Concept Note for E-Learning Modules on Tyranny of Small Decisions and Its Relevance in Tropical Waters of the Indo-Pacific

The Indo-Pacific region has become a focal point for global strategic interaction, marked by heightened geopolitical and geostrategic attention, accompanied by mobilization efforts and security concerns. This focus underscores the need to leverage the economic and political potential inherent in these tropical waters, spanning the Indian Ocean and the Pacific Ocean. The region holds global significance, particularly in terms of biodiversity, mineral resources, and transportation. Positioned geopolitically and geostrategically, India has the potential to take a leadership role in the Indian Ocean Region (IOR) through platforms like the Indian Ocean Rim Association (IORA).

The Indian Government is committed to sustainable development in marine and freshwater ecosystems through various mission-mode projects such as Sagarmala, Bharatmala, Gati-Shakti, Jal Jeevan, and Inland Water Transport. Despite commendable efforts on these mega projects and initiatives like National Rural Drinking Water Program (NRDWP), Accelerated Urban Water Supply Program (AUWSP), Water Framework Law of India 2016, and Namame-Gange and National Water Policy, projects face significant challenges, including over 75 million people still lack clean water access, acoustic capacity, and capability building, particularly in tropical waters. India's escalating freshwater, groundwater, and plastic pollution crises necessitate vigilant monitoring and management, incorporating traditional knowledge from riverine and coastal communities. The climate change-induced risks demand proactive measures to prevent extensive erosions and mitigate potential loss of life and property. Decentralized governance exacerbates resource management disparities at the state level, intensifying the challenges.

India's drive to achieve SDG's demand for efficient sustainable management of freshwater, groundwater, wetland with urban planning, acoustic capacity and capability facilitated by tools like Marine Spatial Planning, which hold promise for flood control, transportation, fisheries, and sustainable development, fostering inclusive growth for riverine and coastal communities.

The Maritime Research Centre (MRC) Pune is actively formulating the Underwater Domain Awareness (UDA) Framework, strategically poised to address challenges and opportunities arising from Government of India's significant strategic initiatives. This framework holds the potential to facilitate cooperation among regional nations and act as a deterrent to external

powers. India, by positioning itself as a partner in capacity and capability building, can strengthen its leadership role in the region. The effective implementation of the UDA framework will contribute to transparency and governance in both marine and freshwater systems. It is imperative to ensure that the nation's decision-makers and stakeholders are well-informed about the associated challenges and opportunities.

The Capacity Building Commission (CBC) is leading an endeavor to unlock the full potential of the blue economy in the tropical waters of the Indian Ocean Region (IOR) and beyond. This initiative is pivotal for realizing the SAGAR vision. The Underwater Domain Awareness (UDA) framework, incorporating policy and technology interventions, as well as the development of acoustic capacity and capabilities, will be the driving force behind this endeavor. The preceding ten modules were dedicated to understanding the extensive UDA framework and its primary application areas. This series of twelve advanced modules will specifically address tyranny of small decisions to ensure effective governance in these unique tropical waters.

Proposal

Commencing this initiative, it is imperative to educate stakeholders and policymakers on the significance and intricacies of Tyranny of small decisions spanning across various domains right from Plastic Pollution, Acoustic Habitat degradation, Freshwater Management, Groundwater Management, Riverine and Coastal Communities. In line with this objective, a series of E-learning modules is set to be introduced, providing a convenient and efficient platform for knowledge enhancement. These modules will comprehensively cover various aspects related to building capacity and capability for the advancement of small decisions management in tropical coastal and freshwater systems. The target audience for these modules includes policymakers at the national, state, and local levels, community representatives, support organizations, on-ground foundations, regulatory bodies, and enforcement agencies. The following is an enumeration of all twelve modules:

1. **Tyranny of small decisions-** Spearheaded from economist Alfred E. Kahn in 1966, the tyranny of small decisions illustrates how seemingly rational choices, combined, lead to unfavorable outcomes. In India, water policies grapple with conflicts over scarce resources, risking groundwater depletion. Urbanization, industrialization, and climate change worsen scarcity, affecting over 600 million lacking sanitation. This dilemma mirrors the tragedy of commons, where shared resources face exploitation. Garrett Hardin's 1968 concept, using the analogy of overgrazing sheep, emphasizes the destructive consequences of individual gains on communal resources, necessitating a comprehensive UDA framework for transformative change.

