

# DISASTER MANAGEMENT AND THE INDIAN COASTS

## *Need for Building Socio-Economic and Ecological Resilience*

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[**Abstract:** *The Indian coasts are at the forefront of natural disasters, occurring due to sea level rise and climate change. The proof of this coastal vulnerability is visible through the tropical storms and cyclones that have caused havoc in the past decades. Though the disaster preparedness at the state level has aided in preventing the loss of lives, the governmental efforts so far have highlighted the need for the disaster management regime to take a step further towards inclusion of coastal resilience building, in the overall scheme. The obligation to develop enhanced strategies towards coastal resilience in India can be identified through the Constitutional guarantees and international instruments. However, there is paucity in incorporation of the same in the current framework on disaster management. The regulations connected with management of coastal zones and the incidental laws concerned with protection of the marine ecosystem are marked by the need for a harmonized approach in mitigating the harm of disasters. By suggesting mechanisms to address these gaps, this paper attempts to draw a link between the ecological and community welfare in the face of disasters. The authors have critically analysed existing design of the policies in place and the scope for ecological, equitable, and socio-economic management of the disaster-prone Indian coasts. Through identification of the approach adopted in different states, schemes followed in other countries and local case studies, this paper assesses the need for community based coastal resilience through capacity development, structural and non-structural measures, microfinance and insurance, along with unconventional methods.]*

### INTRODUCTION

Sixteen years have passed since a catastrophe so impactful that it continues to be remembered to this day. The Indian Ocean tsunami in 2004 wreaked havoc in 14 countries bordering the Indian Ocean. Much has been learnt about the importance of disaster prevention and resilience since. Through this paper, the authors seek to analyse where India stands in its laws and policies with respect to resilience to coastal disasters.

Resilience is defined as the “ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions”.<sup>1</sup> In plain terms, it is the ability to bounce back from the effects caused by a disaster. Coastal resilience is used to describe the capacity of social and ecological systems linked to the coast to absorb disturbances of recurring nature and to retain its essential features.<sup>2</sup> The concept gained significance in the context of climate change adaptation in the Second Report of the

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<sup>1</sup> UNDRR, UNISDR TERMINOLOGY ON DISASTER RISK REDUCTION (2009) available at – [https://www.preventionweb.net/files/7817\\_UNISDRTerminologyEnglish.pdf](https://www.preventionweb.net/files/7817_UNISDRTerminologyEnglish.pdf).

<sup>2</sup> Gerd Masselink & Eli D Lazarus, *Defining Coastal Resilience*, 11 WATER 2587 (2019).

Intergovernmental Panel on Climate Change in 1995.<sup>3</sup> The need for a comprehensive policy for coastal resilience is being felt greater now, especially due to the rise in disasters induced by climate change. It has been predicted that sea level rises due to climate change could lead to tsunamis that are more devastating<sup>4</sup> as well as an increased frequency of cyclone-induced storms.<sup>5</sup>

In light of this context, India's obligation to strengthen coastal resilience is critical due to three reasons. Firstly, it is significant from an environmental perspective. India is blessed with a variety of ecosystems such as mangroves, estuaries, coral reefs, seagrasses, mudflats and lagoons consisting of diverse flora and fauna.<sup>6</sup> The coastal and marine ecosystems house about 20,444 faunal species<sup>7</sup> and 969 species of plants.<sup>8</sup> Any disaster affecting the coasts of India is bound to cause destruction to these delicate ecosystems.

Secondly, building coastal resilience is intertwined with socio-economic considerations. About 170 million people are spread across the coastal states and union territories.<sup>9</sup> Apart from causing death, coastal disasters cause widespread displacement, result in loss of livelihood of coastal communities and destruction in the infrastructure required to carry out activities such as seabed mining, oil and natural gas exploration, energy generation, desalination, fishing, aquaculture, tourism and shipping. In the recent past, the Indian Ocean Rim Organisation, of which India is a member, has turned its focus to the sustainable development of ocean resources.<sup>10</sup> It can be argued that making coastal communities and ecosystems more resilient to disasters is a major step towards achieving this goal.

The third justification for building coastal resilience relates to the international obligation of India. Building resilient cities and enhancing the resilience of communities and ecosystems dependent on the sea directly contribute to the achievement of three Sustainable Development Goals: SDG 11, which pertains to making cities and human settlements more resilient, SDG 13, relating to climate action and SDG 14, which pertains to the conservation of life underwater. In order to conclude whether India is acting in line with these obligations, it is necessary to look into the various laws and policies relating to coastal resilience.

<sup>3</sup> Intergovernmental Panel on Climate Change, IPCC SECOND ASSESSMENT CLIMATE CHANGE 1995, 28 (1995).

<sup>4</sup> Virginia Tech, *Climate change sea level rises could increase risk for more devastating tsunamis worldwide*, SCIENCE DAILY (Aug. 15, 2018) available at – <https://www.sciencedaily.com/releases/2018/08/180815141444.htm>.

<sup>5</sup> Komali Kantamaneni et al., *A Systematic Review of Coastal Vulnerability Assessment Studies along Andhra Pradesh, India: A Critical Evaluation of Data Gathering, Risk Levels and Mitigation Strategies*, 11 WATER 393 (2019), at 394.

<sup>6</sup> Arijit Banerjee, *Protecting India's Coastline*, WORLD BANK (Oct. 11, 2012), available at – <https://www.worldbank.org/en/news/feature/2012/10/11/protecting-indias-coastline>.

<sup>7</sup> Kailash Chandra et al., *Coastal And Marine Ecosystems Of India*, GEOGRAPHY AND YOU (May 20, 2017) available at – <https://geographyandyou.com/coastal-marine-ecosystems-india/#:~:text=FAUNAL%20DIVERSITY&text=A%20total%20of%2020%2C444%20species,cent%20of%20global%20faunal%20diversity>.

<sup>8</sup> *Coastal Plants*, Envis Resource Partner On Biodiversity, available at – [http://www.bsienvi.nic.in/Database/CoastalPlants\\_3944.aspx](http://www.bsienvi.nic.in/Database/CoastalPlants_3944.aspx) (last updated Sep. 28, 2020).

<sup>9</sup> Architesh Panda, *Climate change, displacement, and managed retreat in coastal India*, RELIEFWEB (May 22, 2020) available at – <https://reliefweb.int/report/india/climate-change-displacement-and-managed-retreat-coastal-india>.

<sup>10</sup> *Blue Economy*, IORA, available at – <https://www.iora.int/en/priorities-focus-areas/blue-economy> (last visited on Oct. 15, 2020).

## CONSTITUTIONAL PERSPECTIVE

### Article 21

The right to life encompasses the right to a wholesome and healthy environment.<sup>11</sup> The scope of the applicability of this fundamental right has been widened to extend the right to life to all living species. This includes the well-being of the coastline and the marine ecosystem.<sup>12</sup> Moreover, the term “environment” has been interpreted to be inclusive of wildlife, forests, air and water, which brings the coastal ecosystem within its ambit of protection.<sup>13</sup> Ecological balance is an essential element of a healthy environment. Any practice or phenomenon that affects this balance in the marine and coastal ecosystem is bound to violate Article 21. This calls for an approach that safeguards and conserves the coastal communities as well as the marine living species.<sup>14</sup> The right to environment coupled with the right to development has brought out the right to sustainable development which was declared to fall under the ambit of Article 21.<sup>15</sup> Hence, coastal zone development and industrial activities that affect the coastal system must not be permitted to the extent of it being deteriorative to the marine environment. It has been held that the right to relief and rehabilitation of the citizens after a calamity is present under Article 21 of the Constitution. It is the duty of the State to guarantee the same.<sup>16</sup>

### Directive Principles of State Policy and Fundamental Duties

The socio-economic security of the citizen stems from the practices and initiatives by the State, which is fundamental for the possession of the right to life.<sup>17</sup> The duty of the State to protect the natural environment is present under Article 48A, in Part IV of the Constitution. The relevance of Article 38 is also vital in the context of coastal resilience as it includes the protection of the vulnerable communities that are dependent upon the marine environment for their livelihood, and lack of sufficient measures in lieu of coastal resilience would violate a socially just life for such communities, hence leading to a contravention of the said article. Article 40, which emphasizes upon the organization of village Panchayats and self-governance, is of pertinence, given the fact that these institutions can be tools for the protection of coastal areas during perils. The National Coastal Mission of 2017, which articulates Integrated Coastal Zone Management (ICZM) as one of India’s climate adaptation strategies, provides for the constitution of State Mission Management Units (SMMUs). The activities of these bodies are to be facilitated by the Gram Panchayats/Urban Local Bodies, for adopting a system of stakeholder participatory governance.<sup>18</sup> The duty of the citizens in relation to protection of the natural environment and

<sup>11</sup> *Rural Litigation and Entitlement Kendra v. State of Uttar Pradesh*, 1985 A.I.R. 652.

<sup>12</sup> *Animal Welfare Board Of India v. A. Nagaraja*, (2014) 7 S.C.C. 547.

<sup>13</sup> *MC Mehta v. Union of India*, (1991) 2 S.C.C. 353.

<sup>14</sup> *Virendra Gaur v. State Of Haryana*, (1995) 2 S.C.C. 577.

<sup>15</sup> *ND Jayal v. Union of India*, (2004) 9 S.C.C. 362.

<sup>16</sup> *B.J. Diwan v. State of Gujarat*, A.I.R. 2002 Guj 99.

