

**VULNERABILITY OF COASTAL CITIES:  
AN INTEGRATED ADAPTATION APPROACH  
PART 2**

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*Part I of this article had addressed the vulnerability of coastal cities to climate-change-induced impacts such as extreme-weather events, and sea-level rise. This second part explores how the most-vulnerable groups within coastal communities are at high risk of being marginalised. As such, it tries to address the need to take into consideration the adaptation needs of these marginalised and vulnerable groups, several of whom are likely to be disproportionately affected because of structural and social disparities.*

As had been highlighted in Part 1 of this two-part article, coastlines, across the world, are hubs of business, commerce, industry and tourism. With rapid urbanisation it is likely that human dwelling-concentrations will increasingly extend to low-lying areas of the coast. India's coastal regions are densely populated, with the growth rate of both, population and urbanisation, accelerating. Groups most at risk in a typical Indian city are slum dwellers, squatters and migrants. These include workers in the industrial and informal service sectors; whose occupations frequently place them at significant risk from natural hazards. More often than not, these groups live in traditional and informal settlements, often in locations that are extremely vulnerable to a variety of social and economic risks that are exacerbated by additional stressors such as climate change. Traditional and informal housing, for instance, is especially vulnerable to wind, water and geological hazards. And yet, the risks imposed by climate-change are also applicable in substantive and substantial measure to:

- *industrial units, their in-house infrastructure, plant, machinery and raw materials;*
- *lifeline public and private infrastructure, which includes roads, bridges, railways, ports, airports and other transportation systems; water, sewage and gas pipelines; drainage, flood and coastal defence systems; power and telecommunication infrastructure; and critical social infrastructure such as hospitals, schools, fire and police stations and first responder infrastructure; and*
- *ecosystems and the natural environment, especially wetlands, riverine, estuarine and coastal ecosystems, and surface and groundwater systems.*<sup>1</sup>

It is reliably estimated that the number of people living in Low-Elevation Coastal Zones (LECZ)<sup>2</sup>,

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<sup>1</sup> Aromar Revi, "Climate Change Risk: An Adaptation and Mitigation Agenda for Indian Cities", *Environment and Urbanization Journal*, 2008; Vol 20 (1), 207-229, doi: 10.1177/0956247808089157

<sup>2</sup> LECZs refer to contiguous areas along coasts that have less than 10 meters elevation and are thus most vulnerable to sea level rise and other coastal hazards, such as storm surges, coastal erosion, and saltwater intrusion

as also the total number of people exposed to climate change-related events such as flooding and storm surge events (1-in-100-year return period) are the highest in Asia; and coastal populations of India, China, Bangladesh, Indonesia and Vietnam are expected to have the highest exposure. In fact, available research findings indicate that India could experience a three-fold increase of its LECZ population between the baseline year 2000 (64 million; 6.1% of its total population) and the year 2060 (216 million; 10.3% of its total population) under a high-growth scenario.<sup>3</sup>

### **Conflict in Interests and Environmental Injustice**

The diversity of resources and opportunities along the coastline are important drivers of demographic shifts on account of urbanisation. Once the acceleration in urbanisation overtakes existing socio-economic infrastructure to a point where the influx of people into overtakes the ability of the burgeoning town or city (i.e., the ‘urban agglomeration’) to develop additional physical infrastructure or to create societal safety-nets the socio-economic environment deteriorates very sharply and very swiftly. When this socio-economic deterioration occurs in coastal areas, the poor and economically disadvantaged tend to occupy dwellings located in areas that had already been rejected by the more affluent classes. These areas are often low-lying ones, which are the most prone to being adversely impacted by the effects of climate change in general and flooding in particular.

The problem of instituting climate-change adaptation measures for these disadvantaged segments of urban society are exacerbated by the fact that the stakeholders involved in the coastal development are required to meet often-incompatible demands such as facilitating economic development, meeting needs of the rapidly-expanding tourist industry, while simultaneously protecting vulnerable communities from the effects of erosion and flooding. The interests of business and local communities are frequently in conflict as their concerns are different. To the business community it appears that policies aimed at conservation of the natural ecosystem limit the prospect of economic growth. On the other hand, the more enlightened segments of resource-dependent communities tend to recognise the severity of destruction of the environment due to unregulated development. Economic growth, modernisation and markets are still viewed as the core drivers of development and poverty alleviation. However, the Sustainable Development Goals (SDGs) to eradicate poverty are undermined by the economic aspect of development. Writing in the UN HRC report on extreme poverty, Australian academic Philip Alston warned that states and global organisations are “*completely off track*” to meet the goal of eradicating extreme poverty by 2030. Instead, more people are likely to become highly impoverished by existing challenges like the climate crisis, as well as by new shocks, including the Coronavirus. He stated that “*they are failing in relation to key goals such as poverty eradication, economic equality, and climate change*”. Alston also suggests the framework they provide for poverty eradication appeared more tailored for “*colourful posters*” and “*bland reports*”.<sup>4</sup>

