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Sailing Across the Bay of Bengal

Neel Dharā: Waters, Wetlands, and the Essence of Life

Message from the Hon'ble Governor of Bihar

Spotlight on the Bay's Ecology

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CURRENTS OF THOUGHT

Warming Waters, Fractured Nexus: Climate Risk in the Bay of Bengal and the Call for Shared Action

Expert Writes

Dr Sanjay K. Srivastava

THE SCALE OF WHAT IS ALREADY HAPPENING

Diplomats and policymakers are accustomed to treating climate change as a future concern — something to be negotiated, deferred or managed over the coming decades. The Bay of Bengal refuses that luxury. Its surface temperatures have already risen by 0.9°C since 1980. That number, though modest in appearance, is seismic in consequence.

The Coupled Model Intercomparison Project Phase 6 (CMIP6), the most advanced ensemble of global climate projections that aggregates high-resolution simulations from more than forty international modelling centres, indicates an unambiguous trajectory.

Under the intermediate emissions scenario (SSP2-4.5) used by the Intergovernmental Panel on Climate Change (IPCC), average Bay sea surface temperatures will rise by a further 1.2-1.8°C by 2050. Under the high-emissions pathway (SSP5-8.5), the figure approaches 3°C before the century's end. Each fraction of a degree rewrites the rules of the monsoon, the fishery, the glacier, and the delta.

What CMIP6 makes clear, and what earlier model generations could not, is that these changes are not linear. There are thresholds, and the Bay has already crossed several.

MONSOON, EL NIÑO, AND THE ARCHITECTURE OF RISK

The Indian Summer Monsoon is the most consequential seasonal climate system on Earth. It delivers 70-90% of South Asia's annual rainfall in four months. In the Bay of Bengal region, it is not a weather event but the organising principle of agriculture, water storage, hydropower and public health.

Climate change is not simply making the monsoon wetter or drier. It is making it more erratic. CMIP6 projections show a pronounced increase in the coefficient of variation of monsoon onset dates. This means that first rains may arrive weeks early or weeks late, with little predictability. Intensification episodes, in which a month's rainfall falls in seventy-two hours, are projected to increase by 20-35% under 2°C of warming. Intervening dry spells within the monsoon season grow longer.

The transboundary dimension is critical and often underappreciated. The Ganga, Brahmaputra and Meghna are shared rivers. Their flows depend on Himalayan glaciers, which are retreating at 50 metres per year in some headwater zones and on monsoon precipitation across multiple national watersheds. A drought year in Bhutan has downstream consequences in Bangladesh within days. A flash flood in Arunachal Pradesh tests flood management infrastructure in Assam and the char-lands of the

Brahmaputra simultaneously. The Bay of Bengal is, in this sense, a 'transboundary common' whose climate vulnerability cannot be managed by any single nation alone.

THE WATER–ENERGY–FOOD NEXUS UNDER HEAT STRESS

Consider the heat. In April 2024, heat index values exceeding 52°C were recorded across Bangladesh, eastern India and coastal Myanmar. These are not anomalies. They are the new statistical mode of pre-monsoon heat, and CMIP6 projects that by 2040, under SSP2-4.5, this will occur annually rather than once per decade. Extreme heat operates simultaneously on three interdependent systems that together constitute the fabric of livelihoods across the Bay littoral:

System	Climate impact at 2°C	Transboundary dimension
Water	River low-flows worsen; salinisation of coastal aquifers advances 40 km inland (GBM delta); groundwater depletion accelerates.	Shared river basins: GBM system, Irrawaddy, Mahanadi — all cross national boundaries.
Energy	Hydropower output cut 15-20% in low-flow years; thermal plant cooling capacity reduced; peak electricity demand rises 35% from cooling.	Bhutan, Nepal hydro exports critical for India's grid; Bay-wide grid interconnection remains nascent.
Food	Rice and wheat yield penalties of 8-18% per degree above threshold; Bay fisheries face 40% catch decline; saltwater intrusion destroys agricultural land.	Fish stocks are transboundary; Bangladesh, Myanmar, and India share marine zones with no joint management framework.

These three systems are not parallel concerns but coupled. A monsoon failure reduces river flows, cutting hydropower generation, forcing greater reliance on diesel generators, which raises food production costs and strains livelihoods already damaged by crop failure. Under heat stress, the nexus becomes a cascade.

WHAT THE SCIENCE DEMANDS OF POLICY: FROM DATA to DIALOGUE

The uncertainty lies not in whether warming will intensify risk across the Bay, but in precisely how fast, how severe it will be, and in which specific localities the most acute impacts will first be felt. This is where science must speak directly to diplomatic practice. Uncertainty does not justify inaction. It demands a different kind of policy architecture. Action built on precaution, adaptive management, and above all, cooperation across the transboundary systems that define Bay of Bengal vulnerability.

THE ROLE OF NALANDA: CONNECTING SCIENCE, TRADITION AND COOPERATION

Nalanda University's Centre for the Bay of Bengal occupies a distinctive, and we believe, indispensable position in this landscape. It is a meeting ground — one that draws on centuries of intellectual tradition, the living heritage of the Indian Ocean world, and the

rigorous methods of contemporary earth system science. The ancient Nalanda was a centre of synthesis, where Buddhist philosophy met mathematics, astronomy, medicine, and the arts of governance. The modern Centre for the Bay of Bengal aspires to a comparable synthesis — between the natural sciences of climate change and the social sciences of governance; between South–South cooperation among developing Bay nations and the North–South knowledge partnerships that bring global modelling capacity to regional contexts; and between modern scientific frameworks and the traditional ecological knowledge of fishing communities, farmers, and coastal peoples whose accumulated wisdom about monsoon variability and sea behaviour spans generations.

VI. CONCLUSION

The year 2024 set new records for Bay of Bengal sea surface temperatures, cyclone intensity, and pre-monsoon heat. The year 2025 is on track to match or exceed them. CMIP6 models, which correctly projected the warming trends now being observed, tell us that without rapid emissions reduction globally, the Bay will cross thresholds that make current adaptive challenges look manageable by comparison.

The 1.8 billion people whose food, water, and energy depend on Bay of Bengal systems do not have the luxury of treating this as a long-run problem. Nor, ultimately, do the governments responsible for their welfare.

The science is clear. The policy necessity is equally clear. What has been missing is the institutional space for the kind of sustained, trust-building, multi-track dialogue that turns scientific understanding into cooperative action.

Tārinī: Sailing Across the Bay of Bengal is precisely the image that captures what is needed: not a single vessel charting a unilateral course, but a shared voyage across common waters, guided by both the stars of modern science and the navigational wisdom of peoples who have known these seas for millennia.

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About the Author

***Dr. Sanjay K. Srivastava**, S. Radhakrishnan Chair Professor, National Institute of Advanced Studies at Indian Institute of Science Campus, Bengaluru; Adjunct Research Professor, UNU-Hub (CCNY), The City College of New York; Former Chief, Disaster Risk Reduction, UNESCAP*

Email: sanjay.srivastava@nias.res.in