<sup>17</sup> *Amarnath Shrine, In Re v. Union of India*, (2013) 3 S.C.C. 247.

<sup>18</sup> Biliiana Cicin-Sain et al., *Towards the Development of the Next Phase of Integrated Coastal Zone Management in India: Application of Lessons Learned from an International Review of Implementation of ICZM*, For discussion at the International Conference on Integrated Coastal Zone Management: Lessons Learned and Relevance for India, (2019) available at – <http://www.ncscm.res.in/conference/images/ICZM%20REPORT%20VOLUME%201%20RELEVANCE%20TO%20INDIA%20AND%20SUMMARY%20OF%20INTERNATIONAL%20EXPERIENCES%20.pdf> (last visited on Oct. 15, 2020).

coastal zones are enshrined in Article 51A(g) and there lies a responsibility on the part of the state to facilitate the performance of this duty.<sup>19</sup>

### FRAMEWORK FOR DISASTER MANAGEMENT IN INDIA

The Disaster Management Act, 2005 is the primary legislation which provides for the measures for combating disasters in India. Disaster management has been defined in a manner that includes all stages of dealing with disasters, starting from prevention of disasters and ending with restoration and rehabilitation. Apart from managing disasters as and when they occur, it incorporates the aspect of capacity building in order to ensure preparedness to deal with disasters. The Act provides for the setting up of a multi-level mechanism, with the National Disaster Management Authority at the top and local authorities at the bottom. In addition to these bodies, there are Executive Committees at the national and state levels that assist the National and State Authorities. Authorities at every rung of the system are under the obligation of laying down plans for dealing with disasters.<sup>20</sup>

The 2009 Policy on Disaster Management indicates a change in the approach to tackle disasters. It moved away from a relief-centric approach to an approach that aims at proactively preventing and mitigating disasters.<sup>21</sup> With the adoption of the Sendai Framework and the Paris Climate Agreement, there has been a greater thrust towards what was envisioned in the 2009 policy. Since then, building resilience against disasters has found its way into disaster management plans.<sup>22</sup> The National Plan emphasises the following aspects in order to achieve this feat: improved understanding of risks, better coordination between the various agencies, investing in structural measures and non-structural measures, building capacities, managing risks caused by Climate Change<sup>23</sup>

The goals set out in the National Plan also form the basis for the State Plans. An understanding of these plans from the point of coastal resilience calls for a focussed analysis of the disaster management plans of the coastal states and Union Territories of India.

All coastal states have recognised the need for integrating disaster risk reduction into their respective development plans. Mainstreaming disaster risk reduction ensures that developmental programmes and projects are designed with consideration for possible disaster risks, that programmes and projects do not result in increased social, economic, physical or environmental vulnerability to disasters, that disaster management programmes are designed in a way that balances development and reduction of disaster risk.<sup>24</sup> and that area-specific plans are prepared to facilitate the convergence of all development plans and projects with due regards to reduction of disaster risk.<sup>25</sup>

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<sup>19</sup> *Centre for Environment Law, WWF-I v. Union of India*, (2011) 14 S.C.C. 297.

<sup>20</sup> The Disaster Management Act, No. 53 of 2005, INDIA CODE (1993).

<sup>21</sup> National Disaster Management Authority, NATIONAL POLICY ON DISASTER MANAGEMENT 1 (2009).

<sup>22</sup> National Disaster Management Authority, NATIONAL DISASTER MANAGEMENT PLAN xxviii (2019).

<sup>23</sup> *Id.*

<sup>24</sup> Odisha State Disaster Management Authority, STATE DISASTER MANAGEMENT PLAN 70-71 (2019).

<sup>25</sup> Tamil Nadu State Disaster Management Authority, STATE DISASTER MANAGEMENT PERSPECTIVE PLAN 97 (2018).

Since resilience is the ability to recover from shocks while not compromising on long term growth and well-being<sup>26</sup>, integrating disaster risk reduction into development planning and coastal management is critical to achieving coastal resilience. It is safe to conclude that a disaster management plan can be considered to be effective only if it strikes a balance between short term and long term plans that are set in accordance with the points envisioned in the National Plan of 2019.

The state disaster management plans are drawn in accordance with their respective vulnerabilities to particular disasters and the different economic activities within the state. The plan for the East Godavari district of Andhra Pradesh lays emphasis on mitigating the effects of disasters on farmlands affected by cyclones<sup>27</sup> and supporting farmers through tools such as insurance.<sup>28</sup> Tamil Nadu's plan, on the other hand, focuses on measures that are specific to coastal disasters, based on its vulnerability to such disasters.<sup>29</sup> Accordingly, it has identified five spheres for mainstreaming disaster risk reduction<sup>30</sup> which best fit the requirements of the state. Targeting key areas based on the specific local conditions helps in identifying vulnerable groups and making disaster recovery more inclusive, in line with Section 16 of the Disaster Management Act, 2005. As a consequence, more people would be in a position to recover from the devastations caused by disasters.

The existence of a framework with actors at multiple levels under the Disaster Management Act 2005 will only serve to bolster the aim of achieving resilience. This model has moved further towards a participatory approach which integrates communities and NGOs in disaster management

Despite the existence of goals that are in favour of building resilience to disasters, there are certain aspects that indicate that we are further away from these goals than what we perceive. Firstly, although all coastal states and Union Territories acknowledge the importance of building resilience and mainstreaming disaster risk reduction into developmental plans, only some states have created disaster management plans that support this end directly or indirectly. Some states such as Gujarat only focus on short term and medium-term measures for recovery from disasters even though the plan recognises the importance of disaster risk reduction.<sup>31</sup> Building coastal resilience is a challenge unless importance to long term measures that strengthens communities and ecosystems is given. Secondly, ecological restoration continues to be ignored to a great extent, barring a few states such as Tamil Nadu.<sup>32</sup> Another concern is a practical one which relates to the disbursement of ex gratia payment to those affected by disasters. Although the disaster management plan of Lakshadweep provides for the ex-gratia payments for loss of coconut trees due to natural disasters, it has not been updated.<sup>33</sup> Supporting communities in

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<sup>26</sup> Francis Ghesquiereet. al., THE WORLD BANK, THE SENDAI REPORT 22 (2012) available at – <https://openknowledge.worldbank.org/bitstream/handle/10986/23745/80608.pdf?sequence=2&isAllowed=y> (last visited on Oct. 15, 2020).

<sup>27</sup> East Godavari District, DISTRICT DISASTER MANAGEMENT PLAN 82 (2017).

<sup>28</sup> *Id.* at 233.

<sup>29</sup> *Supra* note 25, at 112.

<sup>30</sup> *Supra* note 25, at 123.

<sup>31</sup> Gujarat State Disaster Management Authority, GUJARAT STATE DISASTER MANAGEMENT PLAN (2016).

<sup>32</sup> *Supra* note 25, at 151.

<sup>33</sup> Directorate Of Disaster Management, COLLECTORATE KAVARATTI, LAKSAHDWEEP DISASTER MANAGEMENT PLAN 13.

rebuilding their livelihoods post disasters is a key aspect in resilience. This example sheds light on a gap in the system which goes against this mission.

## COASTAL ZONE REGULATIONS AND NATURAL HAZARDS

The Coastal Regulation Zone (CRZ) Notification, 2018, was formulated based on the recommendations of the Shailesh Nayak Committee that evaluated the CRZ Notification, 2011, upon the demands placed by states for relaxation of the norms imposed by it. The stance of the states, that aimed to encourage tourism and real estate in coastal areas, was favoured by the Committee. However, the provisions of 2018 Notification based on this Committee's report are not in consonance with the stance taken by the Swaminathan Committee Report, which supports limited scope for tourism. The dilution of the previously existing restrictions in relation to development activities increases the disaster risk and impacts faced by traditional coastal communities, due to increased vulnerability to natural hazards. Moreover there is no mention about the possibility of conflicts arising with local communities due to promotion of tourism.<sup>34</sup> Upon the recommendations of the B.B. Vohra Committee, the area falling under the No Development Zone was reduced from 100 to 50 metres by an amendment to the 1991 Notification. This amendment was quashed by the Supreme Court.<sup>35</sup> However, it has been brought back through the 2018 Notification.

The 2018 Notification increases the scope for fishing communities to dwell closer to the High Tide Line at a distance of about 50m, as compared to the 2011 Notification which allowed the same beyond 100m. This increases the human induced stress on the coastal area, exposing them to coastal disaster risks. The strength of the environmental safeguards imposed by the Notification and the effort to reduce vulnerability is hence questionable, especially in light of the number of cyclones that have hit the Indian Coasts in the past couple of decades.<sup>36</sup> The lack of a well demarcated hazard line is one of the problematic factors that challenge the scope for resilience, along with the lack of efforts taken towards minimization of vulnerability. The devolution of the power to grant approvals/clearances for activities in the CRZ II and III areas upon the State Governments, which previously lay in the hands of the Centre, provides scope for exploitation, if it is not subject to supervision by the Centre as well.<sup>37</sup>

Regulating the commercial pressures on the coastline and safeguarding the vulnerable population has not been sufficiently accounted for in several aspects of the regime in force. It can also be noticed that there is a lack of sufficient incorporation of the high volatility of the coastal ecology. None of the Notifications have taken specific efforts for conservation-based management of Ecological Sensitive Areas. In spite of many natural disasters over the years, the 2018 Notification explicitly permits withdrawal of groundwater in the CRZ II areas, which is an indicator of the fact that it stands to be diluted as compared to the previous regime, when viewed from a perspective calling for disaster resilience.<sup>38</sup> The Fr. Saldanha Committee (II)

<sup>34</sup> Sridhar, A, et al., *Review of the Swaminathan Committee Report on the CRZ Notification*, UNDP, New Delhi, <https://www.dakshin.org/wp-content/uploads/2017/08/Review-of-the-Swaminathan-Report.pdf> (last visited on Oct. 12, 2020).

