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## Integrating Climate Risk: A Non-Traditional General Perspective

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### ABSTRACT

Non-traditional security refers to a broad set of risks that undermine the safety, well-being, and stability of societies without primarily arising from interstate military competition. Unlike traditional, state-centric threats such as armed conflict, territorial disputes, or nuclear deterrence dynamics, non-traditional threats are diffuse, transboundary, and multidimensional. They typically involve hazards like climate change, environmental degradation, pandemics, disasters, food and water insecurity, cyber risks, and transnational crime. Their impacts are felt first and most acutely by populations, economies, and ecosystems rather than through military balances alone, and effective responses demand whole-of-society approaches, cross-border cooperation, and sustained governance capacity rather than coercive force. In the Indo-Pacific spanning the littorals of the Indian and Pacific Oceans, home to small island developing states (SIDS), mega-deltas, archipelagos, and dense coastal urban corridors—this distinction matters because vulnerability is shaped as much by exposure and institutional resilience as by hard power. Climate change sits at the core of this non-traditional security agenda, not only as an environmental issue but as a structural driver of risk that cuts across human, economic, and ecological systems.

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### 1. Introduction

Climate change functions as a security multiplier by intensifying existing vulnerabilities and creating new pathways to instability. Rising sea levels amplify coastal erosion, saline intrusion, and permanent



inundation in atolls and deltas, degrading freshwater supplies and agricultural lands while threatening settlements and cultural heritage. More frequent and intense extreme events, such as tropical cyclones, marine heatwaves, floods, and droughts, generate humanitarian crises, displace populations, and disrupt essential services, from health care and education to energy and transportation. Ocean warming and acidification undermine coral reefs and fisheries, jeopardizing food security and livelihoods across the region's vast maritime economies. These biophysical stressors reverberate through markets and governance systems: disaster costs strain public finances; insurance withdrawal raises sovereign and corporate risk; damaged ports and supply chains interrupt trade; and resource pressures can heighten local tensions, illegal, unreported, and unregulated (IUU) fishing, and maritime law enforcement challenges. Where governance capacity is limited or uneven, whether in remote islands, informal settlements around coastal megacities, or conflict-affected zones, compounded shocks erode trust and legitimacy, overwhelm response systems, and widen inequality. Thus, climate risks rarely act alone; they intensify pre-existing social, economic, and political fragilities, reshaping risk from a series of isolated events into a persistent condition of stress.

## **2. The Indo-Pacific's Climate Hazard Geography and Systemic Risk Landscape**

The Indo-Pacific's risk profile is defined by an intricate physical geography that concentrates people, assets, and ecosystems along highly exposed coastlines. Small island developing states (SIDS) in the Pacific and Indian Oceans are composed of atolls and volcanic islands with limited elevation, narrow freshwater lenses, and economies deeply tied to marine resources. Low-lying deltas such as the Ganges-Brahmaputra-Meghna, Mekong, and Irrawaddy host dense agrarian populations and megacities that depend on sediment flows and subsurface aquifers easily disrupted by sea-level rise and human extraction. Coral reef systems stretching from the Coral Triangle through Melanesia to the central Pacific buffer coasts sustain fisheries and underpin tourism, but they are acutely sensitive to warming and acidification. Seasonal monsoon regimes and cyclone belts shape water availability and hazard cycles across South and Southeast Asia, while archipelagic geographies in Indonesia and the Philippines expose dispersed communities and maritime infrastructure to compound risks from storms, floods, landslides, and tsunamis. These physical features create a geography of exposure where even small perturbations propagate through food, water, and economic systems

## **3. Human Security Under Strain in the Indo-Pacific**

Climate change in the Indo-Pacific is reshaping human security by altering how people secure food and water, maintain health, sustain livelihoods, and access education and social protection. These impacts



rarely occur in isolation. They compound across sectors and time, turning weather shocks into persistent stresses that erode resilience, particularly for vulnerable groups such as smallholder farmers, artisanal fishers, informal workers, women, and youth in coastal and delta regions. Food security in the region is strained on multiple fronts. Warmer oceans and more frequent marine heatwaves disrupt pelagic and coastal fisheries, pushing key species to shift ranges and reducing local catch reliability for small-scale fishers. Coral reef degradation driven by bleaching, acidification, and storm damage reduces habitat complexity and fish biomass, cutting into a vital source of protein and income for island and coastal communities. On land, crop yields become more variable as heat stress shortens growing periods, erratic monsoons complicate planting and harvesting decisions, and heavy downpours increase flood losses and soil erosion. Salinity intrusion in deltas and atoll soils depresses rice, vegetable, and fruit production while making freshwater-dependent aquaculture less viable. Aquaculture faces additional disruptions from disease outbreaks and low-oxygen events during marine heatwaves, along with infrastructure damage from storms and floods. The combined effect is a narrowing margin of stability: households face higher food prices, more frequent lean seasons, and tougher trade-offs between nutrition and other essentials, with ripple effects for child development and public health.

