

# From Chandrayaan 3 to an Indian on the Moon

A few insights into India's triumphant Moon landing and unique approach



– Jatan Mehta  
Space for Inspiration 2024, ESA ESTEC





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Moon Monday*



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# The moments of launch and landing





# Success draft and failure draft

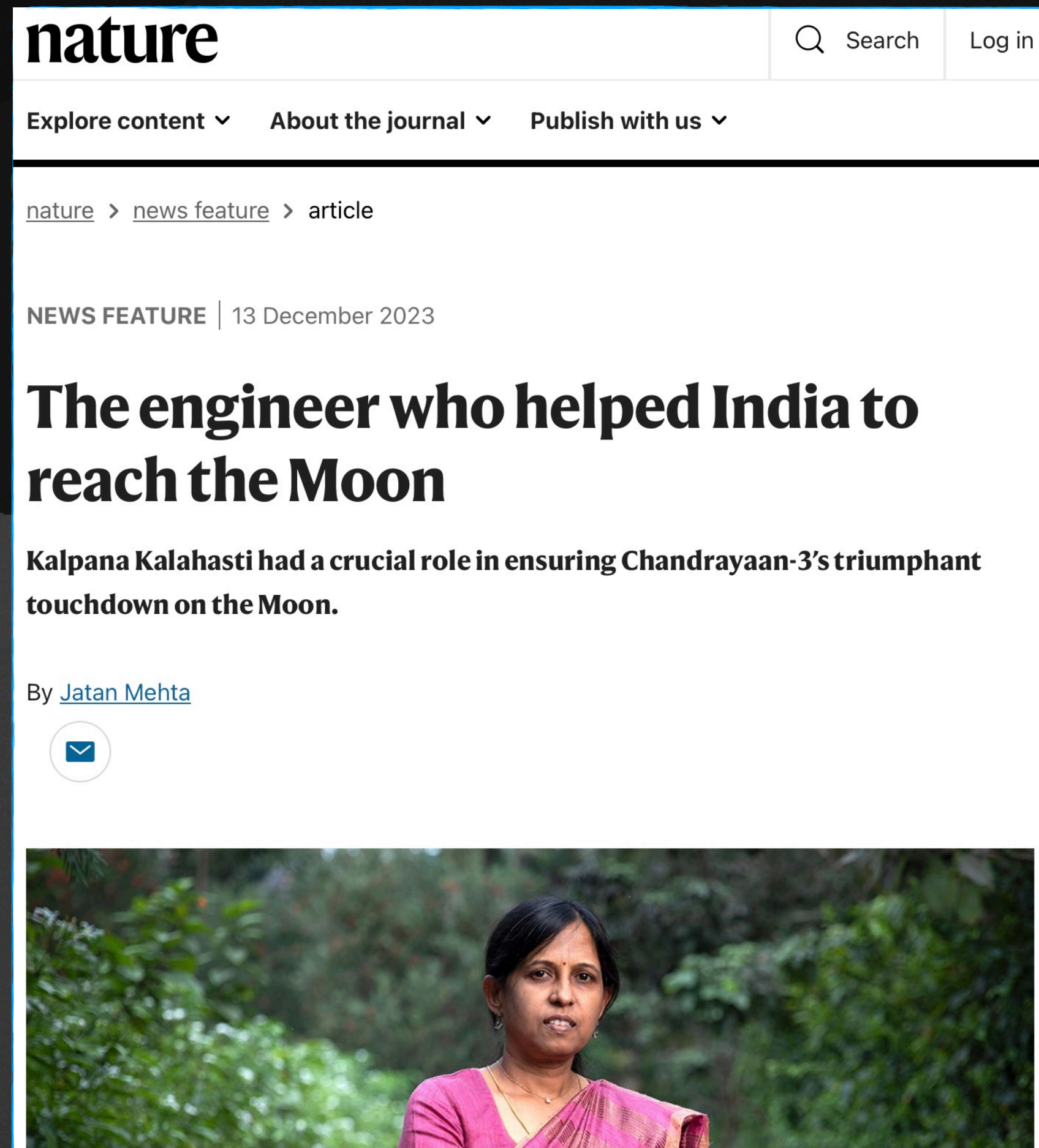
Chandrayaan 3 landed 350 meters from the center of the target landing ellipse of 4 by 2.5 kilometers