<sup>35</sup> *Indian Council For Enviro-Legal Action v. Union of India and Others*, Writ Petition (C) No. 664 of 1993.

<sup>36</sup> Antonio Mascarenhas, *Need for setback lines in coastal zone management: A meteorological point of view*, TROPMET 2001: METEOROLOGYFOR SUSTAINABLE DEV. 564(2002), at 565.

<sup>37</sup> Ministry Of Environment, Forests And Climate Change, CRZ Notification, §§ 5.1, 5.2, 5.3 ( 2018)

<sup>38</sup> *Id.*

recommended that dwelling units must be constructed only for traditional communities with bona fide intentions. It suggested that the areas in which they thrive must be protected with sea walls, and the buildings constructed may occupy space only up to the extent of 100 square metres, with a height of 4.5 metres.<sup>39</sup> Along with the lack of regard to these suggestions, the CRZ regulations lack a resilience based approach, due to absence of emphasis on climate resilient infrastructure, bio shields for mitigation, in spite of being on paper (as seen in the Disaster Management Plan of the State of Tamil Nadu). This illustrates the need for States to utilise their responsibility to prepare impact based Coastal Zone Management Plans rather than mere adoption of generic guidelines.<sup>40</sup>

## RECOGNITION OF INTEGRATION IN ADMINISTRATION

The Integrated Coastal Zone Management Project supported by the World Bank functions with the objective of capacity building, vulnerability reduction and strengthening of resilience, in coastal areas. The primary components of this project are the National Coastal Zone Management Programme, ICZM-West Bengal, ICZM-Orissa and ICZM-Gujarat.<sup>41</sup> Improvement in maintenance of coastal areas is a vital constituent of the Nationally Determined Contributions (NDCs) under the Paris Agreement, in lieu of which India is to generate more carbon sinks by way of increasing tree cover and mangrove areas by the year 2030. ICZM is to aid in enhanced adaptability to the effects of climate change in vulnerable areas, and to invest in cutting edge technology for this purpose.<sup>42</sup> The primary functions of ICZM are ensuring public safety in coastal disasters, area planning, stewardship of the ecological resources in the area, resolution of conflicts, promoting development at a sustainable pace, etc.<sup>43</sup>

ICZM provides support through capacity building in coastal states and union territories for management of the designated seaside areas, by integrating scientific knowledge and information in the course of decision making in such matters. States must be guided in the preparation of ICZMPs for development of coastal resilience, tourism, carbon sequestration, etc., and to mitigate the causes and impacts of disasters. The Society of Integrated Coastal Management (SICOM)<sup>44</sup> constituted by the MOEFCC oversees the implementation of the project, while the National Centre for Sustainable Coastal Management (NCSCM), Chennai is responsible for the provision of scientific and technical inputs.<sup>45</sup> Demarcation of hazard line, which is one of the primary necessities for determination of CZMPs has been delineated through the guidance of the erosion maps provided by NCSCM and flood line prepared by Survey of India (SoI). However, the identification of several errors and discrepancies in these demarcations, coupled with

<sup>39</sup> Ministry Of Environment, Forest Conservation, And Climate Change, *Report of the Committee Chaired by Prof. M. S. Swaminathan to Review the Coastal Regulation Zone Notification* (1991) available at – <https://ncpcindia.files.wordpress.com/2010/11/msswaminathan-report.pdf>

<sup>40</sup> *Supra* note 25.

<sup>41</sup> *Integrated Coastal Zone Management*, WORLD BANK, available at – <https://projects.worldbank.org/en/projects-operations/project-detail/P097985?lang=en> (last visited Oct. 10, 2020).

<sup>42</sup> *New World Bank Program to Strengthen Integrated Coastal Zone Management in India*, THE WORLD BANK, available at – <https://www.worldbank.org/en/news/press-release/2020/04/28/india-integrated-coastal-zone-management> (last visited on Oct. 10, 2020).

<sup>43</sup> *Supra* note 18, at 4.

<sup>44</sup> *Project At a Glance*, Society of Integrated Coastal Management, available at – <http://sicom.nic.in/projects/iczm-project/project-glance> (last visited on Oct. 13, 2020).

<sup>45</sup> *About NCSCM*, National Centre for Sustainable Coastal Management, available at – <http://ncscm.res.in/cms/about-us/ncscm.php> (last visited on Oct. 12, 2020).

irresolute happenings such as shoreline movement, erosion, etc., bring about the need to question the efficiency of the working of these organizations.<sup>46</sup>

Development of ICZM has been highly emphasized upon as an action to be taken in favour of optimal utilisation of coastal resources, sustainability and for mitigation of the damage caused by cyclones, aimed at building resilience. However the existing regulations, guidelines and rules on coastal zone management lack an element of synthesization. There is a need for better cooperation amongst the relevant authorities under each regulation, for an efficient and coordinated implementation of the policies.<sup>47</sup>

## ECOSYSTEM RESILIENCE THROUGH THE LENS OF INCIDENTAL LAWS

The lack of provisions for resilience building in the State and National Disaster management Plans call for a policy approach that provides for the coastal ecosystem to be resilient and rebuild itself. The application of the precautionary principle<sup>48</sup> is necessary while formulating relevant regulations in this respect.<sup>49</sup> One of the aims of the precautionary principle is taking appropriate measures for mitigating the dangers of disasters well in advance, regardless of the availability of foolproof scientific evidence for concluding the definite presence of an imminent danger. The mere possibility of damage is sufficient to enforce and integrate the compulsion to take mitigative measures into the policy and legislations.<sup>50</sup> The lack of adequate proof about coastal disaster risk should not be a barrier for prevention-based planning and building resilience for ecological welfare.<sup>51</sup>

One of the biggest challenges in maintaining the welfare of the marine ecosystem is finding the right balance for affording utilisation of the coastal resources, while implementing measures for conservation and prevention of overexploitation. The coastal infrastructure for ports, transport facilities, houses, etc., contributes to the economic development of the nation.<sup>52</sup> It must be ensured that the development in the coastal zones must be sustainable, that is, it cannot be permitted at the cost of deprivation of the ecosystem services of the ocean and coastal resources. This was recommended by the National Coastal Mission (NCM), which was formulated under the National Action Plan on Climate Change.<sup>53</sup> Rejuvenation of low lying areas for agriculture and aquaculture, erosion of shorelines, spatial planning, solutions to pollution, enhancing

<sup>46</sup> S. Saxena et al., *Coastal hazard mapping in the Cuddalore region, South India*, NAT. HAZARDS. REV. (2012).

<sup>47</sup> NATIONAL DISASTER MANAGEMENT AUTHORITY, MANAGEMENT OF CYCLONES 143, 144 (2008).

<sup>48</sup> Rio Declaration on Environment and Development 1992, Principle 15; United Nations' Framework Convention on Climate Change, Article 3(3).

<sup>49</sup> Jeroen P. van der Sluijs & Wim C. Turkenburg, *Climate change and the Precautionary Principle*, in IMPLEMENTING THE PRECAUTIONARY PRINCIPLE, PERSPECTIVES AND PROSPECTS 245, 251 (Elizabeth Fisher, Judith Jones, And René Von Schomberg, eds. 2006) available at – [http://www.nusap.net/downloads/Climate\\_Change\\_and\\_the\\_Precautionary\\_Principle.pdf](http://www.nusap.net/downloads/Climate_Change_and_the_Precautionary_Principle.pdf).

<sup>50</sup> *Vellore Citizens Welfare Forum v. Union of India*, A.I.R. 1996 S.C. 2715.

<sup>51</sup> NATIONAL INTELLIGENCE COUNCIL, INDIA: THE IMPACT OF CLIMATE CHANGE TO 2030 - A COMMISSIONED RESEARCH REPORT, 18, 37 (2009) available at – [https://www.dni.gov/files/documents/climate2030\\_india.pdf](https://www.dni.gov/files/documents/climate2030_india.pdf).

<sup>52</sup> Thomas Tanner & Jun Rentschler, GLOBAL FACILITY FOR DISASTER REDUCTION AND RECOVERY, UNLOCKING THE “TRIPLE DIVIDEND” OF RESILIENCE: WHY INVESTING IN DISASTER RISK MANAGEMENT PAYS OFF 12 (2015) available at – [https://www.gfdrr.org/sites/default/files/publication/unlocking\\_triple\\_dividend\\_resilience.pdf](https://www.gfdrr.org/sites/default/files/publication/unlocking_triple_dividend_resilience.pdf).

<sup>53</sup> UNDP, GREEN CLIMATE FUND PROPOSAL: ENHANCING CLIMATE RESILIENCE OF INDIA'S COASTAL COMMUNITIES, available at – <https://www.undp.org/content/dam/india/docs/EnE/GCF-coastal%20communities-Brochure-Revised.pdf> (last visited on Oct. 12, 2020).

implementation of ICZM, development of carbon neutral villages in coastal regions, managing salinity levels, sustainability induced fisheries, and consideration of ICZM as a climate adaptation strategy are some of the features of the NCM, which are in line with the incorporation of sustainable development and resilience building in the coastal region.<sup>54</sup> In line with the operation of these principles, it is also important to take a look at the broad legal regime revolving around coastal zone protection.