Health security is affected both directly and indirectly. Rising temperatures and humidity intensify heat stress, raising risks of heat exhaustion and mortality, especially among outdoor workers, the elderly, and those with pre-existing conditions. Shifts in rainfall and temperature patterns expand or shift the ranges of vectors such as mosquitoes, altering the incidence of diseases like dengue, malaria, and chikungunya in ways that challenge surveillance and control. Floods and water shortages elevate risks of food- and water-borne diseases through contamination, spoilage, and compromised hygiene. Disasters and displacement leave lasting mental health impacts—*anxiety, grief, and trauma*—compounded by the loss of homes, livelihoods, and cultural ties. Health systems themselves come under strain when facilities are damaged, supply chains are disrupted, and demand spikes during concurrent crises such as heatwaves coinciding with outbreaks.

Livelihoods and poverty dynamics are highly sensitive to climate shocks. Agriculture faces yield losses, more frequent crop failure, and rising costs for inputs like irrigation and pest control; smallholders struggle to absorb repeated shocks without falling into debt or distress sales of assets. Tourism—vital to many islands and coastal economies—suffers when coral reefs degrade, beaches erode, and extreme events deter visitors, with losses cascading through local service sectors. Artisanal fisheries, a backbone for food and income in many communities, experience catch variability, gear losses from storms, and increased competition as fish stocks shift or decline. Informal workers, who dominate urban and rural



economies across the region, face heightened precarity: heat exposure reduces safe working hours and productivity; floods and storms disrupt marketplaces and transport links; and the absence of formal contracts or insurance leaves little cushion for recovery. Over time, these pressures can lead to negative coping strategies, reduced food intake, school dropouts, risky migration, or environmentally damaging practices, entrenching poverty and inequality.

#### **4. Environmental Degradation and Ecological Security**

Biodiversity across the Indo-Pacific is being reshaped by climate and human pressures, with species ranges shifting both poleward and into deeper, cooler waters as ocean temperatures rise. These redistributions reorganize food webs and can sever long-evolved ecological relationships, especially where species cannot move or adapt quickly enough. Endemic island ecosystems are at particular risk: small ranges, specialized niches, and geographic isolation leave many plants, birds, reptiles, and invertebrates vulnerable to even modest habitat loss or invasive species. On reefs, thermally sensitive corals bleach more frequently, altering habitat complexity and reducing nursery grounds for fish; in mangrove and seagrass systems, dieback and fragmentation diminish shelter and feeding areas for juvenile fish and invertebrates. As these foundation habitats erode, the cascading loss of associated species accelerates, pushing some localized endemics toward extinction.

Multiple degradation drivers converge in coastal zones where populations and infrastructure are densest. Coastal erosion exacerbated by sea-level rise, subsidence, and the interruption of sediment flows by dams and river engineering strips the beach and undermines wetlands that buffer storms. Illegal, unreported, and unregulated fishing depletes stocks, removes key functional species, and damages benthic habitats through destructive gear, weakening ecosystem resilience just as environmental variability intensifies. Marine pollution from plastics and ghost gear to nutrient runoff and untreated wastewater smothers reefs and seagrasses, fuels harmful algal blooms, and creates hypoxic zones that stress or kill marine life. Dredging and land reclamation bury seafloor habitats, increase turbidity, and alter currents, with spillover effects far beyond the footprint of construction. Layered onto these local stressors are climate–ocean interactions, warming, acidification, deoxygenation, and marine heatwaves that amplify physiological stress, slow growth and reproduction, and reduce the capacity of ecosystems to recover between disturbances.

Conservation and security are tightly linked in this landscape, and policy choices carry geopolitical and social implications. Well-designed marine protected areas (MPAs) that are ecologically connected and effectively enforced can bolster biomass, protect spawning grounds, and maintain habitat complexity,



increasing both biodiversity and fishery spillovers that support local food security. Identifying and safeguarding climate refugia areas buffered by oceanographic features, depth, or cool-water upwelling can keep source populations intact and buy time for adaptation. Marine spatial planning (MSP) is the arena where these goals meet competing demands from shipping, fishing, tourism, energy, and seabed mining. Its politics are consequential: decisions about where to permit or restrict activities affect livelihoods, indigenous and customary rights, and national ambitions for blue economy growth. A transparent, participatory MSP that integrates indigenous knowledge, ecosystem thresholds, and climate projections can reduce conflict, guide infrastructure away from critical habitats, and align investment with long-term resilience. Conversely, fragmented governance, weak enforcement, or securitized approaches that sideline communities risk eroding trust and undermining both conservation outcomes and human security.