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<sup>3</sup> Barbara Neumann, Athanasios Vafeidis, Juliane Zimmermann and Robert J Nicholls, “Future Coastal Population Growth and Exposure to Sea-Level Rise and Coastal Flooding—A Global Assessment”, *PLoS ONE*, No 10 (2015).

<sup>4</sup> Alston, Phillip, “The Parlous State of Poverty Eradication”. Human Rights Council, The United Nations, 2 July 2020, <https://chrgj.org/wp-content/uploads/2020/07/Alston-Poverty-Statement-FINAL.pdf>

The Secretary General's "SDG Progress Report 2020" notes that "*the SDGs have had little impact in slowing global warming.*" A deeply problematic fact is that each country's development tends to be focused solely upon a traditional model of economic growth without much consideration being given to its environmental impact or the extent to which it is tied to emissions and extraction.<sup>5</sup> Hence it is important that the nexus between poverty, development, and climate change be holistically studied while formulating adaptation strategies and policy-measures related to climate change. There is a marked lack of equity in decision-making and even less in the actual action taken in terms of coastal adaptive measures, with the most vulnerable and disadvantaged section of the population often being completely overlooked. This is particularly problematic since the adaptive capacity of this section of urban society has already been significantly reduced by existing socio-economic and environmental inequalities. Therefore, it is vital to understand how India responds to its marginalised communities. Since 2015, India has committed itself to achieving the SDGs and their associated targets, including the social, economic and environmental dimension of development, with a sustained focus on ending poverty in all its forms and dimensions.<sup>6</sup>

### **Urban Expansion and Coastal Vulnerabilities**

In India, as in several other littoral States, urban critical infrastructure within coastal cities is already vulnerable to extreme climatic events. Indeed, India has some of the world's most vulnerable coastal cities and simultaneously has amongst the least adaptive-capacity to face anthropogenic climate change. Rapid urbanisation is significantly adding to the problem. For example, there are already about 71 lakh (hundred-thousand) dwellings located within 100 metres of the Indian coastline.<sup>7</sup> Studies undertaken by the National Institute of Disaster Management estimate that by the year 2050, the Mumbai-Pune megapolis is likely to have a population of over 50 million. Likewise, Kolkata's population is expected to touch 20 million.<sup>8</sup> Investment in critical infrastructure to meet the demands of this exponential growth will, of course, increase dramatically but it is important to understand how much of this enhanced investment, will meaningfully address climate-change adaptation measures and enhance the resilience of coastal communities.

The already pitifully-inadequate natural 'green' areas are diminishing alarmingly in the face of uncontrolled development of built-up areas, with numerous water bodies and rivers being encroached upon. For instance, Chennai's Thamaraikeeni lake, in Sholinganallur, has shrunk from

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<sup>5</sup> Alston, Philip, "Promotion and Protection of All Human Rights, Civil, Political, Economic, Social and Cultural Rights, Including the Right to Development", Human Rights Council, A/HRC/44/40, (2 July 2020), <http://www.srpoverty.org>.

<sup>6</sup> NITI Aayog, Government of India, Sustainable Development Goals, 2018-2019 <https://niti.gov.in/verticals/sustainable-dev-goals>

<sup>7</sup> Seetharaman G, "Coastal Concerns: Rising Sea Levels will Inundate Coastal Areas Sooner than Projected", *Economic Times*, 10 Nov 2019, [https://economictimes.indiatimes.com/news/politics-and-nation/coastal-concerns-rising-sea-levels-will-inundate-coastal-areas-sooner-than-projected-/articleshow/71985765.cms?utm\\_source=contentofinterest&utm\\_medium=text&utm\\_campaign=cppst](https://economictimes.indiatimes.com/news/politics-and-nation/coastal-concerns-rising-sea-levels-will-inundate-coastal-areas-sooner-than-projected-/articleshow/71985765.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst)