# The most important difference between Chandrayaan 2 and 3 was *testing*

As orchestrated by Palanivel Veeramuthuvel and Kalpana Kalahasti



The screenshot shows the top portion of a Nature journal article. At the top left is the 'nature' logo. To its right are search and login options. Below the logo are navigation links: 'Explore content', 'About the journal', and 'Publish with us'. The breadcrumb trail reads 'nature > news feature > article'. The article is dated '13 December 2023'. The main title is 'The engineer who helped India to reach the Moon'. The sub-headline states: 'Kalpana Kalahasti had a crucial role in ensuring Chandrayaan-3's triumphant touchdown on the Moon.' The author is identified as 'Jatan Mehta'. Below the text is a circular icon with an envelope symbol and a photograph of Kalpana Kalahasti, a woman with dark hair wearing a pink sari, standing in front of green foliage.

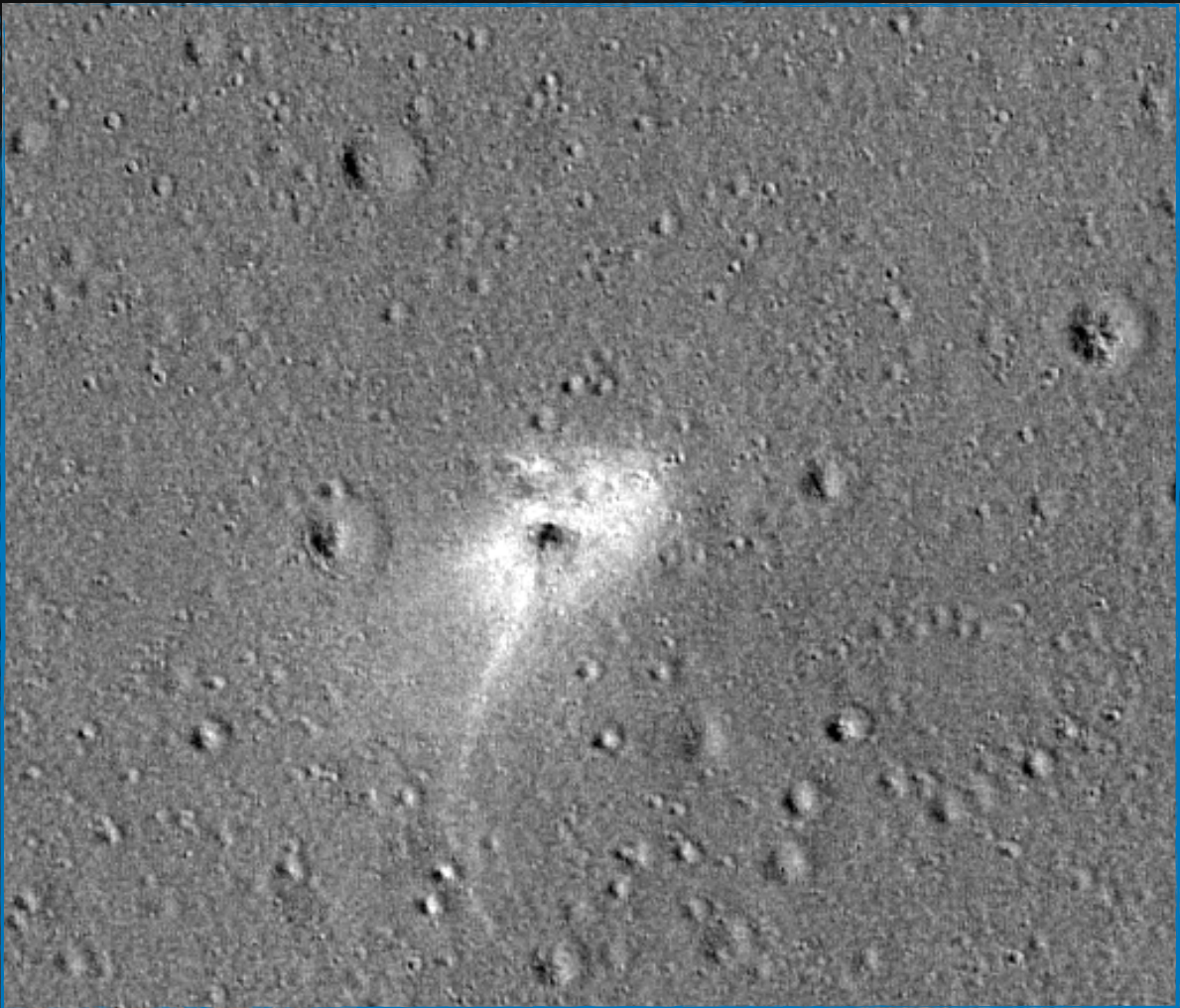
*Veeramuthuvel and Kalahasti spent the bulk of Chandrayaan-3's development time devising and overseeing comprehensive tests and simulations, such as assessing the navigation system's ability to avoid hazards before touchdown on Moon-like terrain.*