In spite of specialized regulations, plans and policies for disaster management and resilience, it is of critical significance to analyse the other legislations that aid in protection of the coastal ecosystem in this respect:

### **BIODIVERSITY CONSERVATION AND SUSTAINABLE USE**

Over 13,000 species of flora and fauna are found in the marine and coastal environment of India, but their sustenance is threatened due to loss of habitat, climate change and overexploitation.<sup>55</sup> The application of the Biological Diversity Act, 2002 with respect to coastal resilience is twofold. Firstly, it accords protection to marine living organisms from overexploitation. Secondly, it recognizes the rights of the indigenous population who are treated as stakeholders in the benefits derived from the biological resources in the region that they are a part of.<sup>56</sup> Furthermore, the Act provides for the formation of Biodiversity Heritage Sites<sup>57</sup> (BHS) which aids in the *in-situ* conservation of such species. The mangrove area in *Asramam* village of *Kollam* district in Kerala is one such BHS, hosting a rich variety of true and associated mangroves, fishes, birds, and other species.<sup>58</sup>

India has also adopted the concept of “Biosphere Reserves”<sup>59</sup>, for the protection of landscapes that brim with threatened living species and culture. Indian coasts are recognized as one of the ten bio-geographic zones under this.<sup>60</sup> However, the magnitude of protection through the establishment of biosphere reserves is questionable as illustrated through the happenings in the Gulf of Mannar region, Tamil Nadu, which is also a National Park under the Wild Life (Protection) Act, 1972. It was declared as a Biosphere Reserve in 1989, but there were no restrictions on the commercial activities until 2002. Although the Biological Diversity Act permits communities to practice fishing at a sustainable rate, unreasonable restrictions were imposed on these communities without proper consultation, leading to a loss of livelihood for these fishermen. On this note, it is interesting to observe that the fishing community had imposed self-restraints on the fishing activities in the region, with protective motives. In spite of their entitlement, fishermen were forced to bribe the forest rangers or other personnel for permission to fish. Ironically this biosphere reserve is situated near a major port, a thermal power plant,

<sup>54</sup> Supra note 18 at 4, 19.

<sup>55</sup> K. Venkataraman, Mohideen Wafar, *Coastal and Marine Biodiversity of India*, 34 (1) INDIAN J. OF MARINE SCI. 57 (2005).

<sup>56</sup> The Biological Diversity Act, §§ 7, 36(5), 44, No. 18 of 2003, INDIA CODE (1993).

<sup>57</sup> The Biological Diversity Act, § 37, No. 18 of 2003, INDIA CODE (1993).

<sup>58</sup> *Declared Biodiversity Heritage Sites*, NATIONAL BIODIVERSITY AUTHORITY, available at – <http://nbaindia.org/content/106/29/1/bhs.html> (last visited on Oct. 13, 2020).

<sup>59</sup> *Man And Biosphere Programme*, UNESCO, available at – <https://en.unesco.org/mab> (last visited on Oct. 13, 2020).

<sup>60</sup> Ministry of Environment, Forests and Climate Change, Government of India, *Annual Report 2018-2019(2019)* available at – <http://moef.gov.in/wp-content/uploads/2019/08/Annual-Report-2018-19-English.pdf> (last visited on Oct. 13, 2020).

chemical based industries, which increase the scope for pollution and damage to the underwater flora and fauna. Hence, it can be concluded that there is a need for stronger legal monitoring of these areas, under the regime of the Biodiversity Act.<sup>61</sup> This can be addressed through demarcation of specialised Marine Protected Areas (MPAs) to conserve biodiversity,<sup>62</sup> and for equitable management of these areas, along with other strategic efforts for shielding the seascape from threats.<sup>63</sup> Such measures are in accordance with the Nationally Determined Contributions which stipulate the protection of biodiversity from the impact of climate change and the threat of natural disasters which are aggravated by climate change.<sup>64</sup>

## WILDLIFE PROTECTION

The Schedules under the Wild Life Protection Act and the prescriptions of IUCN account for many marine species, but human needs are often prioritized over these species' right to life, making it challenging to protect these species and take steps to address their vulnerability in disasters.<sup>65</sup> It has been observed that only 4.9% of the geographic area of India is under any kind of protection, though the prescribed target under the National Wildlife Action Plan stands at 10%.<sup>66</sup> The present regime under the Wild Life (Protection) Act, 1972 with respect to protected areas such as Sanctuaries and National Parks primarily emphasise on terrestrial regions. This approach challenges the overlapping interests of the indigenous coastal communities and the species in the area. However their stakes do merge when it comes to their dependence on the coastal resources for survival. India needs a stronger and specialized regime for protecting the wildlife dependent on the coastal and oceanic health, calling for the harmonization of the existing policies, programmes, schemes.<sup>67</sup>

The conceptualisation of Marine Protected Areas in India is manifested through National Parks, Sanctuaries, Conservation or Community Reserves. Though the activities and restrictions in relation to these areas are properly laid down, it reduces the scope for inclusivities, in terms of reducing stakeholders' involvement. Another issue during declaration of protected areas under this respect is the lack of sufficient recognition of local interests, in spite of the attempts by the Judiciary to resolve the same.<sup>68</sup> The ecological linkage between these voids in regulation and threats due to climate change and occurrence of natural disasters are direct. This plight can be

<sup>61</sup> Lawyers Initiative for Forests and Environment, *CMPA Technical Report Series No. 02: Legal Framework for Conservation of Coastal and Marine Environment of India: A Review*, GIZ GMBH, available at –<https://snrd-asia.org/wp-content/uploads/2018/04/CMPA-Technical-Report-Series-No.-02.-Legal-Framework-for-Conservation-of-Coastal-and-Marine-Environment-of-India-A-Review.pdf> (last visited on Oct. 13, 2020).

<sup>62</sup> Review of the programme of work on marine and coastal biodiversity, COP 7 Decision VII/5, Convention on Biological Diversity, Apr.4, 2004.

<sup>63</sup> UNDP, CONVENTION ON BIOLOGICAL DIVERSITY, QUICK GUIDES TO THE AICHI BIODIVERSITY TARGETS 2011-2020, 12, 13 (2013).

<sup>64</sup> UNFCCC, INDIA'S INTENDED NATIONALLY DETERMINED CONTRIBUTION: WORKING TOWARDS CLIMATE JUSTICE, 24 (2015).

<sup>65</sup> Sujitha Thomas, *Conservation criteria and Red listed marine resources of India*, CENT. MARINE FISHERIES RES. INST., available at – [http://eprints.cmfri.org.in/9872/1/Sujitha\\_9.pdf](http://eprints.cmfri.org.in/9872/1/Sujitha_9.pdf) (last visited on Oct. 15, 2020).

<sup>66</sup> Mohd. Zeeshan et al., *Protected area management and local access to natural resources: a change analysis of the villages neighboring a world heritage site, the Keoladeo National Park, India*, 4 EARTH PERSP. 2 (2017).

<sup>67</sup> *Workshop on Fishery-dependent Livelihoods, Conservation and Sustainable Use of Biodiversity: The Case of Marine and Coastal Protected Areas in India*, MARINE PROTECTED AREAS, available at – <https://mpa.icsf.net/en/page/989-India%202012.html> (last visited on Oct. 15, 2020).

<sup>68</sup> *Animal and Environmental Legal Defence Fund v. Union of India*, (1997) 3 S.C.C. 549.

overcome through more participation of government agencies and voluntary stakeholders' organizations, to integrate their needs with that of the coasts and ocean. Provisions can be brought about for consultation with the state coastal zone management authorities, in the procedure for declaration of a marine National Park or Sanctuary, in order to address the scientific and social factors.<sup>69</sup> Along with these, community conservation<sup>70</sup> with tools for accountability is the way to go, for coastal resilience.<sup>71</sup>

### **Fishing regulation**

Before the era of industrialisation, fishing practices were based solely upon artisanal methods. On account of usage of smaller fishing nets and the issue of inability to accommodate larger quantities of the fish (caught) on the small traditional boats and crafts, the volume of catch was relatively low. Technological advancement has facilitated mechanisation in the fishing sector. Parallely, there has been a monumental increase in the demand for fish due to the growing population.<sup>72</sup> The last few decades witnessed a rise in the number of motorised fishing vessels and modern fishing methods such as purse seining, gill netting, trawling, etc., for improving the volume of the catch as well as the profits from the same, leading to a heavy decline in the fish stock present in the ocean. This is coupled with the issue of by catch, which refers to the unintended catch of non target species that do not have commercial market value.<sup>73</sup> These modern fishing practices are detrimental to oceanic health. For instance, bottom trawling involves the scrapping of all the organisms, including the ones on the seabed, such as sponges and corals. Overfishing causes an imbalance in the food chain in the seabed. The loss of biodiversity due to such destructive fishing practices aggravates the ill effects of global warming and climate change, contributing to the possibilities of occurrence of natural disasters and reducing the scope for mitigation of the same.<sup>74</sup>

Marine Fishing Regulation (MFR) legislations are marked by a lack of uniformity and insufficiency of measures for preventing overexploitation. Though fishing bans during breeding seasons and mesh sizes of fishing nets are prescribed, these are often not enforced in a wholesome manner. Except Andhra Pradesh and Orissa, Turtle Excluder Devices are not prescribed in any other states.<sup>75</sup> This demonstrates the need for incorporation of sustainable fishing practices in the MFR Acts and in their implementation, in order to restore the oceanic health, aid in the mitigation of climate change, reduces the scope for natural disasters and

<sup>69</sup> Pramod Krishnan et al., UNITED NATIONS DEVELOPMENT PROGRAMME, CONSERVATION ACROSS LANDSCAPES: INDIA'S APPROACHES TO BIODIVERSITY GOVERNANCE, 56, 71 (2012).