<sup>8</sup> Anil K Gupta and Sreeja S Nair, "Flood Risk and Context of Land-uses: Chennai City Case", National Institute of Disaster Management, Ministry of Home Affairs, Govt of India, 2010, <https://academicjournals.org/journal/JGRP/article-full-text-pdf/18C62DC40738>

152 acres to a mere 26 acres. The 2017 audit report of the Comptroller and Auditor General of India indicated that *“the built-up area in Chennai metropolitan has grown from 90.88 sq km in 1979 to 541.14 sq km in 2016. On the other hand, the water spread area of lakes and ponds has shrunk from 100.98 sq km to 91.31 sq km in the past 40 years”*.<sup>9</sup> Such a heavy burden imposed on the ecosystem is completely unsustainable and as has been somewhat unemotionally stated, *“of all land-use changes affecting the hydrology of an area, urbanisation is by far the most forceful”*.<sup>10</sup>

Moreover, extensive research indicates that the number of people living in the ‘Low-Elevation Coastal Zone (LECZ),<sup>11</sup> as also the number of people exposed to adverse ‘1-in-100-year’ events related to climate change, such as flooding and storm surges is the highest in Asia. The coastal populations of India, China, Bangladesh, Indonesia and Vietnam are expected to have the highest exposure to such events. In fact, the result depicts that under a high-economic-growth scenario, *“India could experience a three-fold increase of its LECZ population between the baseline year 2000 (64 million; 6.1% of its total population) and the year 2060 (216 million; 10.3% of its total population)”*.<sup>12</sup> As has already been explained, the urban-poor and low-income groups dwell in low-lying areas that have a minimal capacity to respond-to or cope-with these impacts. However, it is also important to recognise that the continued rapid growth of megacities and informal settlements, and poorly-planned developmental activities along the coastline further not only threaten the coastal environment but also accelerate urban crime, and impose extra burdens upon policing and disaster-relief organisations.

Non-climatic factors such as population growth, too, are changing coastal landscape and impacting the coastal ecosystem.<sup>13</sup> Urbanisation in terms of continued development and redevelopment, leading to an ever increasing density in terms of land-use, as also a sharp increase in urban infrastructure such as roads, roofs, paving, etc., lead not only to greatly enhanced water run-off but also enhanced urban flooding. Therefore, coastal disaster-development managers need to invest in inclusive and compatible climate infrastructure development in coastal regions, and simply cannot afford to exclude some sections of people, especially not the already-vulnerable ones.

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<sup>9</sup> Lakshmi K and Radhakrishnana Vignesh, “Mismanaged Urbanisation and Encroachments: Chennai Continues to Lose out on its Water Resources”, *The Hindu*, 14 July 2019, <https://www.thehindu.com/news/cities/chennai/the-shrinking-shape-of-chennais-water/article28426933.ece>

<sup>10</sup> Anil K Gupta, Nair, Sreeja S Nair, “Flood Risk and Context of Land-uses: Chennai City Case”, National Institute of Disaster Management (Ministry of Home Affairs, Govt of India) 2010, <https://academicjournals.org/journal/JGRP/article-full-text-pdf/18C62DC40738>

<sup>11</sup> LECZs refer to contiguous areas along coasts that have less than 10 meters elevation and are thus most vulnerable to sea-level rise and other coastal hazards, such as storm surges, coastal erosion, and saltwater intrusion

<sup>12</sup> Barbara Neumann, Athanasios Vafeidis, Juliane Zimmermann and Robert J Nicholls, “Future Coastal Population Growth and Exposure to Sea-Level Rise and Coastal Flooding—A Global Assessment”, *PLoS ONE*, No 10 (2015), <https://doi.org/10.1371/journal.pone.0118571>

<sup>13</sup> Robert J Nicholls, Poh Poh Wong, Virginia Burkett et al. “Climate Change and Coastal Vulnerability Assessment: Scenarios for Integrated Assessment, *Sustainability Science*, No 3, 1 (2008): 89–102, <https://doi.org/10.1007/s11625-008-0050-4>

