

A Changing Himalayan Operational Environment: Climate Resilience and India's Military Readiness



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Introduction

On September 04, 2026, India placed EOS-05 (Earth Observation Satellite) into orbit, adding another important capability to its Earth observation capabilities.¹ Designed for near-continuous imaging from geosynchronous orbit, the satellite has applications in disaster monitoring, weather analysis and environmental observation.² But its significance for national security extends beyond what the satellite itself is designed to do.

The military operates in the physical environment that such systems observe. Roads disappear under landslides, runways become unusable, rivers alter routes, communications infrastructure fails, and weather can constrain movement and resupply. The question, therefore, is not simply whether India can see a changing climate. It is whether that information becomes part of how the military prepares to operate in it.

The Bhote Koshi flash flood in Nepal on August 26, 2026 offered a stark illustration. When a cascading Himalayan hazard damaged critical infrastructure, the problem was not only humanitarian.³ It was also operational: establishing what had happened, identifying viable routes, locating affected populations, and moving relief when the authorities required it had themselves been disrupted. The episode raises a larger question for India: can its military remain operational when the physical environment on which its mobility, logistics, and communications depend becomes increasingly unpredictable?

Climate as an Operating Condition

Nepal does not establish a simple causal relationship between climate change and any one disaster. The immediate trigger of the Bhote Koshi event remained under investigation, with official and scientific accounts considering snow-and-rock landslides, ice collapse, and upstream water impoundment mechanisms.⁴ Yet the episode demonstrates why Himalayan hazard chains matter for military planners: they can rapidly destroy infrastructure, cross administrative boundaries, and create immediate demand for high-end state capability.

The Himalayan military climatic concerns combine glacier instability, permafrost degradation, landslides, avalanches, flash floods, and glacial lake outburst risks. India, Nepal and China are linked by mountain systems, river basins, roads, border infrastructure and ecological processes; a hazard can create downstream or cross-border effects. India is also expanding strategic roads, bridges, airfields, and connectivity in difficult terrain. A Himalayan hazard can set off a recognisable sequence: infrastructure disruption generates humanitarian and disaster-response demand; that demand absorbs airlift, engineering, medical, communications, and logistics capacity; and diverting those finite assets can pressure conventional readiness.

While rapid air mobility and advanced technology offer unprecedented speed, they cannot rewrite the rugged terrain. The facts of physical geography will remain critically significant in shaping distinctive strategies for the armed services.⁵ Although modern warfare is increasingly joint in some technical respects, physical geography is not; military forces are structurally obliged to tailor their technical and tactical approaches to function within highly distinctive geophysical environments.⁶ In the high-altitude Himalayan theatre, this physical grammar is unyielding. Planners cannot treat the mountain landscape as a passive backdrop to be bypassed by orbital sensors or aircraft; they must respect and adapt their operational designs to a changing geophysical reality in which melting permafrost and shifting slopes dictate what is physically possible on the ground.

Flooding, slope failure, severe weather, or heat can shut down bases and infrastructure: runways, roads, bridges, storage sites, power supplies, and communications nodes. Forward positions often depend on a limited number of routes. Disruption creates problems of redundancy, stockpiling, alternative access, and repair capacity. High-altitude and heat-exposed forces confront physiological strain, acclimatisation demands, water stress and more difficult evacuation or resupply conditions. Temperature, humidity, precipitation, dust, ground instability and power loss can affect platform performance, maintenance and network availability. Disaster response uses many of the

same scarce assets—airlift, engineers, medics, helicopters, logistics and communications—that may be required for conventional missions.

Humanitarian Assistance and Disaster Relief (HADR) preparedness is not the same as preparing the military to operate in a climate-altered environment. The former treats disruption as an episodic emergency the force responds to. In contrast, the latter treats it as a persistent operating condition around which forces, infrastructure, logistics and information systems must be designed.