<sup>70</sup> Shesh Kanta Kafle, *Measuring disaster-resilient communities: A case study of coastal communities in Indonesia*, 5(3) J. OF BUS. CONTINUITY & EMERGENCY PLAN. 315 (2011), at 318.

<sup>71</sup> *Supra* note 69.

<sup>72</sup> A. P. Dineshbabu et al., *An appraisal of trawl fisheries of India with special reference on the changing trends in bycatch utilization*, 55 J. MAR. BIOL. ASS. INDIA 69(2014), at 70.

<sup>73</sup> Jeyabaskaran & E. Vivekanandan, *Marine Mammals and Fisheries Interactions in Indian Seas*, Regional Symposium on Ecosystem Approaches to Marine Fisheries & Biodiversity, Kochi (2013).

<sup>74</sup> Victoria C. Ramenzon, *Destructive fishing practices in Ende, Flores, Indonesia: the importance of designing co-governance programs and policy-making in dealing with climate change*, INTERNATIONAL ASSOCIATION FOR THE STUDY OF THE COMMONS 2, 4 (2013) available at – [https://www.researchgate.net/publication/322626381\\_Destructive\\_fishing\\_practices\\_in\\_Endre\\_Flores\\_Indonesia\\_the\\_importance\\_of\\_designing\\_co-governance\\_programs\\_and\\_policy-making\\_in\\_dealing\\_with\\_climate\\_change](https://www.researchgate.net/publication/322626381_Destructive_fishing_practices_in_Endre_Flores_Indonesia_the_importance_of_designing_co-governance_programs_and_policy-making_in_dealing_with_climate_change) (last visited on Oct. 16, 2020).

<sup>75</sup> R. Jeyabaskaran & V. Kripa, *Status of sea turtle conservation in India and the way forward* 13-18 (Marine Fisheries Information Service Technical & Extension Series No. 238, 2018).

improves coastal resilience.<sup>76</sup> This necessitates the implementation of the Code of Conduct for Responsible Fisheries (CCRF)<sup>77</sup> and regulations that recognize the impact of fishing practices on the coastal ecosystem.<sup>78</sup>

## IMPORTANCE OF BIO-SHIELDS

### Mangroves

Mangroves, salt marshes and seagrass ecosystems support sea life, aquaculture, forestry and household need of nearby communities. More importantly they act as bio shields that reduce the intensity and impact of storms.<sup>79</sup> However, the increasing rates of pollution, erosion, extraction activities, sea level rise and deforestation threaten the sustenance of the mangrove ecosystems. The negative effects of this destruction are exacerbated by climate change.<sup>80</sup>

The advantages of protecting natural coastal ecosystems such as mangroves are twofold. Firstly, the goods and services provided by them contribute to the livelihood of the local communities and ensure food security. Secondly, they aid in disaster mitigation by reducing the vigour of the waves in the course of cyclones.<sup>81</sup> Mangrove restoration is a must, as witnessed in Indonesia, wherein investments are made in mangrove plantations.<sup>82</sup>

In India, the Bhitarkanika Mangroves, Point Calimere Wildlife and Bird Sanctuary and Sunderbans are mangrove sites that are protected under the Ramsar Convention.<sup>83</sup> The valued services of the mangroves have also been safeguarded under CRZ - I of the CRZ Notification.<sup>84</sup> This would be more effective if complemented by an establishment of a buffer zone to account for sea level rise. Geographic Information Systems must be used to monitor the wellbeing of the mangrove ecosystem.<sup>85</sup> Restoration Insurance Service Company (RISCO) is an initiative in the Philippines that takes up the responsibility of mangrove restoration and conservation, for which it seeks and receives remuneration from insurance companies that are benefited from the lesser

<sup>76</sup> Cassandra De Younget al., *Building resilience for adaptation to climate change in the fisheries and aquaculture sector*, in BUILDING RESILIENCE FOR ADAPTATION TO CLIMATE CHANGE IN THE AGRICULTURE SECTOR 103 (FAO, 2012).

<sup>77</sup> Food And Agriculture Organization, CODE OF CONDUCT FOR RESPONSIBLE FISHERIES (1995).

<sup>78</sup> Marta Coll Monton, WWF MEDITERRANEAN, ECOSYSTEM-BASED ASSESSMENT OF THE EFFECTS OF INCREASING TRAWL SELECTIVITY IN THE MEDITERRANEAN (2008).

<sup>79</sup> Sambandam Sandilyan & Kathiresan Kandasamy, *Mangroves as bioshield: An indisputable fact*, 103 OCEAN AND COASTAL MGMT. 94 (2015).

<sup>80</sup> Mario D.P. Godoy & Luiz D. De Lacerda, *Mangroves Response to Climate Change: A Review of Recent Findings on Mangrove Extension and Distribution*, 87(2) AN ACAD BRAS CIENC 651 (2015), at 654.

<sup>81</sup> HL Koh et. al., *Mangrove Forests: Protection Against and Resilience To Coastal Disturbances*, 30(5) J. OF TROPICAL FOREST SCI. 446 (2018).

<sup>82</sup> Spalding M et al., *Mangroves for coastal defence: Guidelines for coastal managers & policy makers*, WETLANDS INTERNATIONAL AND THE NATURE CONSERVANCY (2014) available at – <https://www.nature.org/media/oceansandcoasts/mangroves-for-coastal-defence.pdf>.

<sup>83</sup> *Ramsar Wetland Sites*, Envis Centre on Wildlife & Protected Areas, available at – [http://www.wiienviis.nic.in/Database/ramsar\\_wetland\\_sites\\_8224.aspx](http://www.wiienviis.nic.in/Database/ramsar_wetland_sites_8224.aspx) (last visited on Oct. 13, 2020).

<sup>84</sup> *Supra* note 37, § 10.1

<sup>85</sup> Elizabeth McLeod & Rodney V. Salm, *Managing Mangroves for Resilience to Climate Change*, IUCN Resilience Science Group Working Paper Series - No 2, 27 (2006).

risk of disaster faced by the assets near the coasts.<sup>86</sup> In addition to the measures provided under the existing laws and policies, unconventional steps such as those seen in the Philippines and Indonesia are also worth exploring.

### Corals

Coral reefs play a major role in the oceanic food chain, and their dwindling populations are directly related to the reduction in fish stock. By maintaining water quality, supporting tourism, and sequestering carbon, they contribute to building coastal resilience in terms of addressing climate change and reducing disaster risk, while safeguarding the position of coastal communities.<sup>87</sup> Coral reefs are indirectly protected under the Biodiversity Act, 2002, CRZ Notification, Wild Life (Protection) Act, 1972 and the Environment Protection Act, 1986.<sup>88</sup> However India has not adopted any specific measures in favour of coral reef protection, though it is a party to the CBD, CITES and UNFCCC, all of which have emphasized upon the conservation of coral reefs.<sup>89</sup> The coral reef cover in the Gulf of Mannar increased by over five percent between 2005 and 2009 through community conservation initiatives and joint patrolling after the region was declared as a National Park and Biosphere Reserve. Therefore, declaration of coral reefs as protected areas is one possible solution to address the gaps in conservation measures. Along with retaining the health of the coastal ecosystem, it will also amplify the local endeavours towards risks of climate change and natural disasters.<sup>90</sup>

## BUILDING COMMUNITY RESILIENCE AGAINST COASTAL DISASTERS

Every disaster result in two main changes that every community affected by it needs to cope with. Firstly, it causes destruction of the physical assets of the community. This is known as damage. Secondly, it leads to changes in the economic flows of the community, which consists of the value of the production of goods or services that will not be realised, and the associated increase in the cost of production. These are called losses.<sup>91</sup> Donald Geis defines community resilience as “the safest possible community that we have the knowledge to design and build in a natural hazard context”.<sup>92</sup> Linking this definition with the two kinds of destruction caused by disasters brings us closer to a wider understanding of what constitutes a safe community. For a community to be considered safe in a natural hazard context, security of livelihood and financial security are as important as safety in terms of physical infrastructure. Taking this perspective into consideration, post disaster measures must aim at recovering personal income, basic services and production levels in addition to rebuilding destroyed assets in accordance with disaster

<sup>86</sup> *Restoration Insurance Service Company*, Global Innovative Lab for Climate Finance, available at – [https://www.climatefinancelab.org/wp-content/uploads/2019/03/RISCO\\_Instrument-analysis-1.pdf](https://www.climatefinancelab.org/wp-content/uploads/2019/03/RISCO_Instrument-analysis-1.pdf) (last visited on Oct. 13, 2020).

<sup>87</sup> *Supra* note 53.

<sup>88</sup> Rajesh Sehgal, *Legal Regime Towards Protecting Coral Reefs: An International Perspective And Indian Scenario*, 2 ENV'T AND DEV. J. 185 (2006), at 187.

<sup>89</sup> *The International Coral Reef Initiative*, UNEP, available at – <https://sustainabledevelopment.un.org/partnership/?p=7888> (last visited on Oct. 13, 2020).

<sup>90</sup> *Supra* note 69.