*"The goal was to have a well-documented, well-understood system. There was no compromise in demonstrating the system's performance," says Kalahasti.*

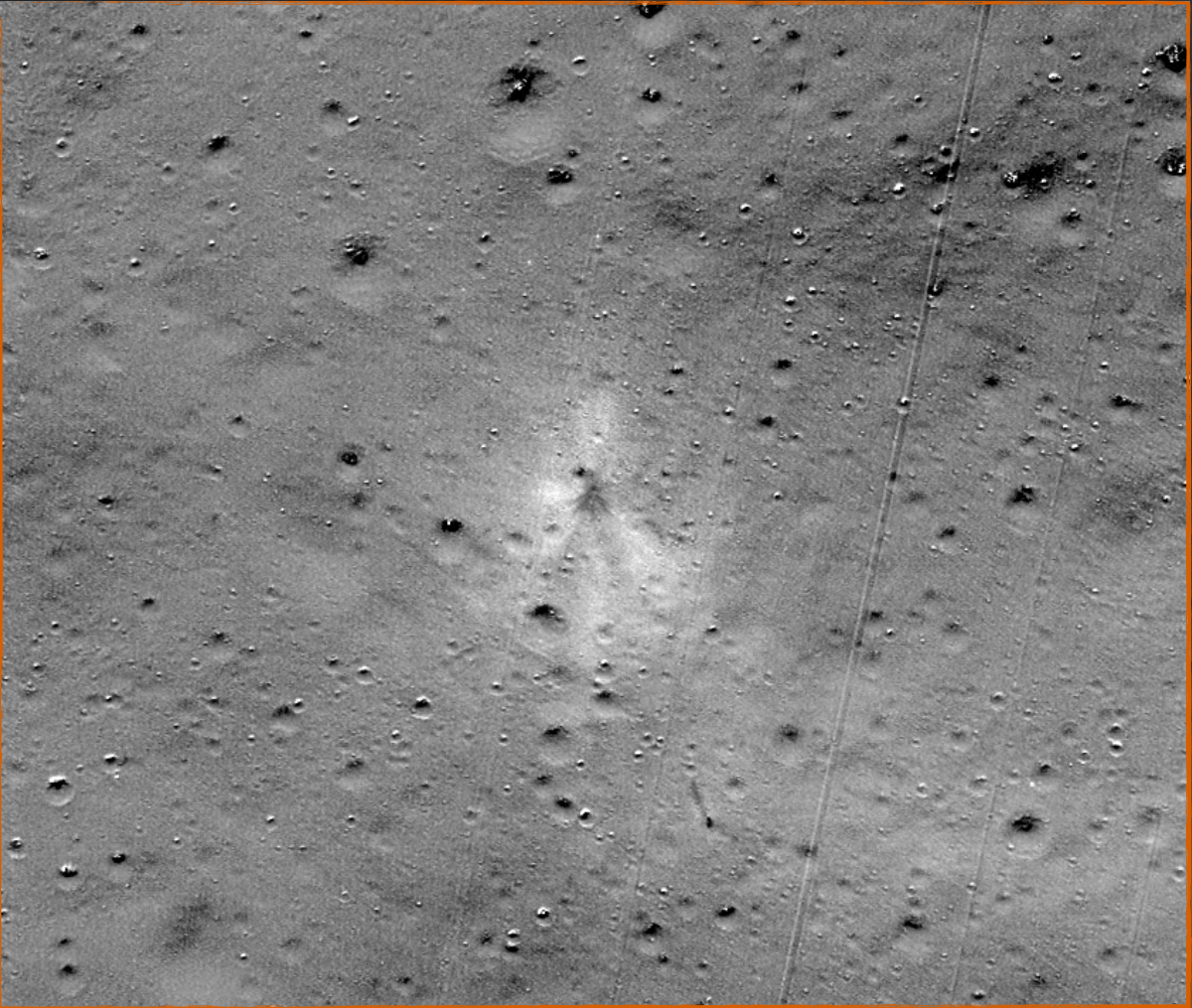


# Reminder that Moon missions remain risky

While our lunar ambitions may have risen, orchestrating hundreds to thousands of people and spacecraft parts for any Moon mission remains a complex, resource-intensive endeavor