2. **Aral Case study**- The Aral Sea, once the world's fourth-largest inland water body, has drastically shrunk since the 1960s due to evaporation and reduced river inflow. By 2007, it had diminished to just 10% of its original size, with salinity surging to three times that of seawater. This catastrophe has led to the collapse of the thriving fishing industry with the extinction of 24 fish species, respiratory illnesses from salt-laden, pesticides dust storms. Additionally, the wetlands associated with the Aral Sea's two river deltas have vanished, resulting in the loss of vital ecosystems. The altered landscape has also affected the regional climate, causing increased aridity and more extreme temperature fluctuations due to the absence of the lake's moderating influence. This catastrophic transformation of the Aral Sea serves as a stark tyranny of small decisions example of the environmental consequences of unchecked human activities and mismanagement of natural resources at administrative level.

3. **Acoustic habitat degradation-**The degradation of underwater ecosystems stems from a complex interplay of human activities and environmental changes. Anthropogenic factors like shipping, industrial noise, and naval operations, along with climate-induced shifts in marine soundscapes, contribute to this issue. This degradation, an example of the "tyranny of small decisions," disrupts communication and navigation for marine species, impacting overall aquatic ecosystems. Urgent mitigation strategies are needed, including noise regulation, advanced vessel technologies, and marine spatial planning, to counteract the erosion of acoustic habitats and restore crucial auditory ecosystems for marine life. Proposed by the MRC the (UDA) framework offers an optimal solution for policy, technology, and acoustic capacity in tropical littoral waters. In the Indo-Pacific, acoustic capacity is crucial for managing strategic challenges. The UDA framework advocates resource pooling and synergized efforts for efficient resource utilization.

4. **Overfishing- Fish**, a vital protein source for 7 billion, faces depletion owing to destructive practices like bottom trawling and blast fishing, influenced by Western-driven corporate interests. This vicious cycle of declining fish populations prompts technological advancements, perpetuating destructive practices. It impacts prices, jeopardizes the livelihoods of 820 million people globally and increases global trade. Inadequate regulations and local governance allow overfishing to persist, leading to ecological damage and threatening species' survival. Declining fish size, driving species to extinction, harder efforts, loss of biodiversity, loss of livelihoods underscore the urgency of sustainable fisheries. Overfishing demands responsible fishery practices at national and international level along with traditional practices involvement to prevent ecological and economic collapse.

5. **Plastic Pollution-** Approximately 80% of marine litter consists of plastic, with over 6.5 million tons of plastic making its way into the ocean each year. Daily, a staggering 15,343 tons of waste is dumped into the South Asian seas, originating from 60 major cities in India. India's extensive coastline housing around 420 million people with pervasive single use plastics, faces significant plastic impact. Floating Plastic Islands enter marine ecosystems in the Indo- Pacific region through various means like improper waste disposal, industrial waste, lost fishing nets threatening marine biodiversity. Despite regulations, inadequate waste management, lack of awareness, and governance challenges persist, highlighting the tyranny of small decisions in addressing marine plastic pollution. Thus, pooling of resources along with data driven decisions at policy level is required.

6. **Coastal community's vs Development-** Approximately 37% of the global population resides within 100 km of coastlines. The World Economic Forum's 2019 Global Risk Report highlights the alarming challenge of rising sea levels, projecting that 90% of coastal areas worldwide will face high-risk conditions by 2050. This includes 570 cities and impacts 800 million people. Coastal communities, especially fisher settlements, harbor deep emotional, cultural, and spiritual ties to marine ecosystems. As we grapple with the consequences of climate change and land-based threats, coastal cities have continued to expand their urban coastal infrastructure development. Coastal development driven by neoliberal norms often neglects indigenous fisher knowledge, socio-cultural bonds, and land rights. Policymakers should engage communities from project inception, acknowledging their economic interests and ecological knowledge. Coastal development must shift towards socially inclusive, locally mediated approaches along with academia and industry collaboration, necessitating a mindset change at research and policy levels globally.

7. **Urban Flooding**- Urban flooding is an increasingly pressing global challenge with multifaceted contributing factors and dire consequences. Rapid urbanization, inadequate infrastructure, and climate change-induced extreme weather events converge to exacerbate this issue. The consequences are devastating, including loss of lives, damage to property, and economic setbacks. Poorly planned urban development, incremental alterations to drainage systems, and unchecked construction in flood-prone areas are examples of these small decisions. Over time, these choices transform cities into flood-prone landscapes. UDA framework underscores the urgency of addressing urban flooding through integrated urban planning, sustainable infrastructure development, digital transformation and climate resilience strategies, highlighting the

need to recognize the far-reaching impacts of small decisions in shaping the resilience of our urban environments.