<sup>91</sup> NATIONAL INSTITUTE OF DISASTER MANAGEMENT, HANDBOOK - POST DISASTER NEEDS ASSESSMENT INDIA12 (2019).

<sup>92</sup> Donal Geis, *By Design: The Disaster Resistant and Quality-of-Life Community*, 1 NAT. HAZARDS REV. 152 (2000).

resilient standards, in order to build a community that is resilient to disasters.<sup>93</sup> Since 2015, psychosocial support has also been given importance at the international level.<sup>94</sup> A combination of all these measures can be broadly divided into structural and non-structural measures.

### **BUILDING RESILIENCE AGAINST COASTAL DISASTER THROUGH STRUCTURAL MEASURES AND SCIENTIFIC CONSTRUCTION PRACTICES**

Structural measures against disasters are physical constructions or engineering techniques that are applied while constructing buildings for achieving resilience.<sup>95</sup> The National Plan has suggested disaster specific structural measures. Some measures such as hazard resistant construction, strengthening and retrofitting all critical infrastructure and introduction of social housing schemes that involve construction of new hazard resistant houses along with retrofitting existing ones are uniform to all kinds of coastal disasters. Construction of shelters is also a common short term, temporary measure. Some measures such as construction of embankments and levees<sup>96</sup> for floods and construction of submerged dykes and sand barriers<sup>97</sup> to mitigate losses due to tsunami are disaster specific measures that have the potential of easing recovery, thereby strengthening resilience to disasters.

Structural measures are also affected by aspects such as integration of disaster resistant building codes and scientific principles that are required to be followed while constructing structures in areas that are vulnerable to disasters. These are non-structural measures that compliment structural measures. The National Disaster Management Guidelines with respect to the management of Tsunamis enumerates certain design principles for tsunamis that are in line with the Precautionary Principle. These principles stress on constructing buildings only after careful considerations of the tsunami risks of the site based on the distance of the site from the sea, elevation above the mean sea level, height of the high tide and the depth, speed and maximum run-up of the tsunami wave.<sup>98</sup> Guidelines for Reconstruction of Houses Affected by Tsunami, laid down by the Government of Tamil Nadu provide scientific recommendations for constructing houses that are resilient to tsunamis.<sup>99</sup> Furthermore, construction of houses that are resilient to hazards under the Pradhan Mantri Awaas Yojana - Gramin could be an effective measure towards building coastal villages that are resilient to disasters. As part of the Disaster Risk Reduction Strategy, it has been suggested that laws relating to land-use and building codes be revised taking disaster resilience into consideration.<sup>100</sup> Adoption of zoning regulations that keep development away from disaster prone areas has also been suggested as a preventive

<sup>93</sup> *Supra* note 91, at 13.

<sup>94</sup> *Mental Health Recommendations Included in Sendai Framework for Disaster Risk Reduction*, UN UNIVERSITY IIGH (Mar. 26, 2015) available at – <https://iigh.unu.edu/news/news/mental-health-recommendations-included-in-sendai-framework-for-disaster-risk-reduction.html>.

<sup>95</sup> *Training Modules- Mainstreaming DRR in Development Planning*, National Institute of Disaster Management 7, available at – <https://nidm.gov.in/pdf/pubs/DRR-Planning.pdf> (last visited on Oct. 16, 2020).

<sup>96</sup> *Supra* note 22, at 118.

<sup>97</sup> *Supra* note 22, at 152.

<sup>98</sup> National Disaster Management Authority, NATIONAL DISASTER MANAGEMENT GUIDELINES – MANAGEMENT OF TSUNAMIS 50(2010).

<sup>99</sup> *Guidelines for Reconstruction of Houses Affected by Tsunami*, General And Public Buildings (Masonry), Government of Tamil Nadu, available at – [https://www.tn.gov.in/tsunami/digitalibrary/ebooks-web/38%20Guidelines for Reconstruction of Houses Affected By Tsunami.pdf](https://www.tn.gov.in/tsunami/digitalibrary/ebooks-web/38%20Guidelines%20for%20Reconstruction%20of%20Houses%20Affected%20By%20Tsunami.pdf) (last visited on Oct. 16, 2020).

<sup>100</sup> *Supra* note 22, at 91.

measure.<sup>101</sup> Effective implementation of plans for Integrated Coastal Zone Management across all coastal states and union territories is a must.

Apart from long-term measures that are solely aimed at building resilience against coastal disasters, there are short term measures that are critical in aiding communities in bouncing back. Making critical infrastructure such as roads, communication lines, sanitation facilities resilient to at least most, if not all coastal disasters is essential. Special focus must be given to making schools and hospitals disaster resilient. Schools are especially important in the disaster response phase since they may be used as temporary shelters to house evacuees.<sup>102</sup> Integration of the principle of Disaster Risk Reduction into schemes such as Pradhan Mantri Gram Sadak Yojana, the National Health Mission, Samagra Shiksha Abhiyan, National Rural Drinking Water Programme and Swachh Bharat Mission could give a major thrust towards building resilience against coastal disasters in coastal villages.<sup>103</sup> Apart from these general schemes, the National Cyclone Risk Mitigation Project was introduced taking into consideration the vulnerability of coastal states and union territories to cyclones. Structural measures such as multipurpose cyclone shelters, go-downs, approach roads and bridges to houses and saline embankments have been constructed in Andhra Pradesh and Odisha under the first phase of the project. Similar cyclone resilient infrastructure is expected to be constructed in Goa, Gujarat, Karnataka, Kerala, Maharashtra and West Bengal under the second phase.<sup>104</sup>

The World Development Report 1994 placed stress on the importance of investing in infrastructure as a means of achieving economic growth, poverty alleviation and environmental sustainability.<sup>105</sup> Since disaster management is linked to all three aspects, making infrastructure disaster resilient is critical to their realisation. The various measures, the Plans, guidelines and regulations made in relation to structural measures for Disaster Risk Reduction are scientific. However, in order to achieve coastal resilience, they must effectively be implemented with scientific ICZM. Importance must also be given to improving structural measures that afford a greater degree of protection to protected areas. Furthermore, it is suggested that apart from having building codes, the construction of structures that are resilient to coastal disasters can also be standardised by the Bureau of Indian Standards (BIS), in a manner similar to Indian Standards on Earthquake Engineering<sup>106</sup>.

<sup>101</sup> West Bengal Department of Disaster Management, WEST BENGAL DISASTER MANAGEMENT PLAN 69 (2015).

<sup>102</sup> Andaman & Nicobar Administration, ANDAMAN AND NICOBAR ISLANDS DISASTER MANAGEMENT PLAN 63 (2012); *Supra* note 25, at 73; Department of Revenue and Disaster Management, PUDUCHERRY, PUDUCHERRY DISTRICT DISASTER MANAGEMENT ACTION PLAN 257 (2017); *Supra* note 24, at 162; State Disaster Management Authority, MAHARASHTRA STATE DISASTER MANAGEMENT PLAN 291 (2016); *Supra* note 31, at 48.

<sup>103</sup> *Supra* note 24 at 75-79.

<sup>104</sup> Schemes, Disaster Management Division, Ministry of Home Affairs, available at – <https://www.ndmindia.nic.in/programs> (last visited on Oct. 16, 2020).

<sup>105</sup> World Bank, WORLD DEVELOPMENT REPORT 1994 INFRASTRUCTURE FOR DEVELOPMENT 2 (1995) available at – <https://openknowledge.worldbank.org/bitstream/handle/10986/5977/WDR%201994%20-%20%20English.pdf?sequence=2>.

<sup>106</sup> Indian Standards on Earthquake Engineering, Bureau of Indian Standards, available at – <https://bis.gov.in/other/quake.htm#:~:text=IS%201893%3A1984%20Criteria%20for,based%20on%20the%20seismic%20intensity> (last visited on Oct. 16, 2020).

## NON-STRUCTURAL MEASURES

Non-structural measures are those that do not involve physical constructions and use knowledge, practice, agreement, policies and laws, public awareness programmes and training to reduce the risks and impacts of disasters.<sup>107</sup> In other words, these include all measures that do not involve the construction of physical infrastructure. The focus of this paper will be restricted to measures protecting the livelihood of coastal communities, measures for providing financial security to coastal communities and capacity building.

### Financial Resilience and Resilient Livelihoods

The Disaster Management Act, 2005 envisages the creation of a multi-tier funding structure. It provides for the creation of Disaster Response Funds at the national, state and district levels to be managed by the Executive Committees of the respective levels.<sup>108</sup> The guidelines for the administration of the National Disaster Response Fund and State Disaster Response Funds clarify that these funds are only to be utilised for providing immediate relief.<sup>109</sup> Hence from the point of building financial resilience against coastal disasters, these funds are not significant. The Disaster Management Act also provides for the creation of a disaster mitigation fund at the national, state and district levels to be administered by the respective Disaster Management Authorities. The Standing Committee on Finance (2018-19) recommended that a Disaster Mitigation Fund be set up and operationalised to provide permanent mitigation measures in disaster prone areas.<sup>110</sup> However, despite the recommendations of the Committee and requests made by certain coastal states such as Tamil Nadu<sup>111</sup>, there has been no change in the situation. The non-creation of such a fund may prove to be a hindrance to implementing long term measures that are required to achieve coastal community resilience against natural disasters.