From Earth Observation to Military Readiness

Once infrastructure is disrupted, information becomes the first operational requirement. Commanders and civil authorities need to know where the water has gone, which roads remain usable, which bridges and structures are stable, where personnel or civilians are stranded, how terrain has changed and whether the hazard is still evolving. That requirement applies during disaster response, but it also applies to ordinary military mobility, infrastructure protection, route planning, logistics and operational awareness.

India already has an Earth observation ecosystem that meets this requirement. Indian Space Research Organisation's (ISRO) Earth observation programme supports environmental monitoring, agriculture, water resources, forestry, ocean observation, urban planning, and disaster management.⁷ The National Remote Sensing Centre's Disaster Management Support programme provides satellite-based inputs on hazards, including floods, cyclones, landslides, earthquakes, and forest fires.⁸ EOS-05 should be situated within this wider ecosystem: it is a reminder that the capacity to observe a changing physical environment is becoming a very important national asset.

The military question is not whether India needs Earth observation for climate and disaster applications. It is whether environmental intelligence enters the operational picture through which the armed forces plan, move and sustain themselves. The same data that identify a flooded corridor, unstable slope, damaged runway or disrupted power line can support route selection, logistics planning, base protection, engineering priorities and the allocation of scarce airlift and rescue assets.

This is where EOS should be considered alongside India's emerging defence-oriented surveillance architecture. Public reporting describes Space-Based Surveillance Phase III, or SBS-III, as a 52-satellite programme intended to strengthen persistent surveillance, intelligence, and reconnaissance, as well as secure communications and land- and maritime domain awareness.⁹

EOS and SBS-III should not be misconstrued as a single system: the former is a national environmental information infrastructure with broad civilian uses. At the same time, the latter is a defence-oriented architecture. But a climate-ready force increasingly needs both pictures at once—the physical-environment picture and the adversary or domain-awareness picture.

This dual requirement demonstrates the precise utility of space power within what Bleddyn Bowen conceptualises as the ‘cosmic coastline.’ Earth orbit is not an isolated high-ground sanctuary, but an adjunct and a flanking environment defined entirely by its proximity and usefulness to Earth.¹⁰ Satellites and their communication streams are strategic ‘tethers of modernity’ that have no intrinsic value; they are only as valuable as the state’s capacity to exploit them to shape political and physical outcomes on the ground. Integrating EOS-05’s environmental data with SBS-III’s threat-tracking capabilities is the logical operationalisation of Bowen’s thesis that outer space must be treated as an information layer designed to enable physical and operational survival on the terrestrial shoreline.¹¹

Integration means a common operational picture combining environmental, meteorological, terrain and threat information; data products designed for route viability, infrastructure condition, flooding, slope risk, weather windows and logistics prioritisation—not only post-disaster mapping; procedures and command arrangements that allow relevant civilian, military and commercial data to move quickly into operational planning; and training that treats environmental intelligence as routine operational input, alongside conventional intelligence.

Space is therefore not the sole basis of climate resilience. It is an information layer that increasingly enables other forms of resilience. Without timely, reliable awareness of terrain, weather, and infrastructure conditions, even well-provisioned forces may struggle to move, communicate, or concentrate capability when it matters most.

Strategic Autonomy and Information Dependence

But an information architecture is only as resilient as its sources, ground infrastructure, communications links, processing systems and contractual access. EOS provides existing domestic environmental information capacity, including civilian and disaster management uses. SBS-III adds a growing defence-oriented surveillance and communications architecture. Commercial systems add capacity, revisit rates, analytics, connectivity, and innovation, but also potentially entail greater contractual, technological, and geopolitical exposure.

This exposure is fundamentally a hardware reality. Critical information infrastructures have become strategic assets in a global contest for technological dominance.¹² Even technologically advanced militaries remain vulnerable to concentrated semiconductor supply chains.¹³ For India, the lesson extends beyond satellite design and launch: space systems depend on specialised processors, sensors, radiation-hardened electronics and other components whose supply chains can remain globally concentrated even when the satellite itself is domestically designed or assembled. Strategic autonomy therefore cannot stop at the satellite bus; it must extend to the critical technologies and supply chains that sustain the orbital information architecture.

