

# **Policy Brief on Ecosystem-based adaptation (EbA) and Nature-based solutions (NbS) for Resilience building**

## **Abstract**

This policy brief discusses the need for effective disaster risk reduction (DRR) and climate resilience strategies, particularly in the face of increasing natural hazards, such as floods, droughts, storms, and landslides, that are amplified by climate change-induced sea level rise, extreme weather events, and rising temperatures. Nature-based solutions (NbS) and ecosystem-based adaptation (EbA) have gained significant attention as sustainable and effective approaches to address these challenges. However, despite the potential benefits of EbA and NbS for DRR and climate resilience in India, there are significant policy gaps that limit their implementation. These gaps include inadequate institutional frameworks, lack of community engagement in adaptation planning, insufficient private sector participation, low budgetary allocation for climate change adaptation programs, and a lack of an integrated and system-thinking framework for NbS implementation and impact evaluation. The brief recommends adopting EbA and NbS to enhance India's resilience to climate change and reduce disaster risk while addressing the policy gaps to scale up these approaches effectively.

## **Problem statement**

Natural hazards such as floods, droughts, landslides, and storms are becoming more frequent and intense, exacerbated by climate change-induced sea level rise, extreme weather events, and temperature increases. As a result, disaster risk reduction (DRR) and climate resilience strategies are urgently needed to protect communities and ecosystems. Although nature-based solutions (NbS) and ecosystem-based adaptation (EbA) are increasingly recognised as sustainable and effective approaches to enhance DRR and climate resilience, there are significant policy gaps limiting their implementation in India. As a result, India's vulnerability to climate change and natural hazards remains high, leading to significant economic and human losses. Therefore, there is a need to address these policy gaps to ensure the effective implementation of NbS and EbA in India for DRR and climate resilience. This policy brief examines the concepts of EbA and NbS for DRR, their adoption in India, policy gaps, good practices, and recommendations for policymakers.

## Background

Floods, droughts, landslides, and storms, among other natural hazards, are becoming more frequent and intense, amplified by climate change-induced sea level rise, extreme weather events, and temperature increases. Consequently, there is an urgent need for effective disaster risk reduction (DRR) and climate resilience strategies. In response, policymakers and practitioners are exploring nature-based solutions (NbS) and ecosystem-based adaptation (EbA) as sustainable and effective approaches. These approaches have gained significant traction for their potential to enhance DRR and climate resilience.

Ecosystem-based adaptation (EbA) and nature-based solutions (NbS) rely on nature to enhance disaster risk reduction (DRR) and climate resilience. EbA is the use of biodiversity and ecosystem services as part of a larger adaptation strategy to help people adapt to the adverse effects of climate change. EbA aims to maintain and increase the resilience and reduce the vulnerability of people and the ecosystems they rely upon in the face of the adverse effects of climate change.<sup>1</sup> The goal is to boost resilience and diminish the susceptibility of ecosystems and communities to the adverse effects of climate change.<sup>2</sup>

While NbS can be defined as actions to protect, sustainably manage, and restore natural or modified ecosystems that address societal challenges effectively, simultaneously providing human well-being and biodiversity benefits.<sup>3</sup> NbS is a more broader concept encompassing a wide range of approaches using nature to address societal challenges, including climate change, biodiversity loss, and sustainable development. EbA and NbS have several advantages over traditional, hard infrastructure-based approaches to DRR. They are cost-effective<sup>4</sup>, provide

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<sup>1</sup> CBD. (2015). Biodiversity against climate change: ecosystem-based approaches and opportunities for adaptation. Retrieved from

<https://www.cbd.int/article/biodiversityagainstclimatechange-1>

<sup>2</sup> CBD (2009). Secretariat of the Convention on Biological Diversity (2009). Connecting Biodiversity and Climate Change Mitigation and Adaptation: Report of the Second Ad Hoc Technical Expert Group on Biodiversity and Climate Change. Montreal, Technical Series No. 41, 126 pages.

<sup>3</sup> Walters, Gretchen Marie. 2016. Nature-Based Solutions to Address Global Societal Challenges. Nature-Based Solutions to Address Global Societal Challenges. <https://doi.org/10.2305/iucn.ch.2016.13.en>.