Despite the lack of a dedicated fund that is aimed at building disaster resilience, there are certain centrally sponsored schemes that may aid victims of coastal disasters. The Mahatma Gandhi National Rural Employment Guarantee Scheme can be implemented in coastal states and union territories in a way that would secure the livelihood of coastal communities by providing them continuous employment opportunities, especially at the time of disasters.<sup>112</sup> Special projects such as the Emergency Tsunami Reconstruction Project, Rajiv Gandhi Rehabilitation Programme and Post Tsunami Sustainable Livelihood Project that are funded by organisations such as the World Bank, Asian Development Bank and the International Fund for Agricultural Development have

<sup>107</sup> *Supra* note 95.

<sup>108</sup> The Disaster Management Act, No. 53 of 2005, INDIA CODE (1993).

<sup>109</sup> Ministry Of Home Affairs (Disaster Management Division), GUIDELINES ON CONSTITUTION AND ADMINISTRATION OF THE STATE DISASTER RESPONSE FUND (SDRF) (2010) *available at* – [https://www.ndmindia.nic.in/images/Guide\\_SDRF\\_28Sep2010\\_english.pdf](https://www.ndmindia.nic.in/images/Guide_SDRF_28Sep2010_english.pdf); Ministry of Home Affairs (Disaster Management Division), GUIDELINES ON CONSTITUTION AND ADMINISTRATION OF THE NATIONAL DISASTER RESPONSE FUND (NDRF) (2010) *available at* – [https://www.ndmindia.nic.in/images/Guide\\_SDRF\\_28Sep2010\\_english.pdf](https://www.ndmindia.nic.in/images/Guide_SDRF_28Sep2010_english.pdf).

<sup>110</sup> Standing Committee On Finance (2018 - 19), *Central Assistance for Disaster Management and Relief* 79 (2019).

<sup>111</sup> Special Correspondent, *T.N. asks Centre to set up disaster mitigation fund*, THE HINDU (May. 16, 2017, 1:22 AM), *available at* – <https://www.thehindu.com/news/national/tamil-nadu/tn-asks-centre-to-set-up-disaster-mitigation-fund/article18461212.ece>.

<sup>112</sup> *Supra* note 24, at 73.

complimented government efforts and schemes in mitigating the effects of the 2004 tsunami in Tamil Nadu.<sup>113</sup>

Projects that are specially tailored to build coastal community resilience are on the rise. A project by the Green Climate Fund under the UNFCCC aims at supporting the Government of India in its efforts to enhance the resilience of coastal communities to climate change through a combination of ecosystem adaptation and community approaches. Importance has been given to helping communities shift to climate resilient livelihood.<sup>114</sup> Since climate change is expected to exacerbate the effects of natural disasters, creating climate resilient communities would entail building resilience against disasters.

As important as it is to have long-term non-structural measures, it is equally important to have temporary institutional arrangements that would enable communities to recover from the financial shock caused by disasters. Reserve Bank of India's Master Direction on Relief Measures by Banks in Areas affected by Natural Calamities provides for short-term measures such as restructuring of loans.<sup>115</sup> However, the arrangements under the Direction are more favourable to those having agricultural credit. Other vulnerable communities are at a relative disadvantage since their loans are rescheduled only if the natural calamity is severe enough to warrant it.<sup>116</sup> Imposing such requirements could hamper coastal communities from having a smooth recovery after coastal disasters. This in turn is a hurdle to achieving coastal community resilience and increases the burden on coastal communities to be more self-reliant, which can be challenging due to their socio-economic background. Furthermore, even centrally sponsored schemes such as the Centrally Sponsored National Scheme of Welfare of Fishermen do not take into consideration the vulnerability of fisher folk to coastal disasters. The group insurance plan under the scheme is restricted to compensation for accidents suffered by fishermen. However, the saving-cum-relief component of the scheme is indicative of qualities that are the basis for building coastal community resilience.<sup>117</sup> Expanding the scope of this scheme by bringing disaster losses within its ambit would be a major step towards a disaster resilient fishing community. Focus also needs to be given to coastal communities engaged in other kinds of coast dependent occupation such as coastal tourism.

Apart from government sponsored schemes and projects funded by international organisations, building coastal community resilience entails developing the community's capacities to achieve a greater degree of self-reliance in combating disasters. The microfinance sector is capable of meeting the needs of coastal communities by providing long term access to financial services. A variety of packages and services such as client responsive loan products, forced savings products, voluntary savings products, credit for disaster resilient housing improvements and provision of assets for lease facilitate the diversification and rise in income of vulnerable coastal communities.<sup>118</sup> Since such measures have been developed in a way that would build the assets

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<sup>113</sup> *Supra* note 25, at 85.

<sup>114</sup> *Supra* note 53.

<sup>115</sup> Master Direction– Reserve Bank of India (Relief Measures by Banks in Areas Affected by Natural Calamities) Directions 2018 – SCBs, Reserve Bank Of India (2018).

<sup>116</sup> *Id.*

<sup>117</sup> *Centrally Sponsored National Scheme of welfare of Fishermen*, Department Of Animal Husbandry and Dairying, available at <http://dahd.nic.in/related-links/centrally-sponsored-national-scheme-welfare-fishermen> (last visited on Oct. 15, 2020).

<sup>118</sup> Eileen Miamidian et al., *Surviving Disasters and Supporting Recovery Guidebook for Microfinance Institutions* 17-20 (The World Bank, Working Paper No. 10, 2005).

of the community over a period of time, post disaster recovery would be easier, allowing affected communities to bounce back with support from their own assets. The microfinance sector is in its early stages of development with relation to Disaster Risk Reduction. Presently, the contribution of microfinance institutions is restricted to the response and recovery phases of disasters due to the lack of a dedicated policy for outlining their role in Disaster Risk Reduction.<sup>119</sup> However, with proper policies and regulations, it can be a promising tool for building coastal community resilience. Unconventional approaches such as bio-rights, that award communities for undertaking ecosystem conservation activities through micro-credits that get converted to payments upon successful completion of projects<sup>120</sup> are worth exploring due to their relevance to sustainable development.

Financial security in times of disasters can also be achieved through the mechanism of insurance. The Standing Committee on Finance (2018-19) has recommended that all properties in disaster prone areas be insured.<sup>121</sup> This recommendation is not new. The need for disaster insurance has been recognised by bodies such as the National Disaster Management Authority and the Insurance Regulatory and Development Authority since 2013.<sup>122</sup> However, the introduction of disaster insurance is a challenge without comprehensive policies that mandate and regulate such products, especially in coastal areas, where the risk of disasters is higher.

Currently, in India, insurance cover for properties against disasters does not fall under a single category of insurance, but is scattered across multiple kinds of policies such as property insurance, marine insurance, flood insurance and crop insurance schemes. Disaster Insurance does not have a separate market since its value has not been realised by consumers and insurance companies themselves.<sup>123</sup> Insurance policies that have been created for the purpose of aiding vulnerable communities are in the form of crop insurance schemes under the Pradhan Mantri FasalBima Yojana, Restructured Weather based Crop Insurance Scheme, the Coconut Palm insurance scheme and the Unified Package insurance scheme. Insurance coverage for vessels and fishing gear is heavily dependent on the area of operation, the kind of vessel and the insurance company itself. Coastal assets such as houses and immovable property are currently not protected under any scheme or programme. The Disaster Risk Insurance Product for Coastal Communities, which is currently not operational, has been the only policy in this area.<sup>124</sup>

Considering scientific evidence which suggests that the intensity and frequency of natural disasters is expected to rise and have the worst effects on areas that are already vulnerable,<sup>125</sup> the

<sup>119</sup> *Building Resiliency Through Disaster Risk Reduction: An Assessment of India's Microfinance Sector*, SEEP NETWORK (Mar. 2017), available at – [https://seepnetwork.org/files/galleries/1733\\_DRR\\_Diagnostic\\_IFMR\\_LEAD\\_7F\\_lr.pdf](https://seepnetwork.org/files/galleries/1733_DRR_Diagnostic_IFMR_LEAD_7F_lr.pdf).

<sup>120</sup> Pieter van Eijk & Ritesh Kumar, *Bio-rights in theory and practice: A financing mechanism for linking poverty alleviation and environmental conservation*, WETLANDS IN'L (Jan. 2009), available at – [https://south-asia.wetlands.org/wp-content/uploads/sites/8/dlm\\_uploads/2018/03/WI\\_Bio-rights-in-theory-and-practice.pdf](https://south-asia.wetlands.org/wp-content/uploads/sites/8/dlm_uploads/2018/03/WI_Bio-rights-in-theory-and-practice.pdf).

<sup>121</sup> *Supra* note 110, at 80.

<sup>122</sup> IRDA – NDMA, *Disaster Relief and Risk Transfer Through Insurance*, CEA (Jul. 2013), available at – [http://www.cea.nic.in/reports/others/planning/pslf/disaster\\_risk.pdf](http://www.cea.nic.in/reports/others/planning/pslf/disaster_risk.pdf).

<sup>123</sup> Saon Ray et al., *Financing Resilience against Natural Disasters*, ICRIER (Sep. 2019), available at – [https://icrier.org/pdf/Financing\\_Resilience\\_against\\_Natural\\_Disasters.pdf](https://icrier.org/pdf/Financing_Resilience_against_Natural_Disasters.pdf).

<sup>124</sup> Shinoj Parappurathu et. al., CENTRAL MARINE FISHERIES RESEARCH INSTITUTE, MARINE FISHERIES INSURANCE IN INDIA: STATUS AND PROSPECTS 3-4 (2017).