The more military readiness depends on persistent information, the more the resilience of that information architecture becomes a component of strategic autonomy. A force may have access to excellent commercial imagery or communications in peacetime but face different conditions when a disaster, conflict, network disruption or geopolitical dispute produces simultaneous demand and restricted access.

Regulatory continuity is not the same as contractual priority; contractual priority is not the same as operational assurance. Indian Space Policy 2023 and the Indian National Space Promotion and Authorisation Centre's (IN-SPACe) implementation framework provide authorisation, supervision and government emergency-control mechanisms for non-government space activities.¹⁴ Specific defence contracts can define what access, data delivery, service continuity, surge capacity, redundancy and priority use a provider owes when demand spikes. Even a strong contract cannot overcome a disabled ground station, a damaged fibre link, a cyber-incident, an inaccessible foreign component, unavailable launch or replenishment capacity, or an overwhelmed data-processing node.

Commercial Earth Observation (EO) and communications can add redundancy and capacity. The relevant strategic question is whether the state has designed the contracts, ground infrastructure, data arrangements and contingency plans needed to convert commercial capacity into assured availability during a combined environmental and geopolitical crisis. Strategic autonomy is therefore more than owning satellites or manufacturing hardware domestically. It is the ability to preserve critical information flows and use them operationally when physical, technological and geopolitical systems are under simultaneous pressure.

Five Changes India Should Make

India is not starting from zero. It has established procurement processes, climate and environmental testing capacity, an Earth-observation ecosystem, a growing defence-space architecture, and an expanding commercial space sector. The gap is not the absence of relevant institutions; it is the absence, in the public record, of a systematic mechanism linking climate projections to force design, acquisition, infrastructure, exercises and space-enabled information. This resembles what Anit Mukherjee describes more broadly as an “absent dialogue” among India’s political, bureaucratic and military institutions—a useful lens for understanding the coordination challenge between civilian space organisations and military planners.¹⁵ The published membership of the Space Commission includes senior civilian, national-security and space officials, including the National Security Adviser and the IN-SPACe chair. Still, it does not list a standing Defence Space Agency or Ministry of Defence representative. It is argued that defence stakeholders should receive more formal representation in India’s space-governance structure.¹⁶

This does not necessarily mean the Space Commission must be reconstituted immediately. A more modest first step would be to establish a standing Defence Space Agency or a Ministry of Defence representative, observer, or formal liaison mechanism for matters involving military space services, environmental intelligence, and continuity of critical infrastructure. The aim would be to create a continuous civil–military dialogue without creating another large bureaucracy.

1. Test equipment against projected conditions, not only historical conditions

India’s defence-quality system already uses climatic and environmental-testing standards, including the Quadripartite Standardisation Agreement (QSTAG) 360 and the Military Handbook (MIL-HDBK) 310.¹⁷ The objective should be to incorporate forward-looking regional climate projections into the operating-environment assumptions used for long-life platforms, supply-line roads and high-altitude infrastructure. Procurement should account for higher thermal thresholds, altered precipitation, permafrost degradation, slope instability, and changes in water availability over an asset’s expected service life. This does not require a new testing bureaucracy; it requires updating the risk baseline within existing requirements, trials and life-cycle planning. The Defence Acquisition Procedure (DAP) and existing quality-assurance system provide an administrative route to do so, but the public record does not show that projected climate conditions are already being applied systematically.

2. Integrate environmental intelligence into existing space architecture

India does not need a separate climate-satellite constellation to improve military resilience. It needs environmental intelligence to become an operational complement to the space architecture it is already building. Public reporting describes SBS-III as a 52-satellite programme intended to strengthen persistent surveillance, intelligence, reconnaissance, secure communications and land-and-maritime domain awareness.¹⁸ EOS and SBS-III should not be treated as interchangeable systems: EOS represents national environmental-information infrastructure with broad civilian and disaster-management uses, while SBS-III is a defence-oriented surveillance architecture. The objective should therefore be a controlled, tiered information interface, not unrestricted fusion of civilian and classified data. Environmental products such as route-viability assessments, flood overlays, slope-risk maps, runway-condition reports and weather windows could be made available at the appropriate classification level to engineers, logistics planners and operational commanders, while sensitive threat data remain compartmented. Antariksha Abhyas 2024 offers an existing institutional precedent: the DSA conducted the exercise with the armed services, ISRO, Defence Research and Development Organisation (DRDO) and other security organisations to examine operational dependence on space services and vulnerabilities caused by disruption or denial.¹⁹

