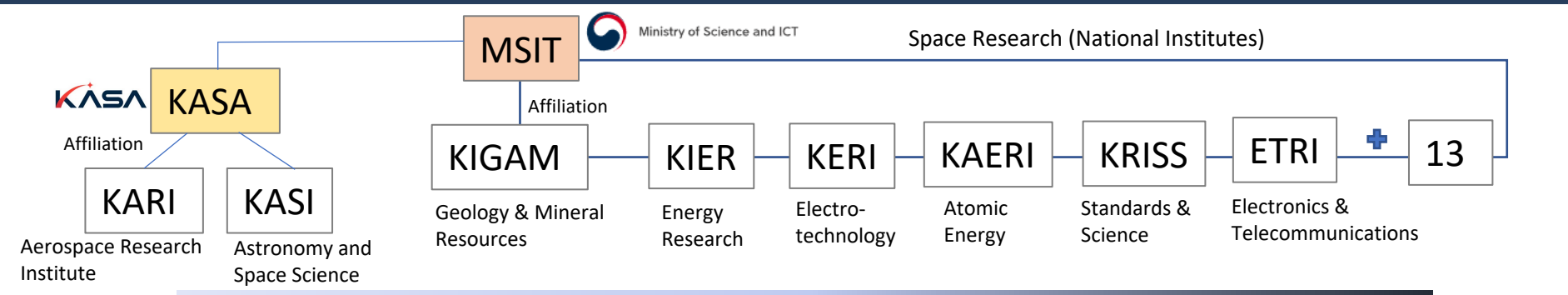
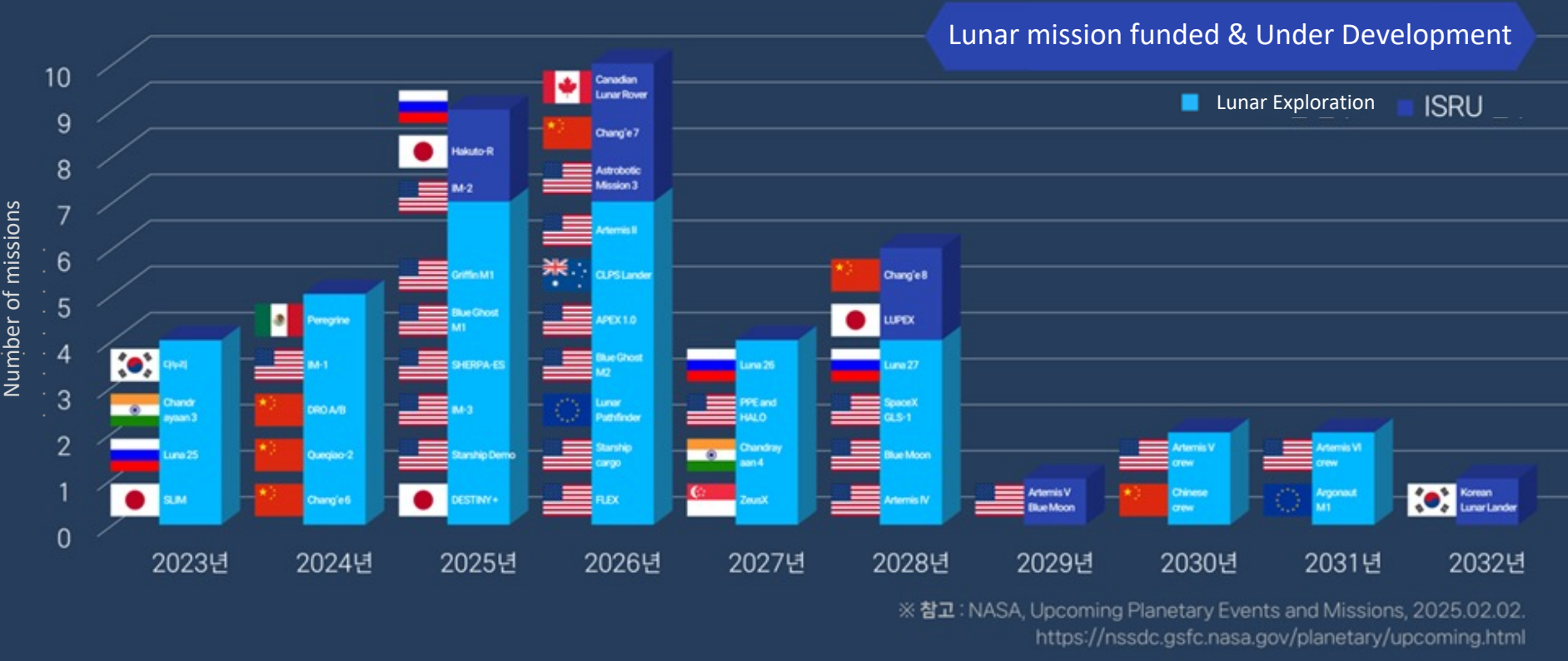
KPLO mission results by KGRS, KIGAM



Contribution to ILRPC !