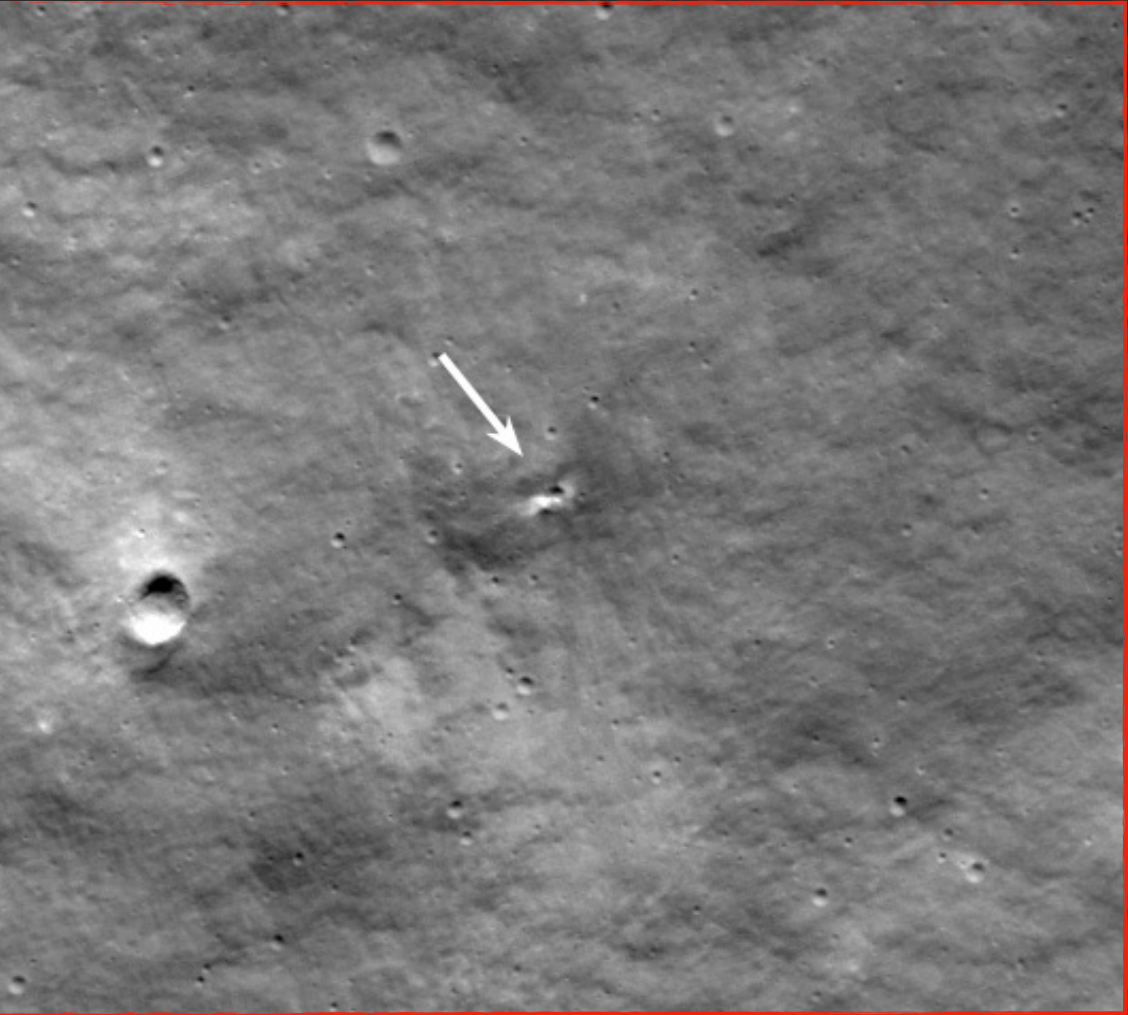
*Beresheet crash*



*Chandrayaan 2 lander crash*



*Hakuto-R crash*

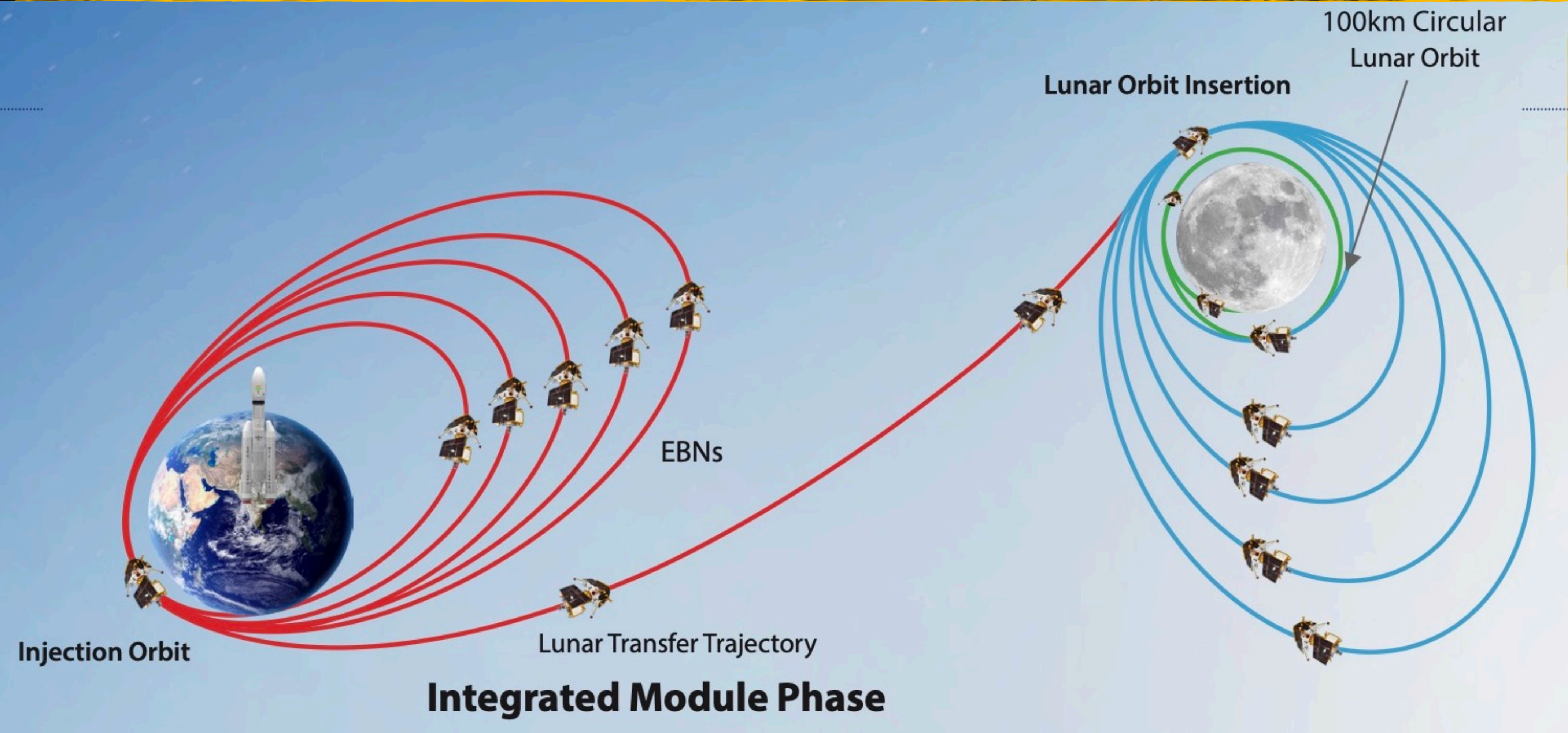


*Luna 25 crash*



# Cost of Chandrayaan 3 and ISRO's planetary missions

Work with the resources available





# This approach continues to be visible in planning of future missions

Chandrayaan 4, a precursor to sending humans to Luna, and a direct look at the Moon's past