<sup>125</sup> Jason Anderson & Camilla Bausch, POLICY DEPARTMENT ECONOMIC AND SCIENTIFIC POLICY, EUROPEAN PARLIAMENT, CLIMATE CHANGE AND NATURAL DISASTERS: SCIENTIFIC EVIDENCE OF A POSSIBLE RELATION BETWEEN RECENT NATURAL DISASTERS AND CLIMATE CHANGE (2006) available at –

demand for insurance policies for protecting the assets in vulnerable areas such as coasts is likely to grow, especially if the various schemes and plans directed at building assets of coastal communities are successful. A public-private partnership in the partnerships, which has been successful in Spain is an option to be considered to provide coverage for disasters.<sup>126</sup>

### **Building Coastal Community Resilience Through Capacity Development**

Capacity development is the process by which the capacities of people, organizations and the society are systematically stimulated and developed in order to achieve social and economic goals through means which include the improvement of knowledge, skills, systems and institutions.<sup>127</sup> In the context of disaster management, capacity development would mean building capacities of multiple actors spanning across multiple levels by taking initiatives for developing disaster resilience, implemented across all time frames - recurring, short, medium and long.<sup>128</sup> The success of such programmes is dependent on the direct involvement of the stakeholders<sup>129</sup>, primarily the vulnerable community. Coastal community involvement may take several forms. Two aspects that are especially relevant in the context of coastal community resilience are in the field of building disaster resilient livelihoods and disaster education and awareness.

Projects such as those under the Green Climate Fund of the UNFCCC fall under the first category of capacity building. This project, in addition to supporting institutional changes and providing financial support, engages with the coastal communities in the target villages in Odisha, Andhra Pradesh and Maharashtra. Importance has been given to providing technical support to these communities to aid them in transitioning to climate-adaptive livelihoods such as crab farming, oyster and mussel farming, ornamental fishery, integrated duck-fish farming, honey production from mangroves, growing aromatic and medicinal plants and seaweed farming. Efforts are also directed at developing value chains for these livelihoods.<sup>130</sup> By directly interacting and working with coastal communities, projects of this nature can be effective in identifying the challenges that such communities face and support them in a way that can meaningfully contribute to building resilience against disasters. Furthermore, their policy recommendations are likely to be closer to reality. Capacity development of this nature uses a bottom-up approach in bringing forth institutional changes.

The UNCED recognized the importance of capacity building for the protection of the natural environment during the development process. This cannot be achieved without regional cooperative management along with national policies to implement ICZM.<sup>131</sup> However, for such management to succeed, it is vital to incorporate three aspects. Firstly, there must be consideration accorded to the historical practices related to the management. Secondly, the specific objectives of the plan must be clearly laid out. Thirdly, the tools adopted for

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[https://www.ecologic.eu/sites/files/project/2013/Brief\\_CC\\_and\\_natural\\_disasters\\_scientific\\_evidence\\_of\\_relati\\_on\\_Jan\\_2006\\_EP\\_version.pdf](https://www.ecologic.eu/sites/files/project/2013/Brief_CC_and_natural_disasters_scientific_evidence_of_relati_on_Jan_2006_EP_version.pdf).

<sup>126</sup> *Disaster Risk Financing: A Global Survey of Practices and Challenges*, OECD (2015) available at – [https://read.oecd-ilibrary.org/finance-and-investment/disaster-risk-financing\\_9789264234246-en#page3](https://read.oecd-ilibrary.org/finance-and-investment/disaster-risk-financing_9789264234246-en#page3).

<sup>127</sup> *Supra* note 1, at 6.

<sup>128</sup> *Supra* note 22, at 305.

<sup>129</sup> *Id.*

<sup>130</sup> *Supra* note 53.

<sup>131</sup> Giuseppe Daconto, *Capacity Building For Integrated Coastal Zone Management In Countries Of South Asia in 3 COASTAL ZONE MGMT. IMPERATIVE FOR MARITIME DEV. NATIONS* (1997).

management must be within the scope of capacity of the regional bodies for a full-fledged participatory approach. Creation of specialized institutions with well-defined responsibilities at the community level is also an important feature for carrying out capacity building through ICZM.<sup>132</sup>

Another form of capacity development is educating coastal communities about disasters. This aspect has received importance in the National Disaster Management Plan, 2019<sup>133</sup>, the plans of several coastal states<sup>134</sup> and that of Andaman and Nicobar Islands.<sup>135</sup> These plans aim at disseminating information about disasters and communicating mitigation measures to the public. The National School Safety Policy of 2016 was a more directed effort to educate school students and teachers about disasters through training, mock-drills and mass sensitisation programmes.<sup>136</sup>

Education about measures specific to coastal communities can be more effective when conducted by local authorities or by experts in the field of coastal disasters. ‘Sagar Vani’, an application developed by ESSO - Indian National Centre for Ocean Information Services for providing ocean information services can be used as a channel for providing information on coastal disasters to coastal communities<sup>137</sup>. In addition to spreading disaster awareness, such a platform can be used in all phases of coastal disasters if the required infrastructure remains unaffected even after being hit by the disaster. By building disaster resilience of the required structural infrastructure, communication with the affected coastal community can be maintained at all times. In the pre-disaster phase, this allows early warning and evacuation and in the post-disaster phase, it would aid in identifying the location of victims and ascertaining their status. This proves how structural and non-structural measures are deeply connected and complement each other.

Appreciating and incorporating the knowledge of indigenous coastal communities as part of disaster awareness programmes will make the suggested measures more relatable to the community and will be more easily accepted. Respecting the hierarchies that exist within the community and factoring them into coastal community-based disaster prevention and mitigation steps could help in leveraging the strong lines of communication within the community. A study of the coastal indigenous communities in Samoa revealed that the role of indigenous institutions was vital in the recovery phase and in preparing for future tsunamis. Furthermore, the community may be structured in a way which builds accountability. Such a system will play a

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<sup>132</sup> Stephen B. Olsen et al., *Ecuador's Participatory and Adaptive Approach to Integrated Coastal Management*, in COASTAL ZONE MGMT. IMPERATIVE FOR MARITIME DEV. NATIONS 253(1997).

<sup>133</sup> *Supra* note 22 at 99.

<sup>134</sup> *Supra* note 27 at 10; *Supra* note 31 at 50; Karnataka State Disaster Management Authority, KARNATAKA STATE DISASTER MANAGEMENT PLAN 93 (2019); State Disaster Management Authority, MAHARASHTRA STATE DISASTER MANAGEMENT PLAN 11 (2016) *Supra* note 24 at 161; *Supra* note 101 at 8; *Supra* note 25 at 61.

<sup>135</sup> Andaman And Nicobar Administration, ANDAMAN AND NICOBAR ISLANDS DISASTER MANAGEMENT PLAN 25 (2012).

<sup>136</sup> National Disaster Management Authority, NATIONAL DISASTER MANAGEMENT GUIDELINES - SCHOOL SAFETY POLICY 13 (2016).

<sup>137</sup> "SAGAR VANI" - *An Integrated Information Dissemination System*, ESSO - INCOIS, available at – <https://incois.gov.in/portal/datainfo/ids.jsp> (last visited on Oct. 15, 2020).

key role in ensuring that no individual in the community gets excluded in the event of a disaster.<sup>138</sup>

## CONCLUSION

Rising occurrences of coastal disasters such as cyclones and floods have highlighted the need for stronger measures for disaster prevention and mitigation in coastal areas. Although the existing framework recognises these gaps and lays down comprehensive measures for their redressal, a greater thrust is required for the integration of disaster risk reduction in the development process to ensure coastal community resilience to disasters. Measures in recognition of this would not only help coastal communities in springing back from the devastating effects of disasters but would also give more meaning to the principle of sustainable development and the constitutional safeguards under Article 21. Since sustainable development entails environmental protection along with human development, efforts to mitigate the effects of disasters must be extended to the protection of coastal ecosystems as well.

Scientific coastal zone management, recognition and conservation of more MPAs, regulation of fisheries and strengthening bio-shields are different methods that are primarily aimed at protecting the coastal environment. However, what needs to be internalised at an institutional level is the fact that environmental preservation is a disaster mitigation measure in itself. In addition to this, they preserve the livelihoods of those dependent on the resources that the coastal ecosystem is endowed with. Conservation of the coastal ecosystem is thus crucial in building resilience of the ecosystem and those surrounding it.

Environmental preservation is not the sole solution to developing the resilience of coastal communities. The long-term needs of communities affected by disasters will be better addressed with the setting up of a Disaster Mitigation Fund. Bouncing back from disasters will be easier when the monetary support from the fund is complemented by short term measures and schemes that target coastal communities. Well-developed microfinance packages and insurance schemes that are tailor made for coastal communities are other measures that are critical to building livelihoods and assets that are resilient to the effects of disasters and climate change. Assets and infrastructure can also be made disaster resilient by adopting disaster-specific structural measures and scientific construction practices. All these measures will be more effective with improved community awareness of disaster risks, unconventional projects and partnerships with international organisations, NGOs and the private sector.

Disaster Risk Reduction is a complex process which is a combination of all aspects of disaster management. India has set the right goals. By implementing scientific measures that are inclusive of all vulnerable groups, we will take a step closer to achieving disaster resilience.

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<sup>138</sup> Andrew Rumbach & Dolores Foley, *Indigenous Institutions and Their Role in Disaster Risk Reduction and Resilience: Evidence from the 2009 Tsunami in American Samoa*, ECOLOGY AND SOCIETY, available at – <https://www.ecologyandsociety.org/vol19/iss1/art19/> (last visited on Oct. 15, 2020).