Lunar missions (2023 ~ 2032) funded



(1) ISRU – Resources : KIGAM, KIER, KERI, KAREI



(2) ISRU – Construction : KICT

Milestones for Space Resource Development

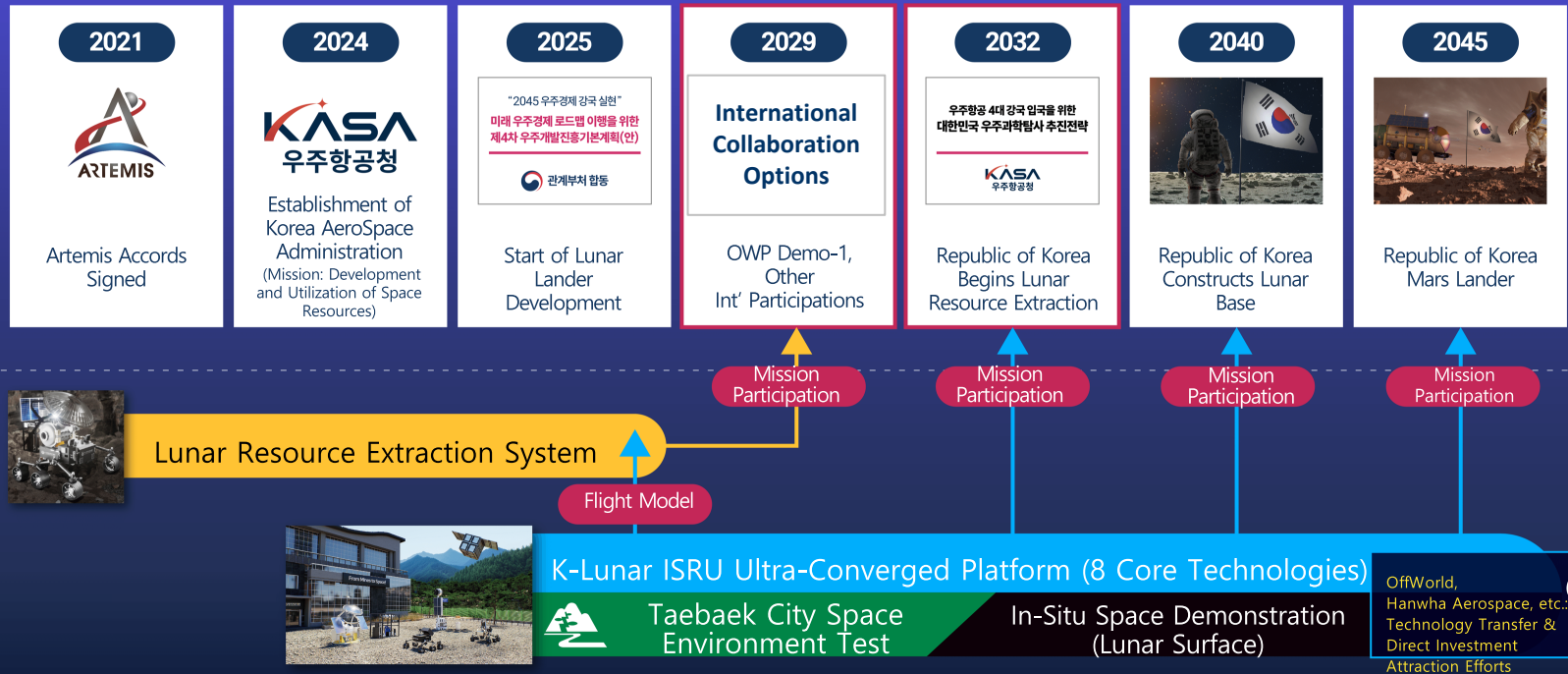


Moon to Mars

To Timely Implement Korea's Space Plan and Lunar Exploration Missions



Strategic Research Group



Development & Plans of Space Resources by National Institutes



Comprehensive full-cycle ISRU process technology covering lunar resource exploration, production, and storage