**Target: 2026**

1 Returner module launched onboard PSLV

2 Chandrayaan-4 composite spacecraft launched by LVM3

Ascend Unit  
Lander  
Return Vehicle  
Service Module

Docking & Sample transfer

Returner module

Lunar Docking & Sample transfer

Ascender module

Capsule re-entry

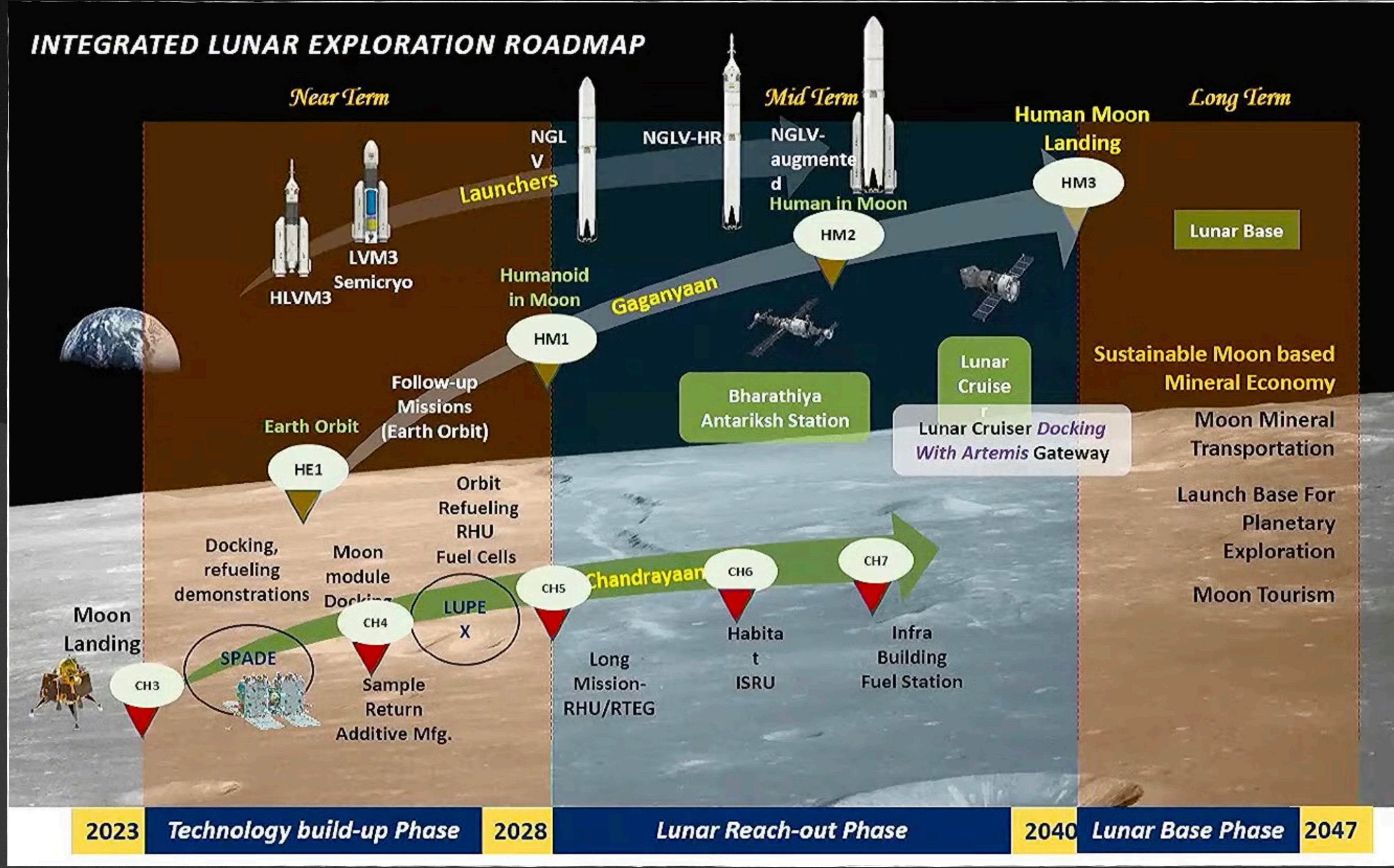
### Technology elements

- Lunar Sampler (Robotic Arm)
- Ascender module
- Docking in Lunar / Earth Orbits
- Sample transfer
- Return & re-entry



# A notional roadmap tying to the announcement of sending an Indian to Luna

Note the Gateway lunar cruiser





# International collaboration

LUPEX, a joint JAXA-ISRO Moon mission to study water ice on the Moon's south pole