## Unequal Participation in Decision-making Process

The responsibility for the conservation and regulation of coastal areas in tackling climate-change rests with a variety of stakeholders, local communities, state and central government agencies, etc. Consequently, the proactive and enthusiastic participation of different sectors and groups in the decision-making process is vital in order to formulate a holistic and integrated national climate approach. Ironically, however, the recent Environment Impact Assessment (EIA) 2020 amendment draft<sup>14</sup> has proposed the exclusion of local decision-makers and local communities in the decision-making process, thereby ignoring and marginalising their concerns and traditional knowledge of the environment. Indigenous and resource-dependent communities have a deep understanding and knowledge of natural disasters and how to cope with them. When their participation is excluded, we lose out on a wealth of knowledge about resources that have been an integral part of their lives. In a broader sense, such short-sighted policies border on arrogance and, more importantly, create structural inequalities within the socio-environmental system. Marginalised communities are the one who usually face environmental injustice in terms of exposure to environmental hazards. Consequently, access to natural resources, equitable protection from climate-change burdens, meaningful involvement in decision-making procedures, and fair access to the benefits of adaptive measures, collectively constitute a *sine qua non* for a successful climate-change policy.

The EIA 2020 draft amendment has also proposed that violations are to be reported either by a government authority or the developers themselves. Civil society has been left with little or no scope to raise public complaints. Incredibly, the onus is on the violators themselves to disclose, *suo motu*, that they broke the law! In the case of encroachment and illegal land use, a public complaint would not be considered as a proper channel to report any violations. This makes a mockery of the State's commitment in preserving the fragile ecosystem, especially in coastal cities, where land for development is limited, and the possibility of encroachment of protected areas for commercial purposes is high. Land-grabbing from local communities for ostensibly-developmental purposes, with little compensation to displaced segments of society (more often than not these are the already disadvantaged segments) is commonplace. For instance, the Kerala government has proposed to relocate some 18,000 households that dwell within 50-metres of the sea by offering to compensate the residents with Rs 10 lakh each. However, so unrealistically meagre is this compensation that 16,000 of the 18,000 flatly refused to accept the offer.<sup>15</sup> Such actions by the local and national governments put profits above people and are detrimental to the environment and equity for minorities. Limiting public-engagement and giving inadequate time to public hearings are actions that have an acutely adverse impact on the environment and the cost of this sort of negligence will be very high. It is likely to result in climate refugees, poverty, unemployment, migration, amongst a host of other undesirable primary, secondary and tertiary effects. It is reiterated that the people most affected by this new draft-amendment of the EIA 2020 are

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<sup>14</sup> EIA Draft Notification, Ministry of Environment, Forest and Climate Change, New Delhi, March 2020, [http://environmentclearance.nic.in/writereaddata/Draft\\_EIA\\_2020.pdf](http://environmentclearance.nic.in/writereaddata/Draft_EIA_2020.pdf)

<sup>15</sup> Seetharaman G. "Coastal Concerns: Rising Sea Levels will Inundate Coastal Areas Sooner than Projected", *Economic Times*, 10 Nov 2019, [https://economictimes.indiatimes.com/news/politics-and-nation/coastal-concerns-rising-sea-levels-will-inundate-coastal-areas-sooner-than-projected-/articleshow/71985765.cms?utm\\_source=contentofinterest&utm\\_medium=text&utm\\_campaign=cppst](https://economictimes.indiatimes.com/news/politics-and-nation/coastal-concerns-rising-sea-levels-will-inundate-coastal-areas-sooner-than-projected-/articleshow/71985765.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst)

those belonging to the most vulnerable sections of society. The more powerful and more affluent sections have the facilities and assets to insure and rebuild, whereas the poor are unable to do so. A case in point is the infection rates in the Covid-19 pandemic, where densely populated coastal cities like Mumbai, Kolkata and Chennai have become infection hot-spots. Within these overcrowded coastal cities, poor and marginalised communities are the ones who are hardest hit, largely due to their lack of access to resources and health-care facilities and a concomitant lack of basic opportunities. Climate-change impacts are placing them at an even higher risk of exposure to the pandemic. Climate-induced disasters such as devastating monsoon flooding that regularly hits both the east and west coasts of India [Cyclones *Amphan* and *Nisarga* are recent examples] has increased the vulnerability of the coastal communities even further. The harsh aftermath of such disasters is a reminder that climate adaptation and resilience measures and mechanisms are more urgent than ever.