Earth-Orbit CubeSat

Mining Rover

- Lunar regolith collection: 1 kg (continuous)
- Lunar resource extraction: 0.1 kg per cycle

Rocket-Fuel Production System

- Methane fuel production for space rockets: 600 g CH₄/day capacity

Lunar-Ultra-Low-Orbit CubeSat

- Operational altitude: 10–50 km above the lunar surface
- Attitude control precision: > 0.05°
- Deep-space communication antenna gain: > 15 dB

Space Wireless Power-Transmission System

- Wireless TX/RX power: 10 kW (transmit), 3 kW (receive)
- Power-recovery unit efficiency: < 7 % at 673 K
- Average fault-recovery time: < 1 minute
- System power density: > 9 kW /L

Exploration Rover

- 3D point density: 1,000 points/m²
- 3D mapping accuracy: ≥ 90 %
- Positioning accuracy: ≤ 100 cm

Resource Extraction Unit

- Water/mineral detection: ppm-level at 1.5 m standoff
- Water, elemental, and radiation-environment survey: 1 m depth × 1 m width
- Extraction of volatiles (e.g., water, oxygen)

Real-Time Space Radiation Monitor

- Computational-model accuracy for radiation-environment assessment: > 90 %
- In-situ calibration accuracy: > 80 %

Heat-Pipe Reactor

- Reactor thermal output: < 100 kW_{th}
- Power-conversion efficiency: > 25 %
- Reactor lifetime: 10 years

GPR

- 40 m depth



Recent Research and Development in ISRU, KIGAM



- 1.1 km mining site #1 GRS, GNS, LIBS Demonstrator



Payload Developing Lab



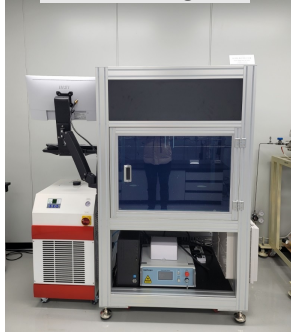
Soil sampler w/Volatile Extractor



Volatile Extractor



Laser Heating Unit



Solar Concentrator-Soil Heating Unit



Soil heating Gas Analyzing System



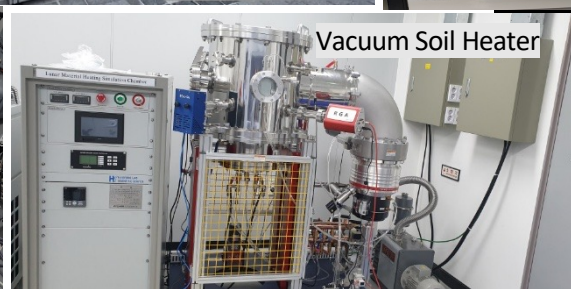
Gas Extraction/oxidization System



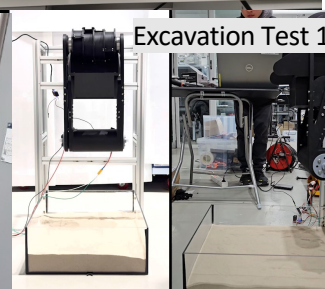
Soil Heating Unit



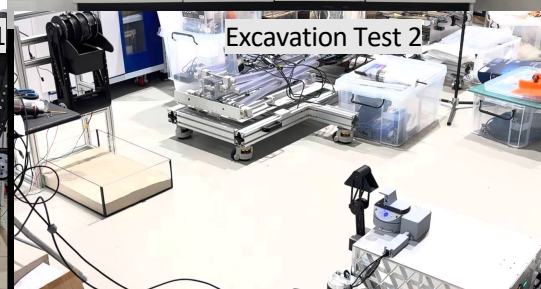
Vacuum Soil Heater



Excavation Test 1



Excavation Test 2



Recent Resource Prospecting Demonstration

Mining Site #2 : Taebaek City



학회지

Korean Society for
Space Resources & Energy

학회지 소개

학회지 바로가기

학회지 소개

🏠 > 학회지 > 학회지 소개



- Korean Society for Space Resources and Energy is established under KASA.
- KIGAM supports Space and Planetary Resources
- Recent activities are reported by the member of KARI to the UN committee.