8. **Freshwater management**- Freshwater sources, vital for life, are under severe threat in India. Climate change exacerbates the crisis, altering rainfall patterns and elevating temperatures. Unregulated groundwater development, fueled by subsidies, leads to a 4-meter drop in water tables. India consumes a quarter of global groundwater, yet millions lack safe water access. Severe river pollution, a result of domestic and industrial discharge, worsens health concerns. Mismanagement and sporadic rainfall compound the issue. Urgent action is needed to address this dual challenge of depleting resources and escalating pollution for sustainable water access in India. In the context of freshwater, digital transformation and inclusive technologies are essential. Governance inefficiencies can be addressed by tailored digital platforms, avoiding blind adoption of foreign technologies. A collective approach encompassing technology, academic and policy driven by UDA framework, is crucial for tackling interlinked issues and providing sustainable solutions to freshwater management challenges.

9. **Groundwater Mismanagement- India's** declining groundwater levels are significantly influenced by power subsidies provided to agriculture, with 89% of groundwater in 2009 allocated for irrigation and 11% for domestic and industrial use. High minimum support prices (MSP) encourage farmers to focus on cash crops and irrigation-intensive crops, exacerbating groundwater depletion. Private groundwater ownership is prevalent due to limited regulations, compounding the issue. Groundwater depletion in India is a critical sustainability challenge. Its monitoring, management, implications, and knowledge gaps need systematic review. In marine and freshwater systems, Marine Spatial Planning (MSP) emerges as a potent tool for resource governance, security, and sustainability. Precise mapping aids efficient exploitation, while geoinformatics models assess water vulnerability. Groundwater flow models, like MODFLOW, simulate groundwater movement, but their full potential remains untapped without policy integration. Digitally accessible data maximizes water efficiency, empowering diverse stakeholders with vital information on water quality and availability.

10. **Traditional Practices vs Development**- For over a decade, the imperative of integrating Indigenous perspectives and wisdom into mainstream planning has been emphasized. Regrettably, there remains scant evidence of substantial change in this regard. This situation is particularly pronounced in India, where water planning is predominantly shaped by the National Water Policy and guided by state legislation, effectively disregarding the nuances of regional ecology and culture. Despite the government of

Maharashtra, one of India's 28 states, advocating for a participatory and context-specific approach in its Integrated Watershed Development Program for an extended period, the advancement towards meaningful participation has been sluggish and fraught with challenges. Inadequate governance and anthropogenic impact result in severe contamination of both ground and surface water sources. The imminent freshwater scarcity crisis underscores the urgency of robust water quality management with incorporation of indigenous practices. Climate change and natural disasters exacerbate the challenge, impacting the hydrological cycle and waste management systems.

11. **Wetlands Management- In** the last 30 years, India has experienced a rapid deterioration of its wetlands, with nearly one-third lost due to urbanization, overfishing, agriculture, deforestation, dredging, climate change, and pollution. Urban areas witness even faster wetland loss. Wetland loss poses not only a biodiversity crisis but also a developmental crisis, risking water, food, livelihood, and climate security. Inadequate governance and anthropogenic impact result in severe contamination of wetlands. This underscores the urgency of robust wetland management specific to geographical area, it is nature along with incorporation of indigenous practices by local communities.

The Potential Participants

The potential participants for the E-learning modules will include:

(a) The Fisheries Department.

(b) The Water Resource Departments.

(c) The Public Sector Undertakings (PSUs).

(d) The Administrative Training Institutes under the Government of India.

(e) Maritime Boards in all the nine Coastal States.

(f) Environmental Regulators and Disaster Management Authorities.

(g) Energy Regulators

(h) Central Pollution Board

(i) Auditors and Science & Technology Departments

(j) Ministry of Environment, Forest and Climate Change

(k) Central Water Commission

(i) Ministry of Jal Shakti

(m) Surface Transport Departments & Regulators

The participants will be provided with a significant amount of reading material, along with the presentation in the form of a video. The MRC runs a digital platform, named the UDA Digest and has two forms of contents. A series of short articles (1500 words), presenting easy to read content for quick appreciation of the UDA framework and its varied aspects. The second is the short reports, comprising serious research outputs from in-house research fellows and senior domain experts. The short reports are 10,000 words, serious piece of research output with references and detailed scientific and analytic effort. These are all peer reviewed by the specific subject matter expert and the in-house research team.