The COVID-19 pandemic has also shown that individual resilience is essential to reduce community vulnerability. What this means, of course, is that livelihood and economic security are crucial if people are to have uninterrupted access to food, water, sanitation, shelter, and other services essential to the maintenance of health. This is true to withstand any disaster, whether it is a pandemic or a climate-related one. Ensuring sustainable and reliable access to resources and facilities will reduce the risk of exposure to hazards and provide the capability of individuals and communities to recover.

### **Social Equity in Climate Change Adaptation**

Adaptation measures alone cannot provide a holistic approach to reduce climate change impacts in the context of the rapid rise in population and urbanisation. When developmental projects do not take into consideration the adaptive capacities of the poor, the mitigation measures, and climate-change impact, they further denude the urban poor, and the gap between rich and poor widens, generating societal tensions that are too well known in India. In many cases, regional and national level developmental policies actually and actively undermine the resilience of the weaker section of the society. Therefore, identifying and addressing the root cause of the vulnerability of different societal segments to the impacts of climate change are of foremost importance. Similarly, development policies that address only certain aspects of poverty are likely to fail, resulting in detrimental impacts on the overall response-capacity and sustainable adaptation of the nation. Clearly, adaptation measures and development must be considered within a broader social and environmental context. Sadly, development plans that fail to include climate-change risk-assessment are all too common even in mega projects such as SAGARMALA, which seeks to promote port-led development of the country as a whole.

If the policies and measures for climate adaptation and mitigation are not adequately comprehensive or sufficiently inclusive, they may increase resilience on one level while increasing vulnerability on others. Therefore, socio-economic and environmental inequalities that often reduce adaptive capacity need to be properly and sincerely addressed. Local knowledge about adverse climate change impact and how it can be mitigated, and about adaptation and development must be valued and must be shared at the national level. A strong capacity to reduce risk and

build resilience requires a firm local government policy that is pro-poor. Such a policy or policies must be especially aimed at ameliorating the vulnerabilities of those living in suburban slums, which are amongst the most hazardous locations. In the final analysis, only local government can provide better access to resources and assistance in improving the quality of housing, which can withstand hazards and reduce costs and susceptibility.

### **We Need Integrated Measures and Policy**

Yet, the state and central governments cannot duck their own responsibilities either, pinning the entire burden upon local government bodies. Clearly, climate-change adaptation and impact-reduction measures require to be integrated into larger socio-economic development programmes. Thus, the state and central governments need to ensure social sustainability and just and social equity to ensure equitable management of all institutions serving the public. While framing coastal management policies, policymakers must integrate regional and local perspectives, and recognise the dynamic nature of the coastal environment, as also the vulnerability of coastlines, instead of viewing each of these as distinct factors.

A strong integration of well-directed adaptation efforts, with a sustained focus on the disadvantaged sections of the population, is required. Addressing and providing inclusive, equitable and environmental justice in the planning and policy-making procedures will strengthen and increase the adaptive capabilities and resilience of vulnerable groups. As Mr Ovais Sarmad, Deputy Executive-Secretary of UN Climate Change, said: “*We do not have time to lose, and urgent climate action is absolutely critical and necessary. What benefits the most vulnerable will benefit us all.*”<sup>16</sup> Therefore, equity simply has to play a very much more significant role in local, regional and national climate change adaptation strategies in Indian coastal cities than is currently the case. Equal participation needs to be considered a ‘core’ strategy for fostering sustainable development and socio-economic advancement that would support an improvement in the quality of life while maintaining natural resources.

Along with tackling inequality and poverty, it is essential to provide environmental justice and bottom-up solutions at the community level. Effective management of the coastal zone requires resolution of conflicting demands on resources while ensuring that human activity does not significantly affect the coastal system or the ecosystems which they support. It further requires improved institutional capacity and effective urban governance, the involvement of non-government organisations and civil society at large into the urban governmental decision-making processes.<sup>17</sup>

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<sup>16</sup> United Nations Climate Change, “Impacts of Climate Change on Sustainable Development Goals Highlighted at High-Level Political Forum”, 19 July 2019, <https://unfccc.int/news/impacts-of-climate-change-on-sustainable-development-goals-highlighted-at-high-level-political-forum>

<sup>17</sup> Dodman, David and Satterthwaite, David, “Institutional Capacity, Climate Change Adaptation and the Urban Poor”, *Institute of Development Studies*, Bulletin, No 4, 39 (September 2008).

## **About the Author**

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