3. Climate-stress conventional exercises and wargames

Environmental hazards should become active operational variables rather than remaining administrative HADR afterthoughts. Joint exercises should test a conventional border crisis occurring simultaneously with a glacial-lake outburst, landslide, flood or extreme-heat episode that destroys a supply bridge, degrades communications and generates an urgent civilian disaster-response demand. Such scenarios would test redundancy, decentralised mission command, alternative routes, logistics prioritisation and the ability to maintain the command cycle under physical disruption. India's Joint Doctrine for Multi-Domain Operations provides a useful framework because it calls for coordinated employment of military and non-military capabilities across land, sea, air, space, cyber and cognitive domains through a Whole-of-Nation Approach.²⁰ No comparable public evidence was located of Indian conventional wargames systematically combining these climate-stress variables. That is an observation about the public record, not proof that such planning does not occur.

4. Guarantee continuity of commercial space services

India's general civilian space-regulatory framework is not a substitute for defence-specific service assurance. IN-SPACE's authorisation framework permits the government to impose controls on satellite, payload and ground-station operations during conflict, natural disasters or declared emergencies.²¹ That is an emergency-control power; it is not the same as guaranteeing military priority access, uninterrupted data delivery or surge capacity. Defence contracts for commercial Earth observation, satellite communications, data processing and geospatial analytics should therefore specify crisis priority, data control, surge capacity, redundancy, alternate ground stations, delivery timelines and continuity of service. The objective is to convert commercial capacity into operationally assured capability, rather than assuming that commercial availability in peacetime will automatically translate into access during conflict or disaster.

5. Secure the microelectronics supply chain for orbital hardware

Strategic autonomy in space and climate resilience is incomplete if the processors running India's orbital and ground-control systems depend on a concentrated global fabrication base. ISRO has already begun addressing this: in February 2026, it announced plans to produce space-grade semiconductors domestically within four years through its Semiconductor Laboratory in Chandigarh, which has already developed the space-qualified Vikram 32-bit processor.²² This effort sits within the government's broader SEMICON India Mission, which has committed roughly INR 76,000 crore to reducing import dependence on chips.²³ The relevant policy task is not to invent a new procurement mechanism inside DAP—India's Buy (Indian-IDDM) category sets indigenous-content thresholds, not production-quantity guarantees, and does not currently establish any equivalent for semiconductor manufacturing runs.²⁴ The task is instead to ensure that SCL Chandigarh's space-grade output, and any future defence-relevant fabrication capacity built under SEMICON India, is scaled and funded to the specific volumes SBS-III, EOS follow-on missions, and secure ground infrastructure will require—rather than leaving that demand signal implicit.

Conclusion

The Bhote Koshi disaster was a reminder of how quickly a Himalayan hazard can turn infrastructure failure into an operational problem. It did not prove that every such event is caused by climate change. It showed instead why a military cannot assume that roads, bridges, airfields, communications networks and information systems will remain available when they are most

needed. The issue is not whether climate change is an environmental concern for the armed forces. It is whether India's forces can remain operational when the physical environment in which they are based, move and communicate becomes less predictable. A climate-ready military is therefore not simply one that can respond to disasters. It is one designed to remain operational in the environment those disasters help reshape.

(Disclaimer: The views and opinions expressed in this article are those of the author and do not necessarily reflect the position of the Centre for Aerospace Power and Strategic Studies [CAPSS])

Notes:

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¹⁰ Bledwyn E. Bowen, *Original Sin: Power, Technology and War in Outer Space* (London: Hurst & Company, 2022), pp. 13–14.

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