# Too much is happening even for people in lunar exploration to catch up!

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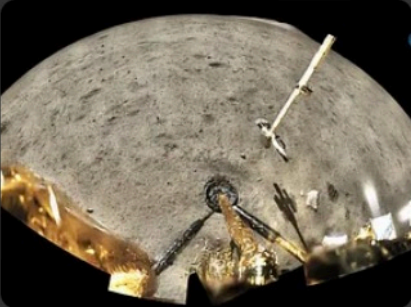
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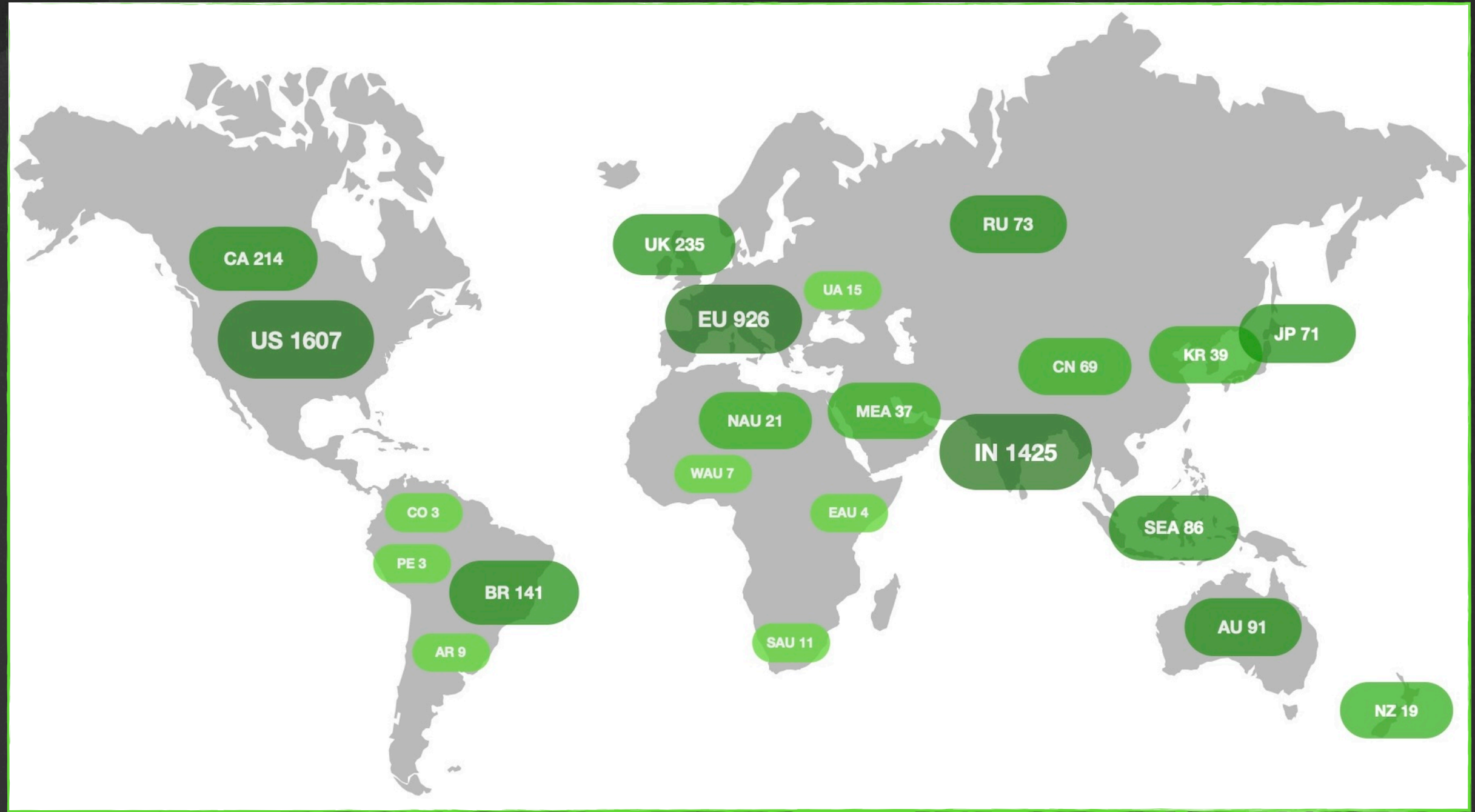
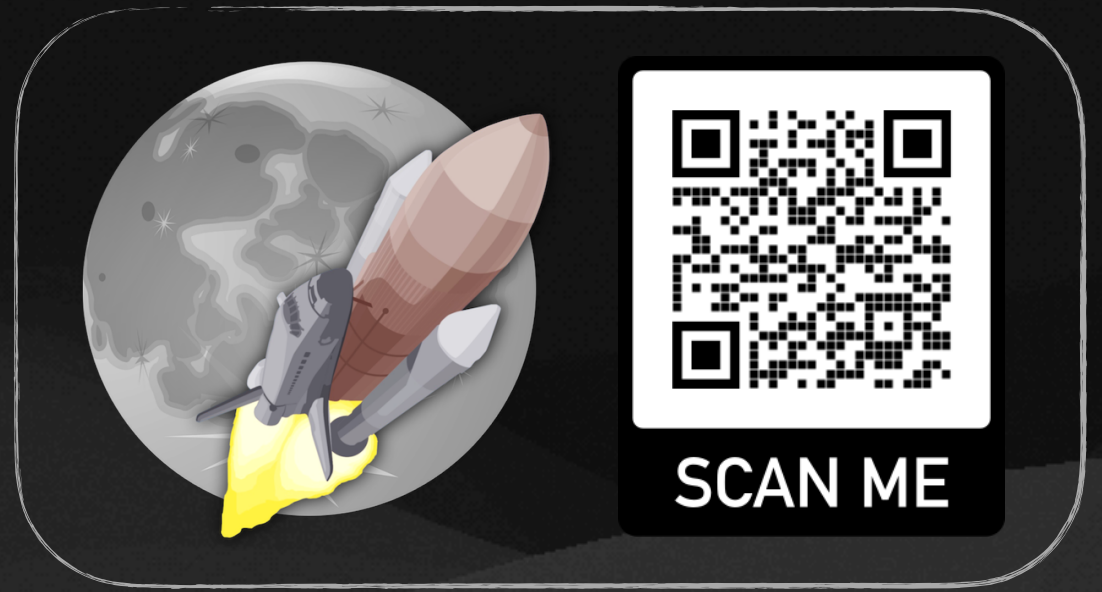
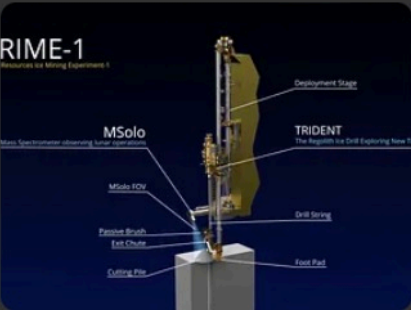
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*“Apart from the [Chandrayaan 3] mission’s technical aspects, I hope young professionals across India and the world get inspired by how the team meticulously emerged from failure.”*

*– Kalpana Kalahasti*

*Associate Project Director, Chandrayaan 3*



# Thank you for your time

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