## **5. Maritime and Geopolitical Dimensions**

Climate change is reshaping sea-lane security across the Indo-Pacific by increasing the frequency and severity of disaster-induced disruptions, exposing port vulnerabilities, and amplifying supply chain shocks. When extreme weather closes key straits or damages terminals, the effects cascade through tightly coupled shipping networks, as seen in analyses of chokepoint blockages that transmit delays and costs far beyond the incident site. Modelling of maritime network blockages shows how a single interruption can ripple globally, magnified by just-in-time logistics and limited redundancy dynamics that climate extremes are making more common in coastal hubs and narrow straits central to Indo-Pacific trade flows. Strategic assessments of key nodes such as the Makassar and Tsugaru Straits underscore how hazard exposure, infrastructure robustness, and response capacity together determine risk profiles at chokepoints; under climate stress, even short outages can trigger long detours, congestion, and price spikes, testing both commercial resilience and crisis coordination among states.

Territorial and exclusive economic zone (EEZ) disputes intersect with environmental stress in ways that complicate maritime law enforcement and crisis management. As sea-level rise and erosion threaten to alter baselines and low-tide elevations, Pacific Island countries and other coastal states are developing legal and technical strategies to “fix” maritime limits and preserve jurisdictional rights over living and non-living resources despite physical shoreline change. Climate-driven resource shifts can increase incidents of illegal, unreported, and unregulated fishing, challenging patrol capacities and raising the risk of confrontations at sea, especially in contested waters. These pressures demand clearer rules of engagement, cooperative monitoring, and dispute-avoidance mechanisms that account for both legal



complexities and the operational realities of enforcing conservation and safety at sea amid harsher conditions.

## 6. Economic Security and Supply Chains

Climate change is reshaping economic security across the Indo-Pacific by exposing key sectors, stressing trade and logistics, altering investment risk, and forcing difficult choices about where and how to invest in resilience. The pattern is cumulative and systemic: sectoral shocks propagate through supply chains and financial systems, raising costs and reducing reliability, particularly where infrastructure and institutions are least prepared.

Agriculture contends with heat stress, erratic rainfall, floods, and salinization that depress yields and increase variability, particularly in deltaic and monsoon-dependent systems; these effects undermine food availability and farm incomes, with knock-on risks for national food import bills and rural debt cycles. Fisheries and coastal aquaculture face climate-driven stock shifts, marine heatwaves, and disease outbreaks, compounded by uncertain trends in ocean productivity that make long-term planning and quota management difficult for governments and industry alike. Coastal tourism—central to many island and archipelagic economies—absorbs repeated hits as storms, erosion, and coral reef degradation reduce destination attractiveness and increase operating costs for insurance, rebuilding, and protective measures. Manufacturing in coastal special economic zones (SEZs) is exposed to flooding, storm surge, and heat-related power and labour productivity losses, creating recurring downtime and inventory damage that ripple upstream and downstream. Extractives, including offshore energy and coastal refineries, face physical risks to platforms, terminals, and pipelines, alongside transition pressures as global markets pivot toward lower-carbon inputs.

In sum, Indo-Pacific economic security under climate change hinges on reducing sectoral fragility, de-risking trade corridors, pricing climate into credit, and mobilizing capital for resilient and nature-positive infrastructure. Where governments and markets co-invest in resilience ahead of shocks, supply chains stabilize and growth prospects improve; where action lags, climate volatility is translated into higher costs, thinner margins, and more frequent crises across the regional economy

## 7. Conclusion

Climate change now sits at the heart of geopolitics and human security in the Indo-Pacific. It operates as a constant stressor, amplifying existing vulnerabilities and reshaping power dynamics on land and at sea. In a region where low-lying atolls, delta megacities, archipelagic sea lanes, and resource-rich coastal



shelves coincide with dense populations, vital trade arteries, and contested maritime spaces, hazards do not arrive alone. Extreme weather, sea-level rise, heat stress, ecosystem decline, and supply chain shocks intersect with sovereignty questions, development choices, and great-power rivalry to create a complex, evolving security environment. Meeting this challenge demands an integrated, justice-centered model of resilience that advances people, places, and ecosystems together. Such an approach protects the most exposed communities first, respects indigenous stewardship and local knowledge, and ensures adaptation does not entrench inequality or displace rights. It pairs nature-based defences with resilient infrastructure; connects risk-informed urban planning with healthy ecosystems; and links early warning to reliable last-mile delivery. It treats education, health, and social protection as core security assets and aligns coastal and ocean management with sustainable livelihoods and credible blue-economy opportunities.

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