<sup>4</sup> United Nations Environment Programme (2020). The Economics of Nature-based Solutions: Current Status and Future Priorities. United Nations Environment Programme Nairobi.

multiple benefits beyond disaster risk reduction, and can be more resilient to climate change due to their reliance on diverse and adaptive ecosystems.

India is one of the most disaster-prone countries in the world, with a high vulnerability to climate change impacts such as floods, droughts, cyclones, and landslides. India ranks second in the 2011 Climate Change Vulnerability Index and is particularly vulnerable due to growing urbanization, industrialisation and economic growth.<sup>5</sup> The country has experienced a significant increase in the frequency and intensity of extreme weather events in recent years, which has resulted in significant economic and human losses.

The study by the Indian Network for Climate Change Assessment (INCCA) using PRECIS models, predicts an increase in annual mean temperatures of between 1.5 and 2.0°C by the 2030s.<sup>6</sup> Additionally, projections for 2050, and 2080, also indicate an overall warming owing to a rise in GHG levels.<sup>7</sup> Adopting EbA and NbS can help India address these challenges by enhancing its resilience to climate change and reducing disaster risk.

India has a diverse range of ecosystems, including forests, wetlands, and coastal zones, which can provide a range of ecosystem services that can enhance DRR and climate resilience. Implementing EbA and NbS can provide multiple benefits, such as reducing soil erosion and increasing soil fertility, which can improve agricultural productivity and enhance food security. They can also provide climate regulation benefits by sequestering carbon and reducing greenhouse gas emissions. Furthermore, they can provide recreational and cultural benefits, such as ecotourism and biodiversity conservation.

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<sup>5</sup> Porsché, I., Kalisch, A. and Füglein, R. (2011). Adaptation to Climate Change with a Focus on Rural Areas and India. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, New Delhi, India. Pp. 232. Available online through: [www.giz.de](http://www.giz.de)

<sup>6</sup> MoEF [Ministry of Environment and Forestry] (2010). Climate Change and India: A 4x4 Assessment A Sectoral and Regional Analysis for 2030s. Executive Summary Report. Indian Network for Climate Change Assessment. Ministry of Environment and Forests, Government of India. New Delhi, India. Pp.36. Available online at: [moef.nic.in/downloads/public-information/fin-rpt-incca](http://moef.nic.in/downloads/public-information/fin-rpt-incca)

<sup>7</sup> MoEF (2012). India Second National Communication to the United Nations Framework Convention on Climate Change. Ministry of Environment and Forests, Government of India. New Delhi, India. Pp.310. Available online through: [http://unfccc.int/national\\_reports/annex\\_i\\_natcom/submitted\\_natcom/items/4903.php](http://unfccc.int/national_reports/annex_i_natcom/submitted_natcom/items/4903.php)

## Policy Gaps

Despite the potential benefits of EbA and NbS for DRR and climate resilience in India, there are significant policy gaps that limit their implementation.

Southeast Asia and East Asian countries, particularly India faces various challenges in the implementation of NBS or EBA including characteristics of urbanization, biophysical environment and climate conditions, ecological hazards and rehabilitation, human-environment connections and disputes, and policy and governance frameworks.<sup>8</sup>

However, India has also taken steps to create an institutional framework and mainstream climate change adaptation measures in several sectoral policies such as in National Environment Policy (NEP), National Water Policy, National Policy for Farmers, etc. However, there are serious policy gaps in addressing the potential risks of climate change as well. For instance, the potential impacts of climate change on human health is overlooked in the draft National Health Policy. Similarly, in the Strategic Plan for New and Renewable Energy Sector for the Period 2011–2017, climate change continues to be identified as an external factor that will drive the development of the country's renewable energy sector, but the potential risk that climate change poses to energy production is not acknowledged.<sup>9</sup>

Moreover, there is a lack of an integrated and system-thinking framework for NbS implementation and impact evaluation. Although there are tools, models, design guidelines, standards, and protocols available for NbS implementation, there exists a need for a framework that takes into account diverse climatic, environmental, and social-economic conditions and urban designs. This framework should also integrate NbS into local policy frameworks, socio-economic transition pathways, and spatial planning.<sup>10</sup>

Additionally, there is a need for more community engagement in adaptation planning, as well as higher private sector participation in developing climate-smart and inclusive cities.<sup>8</sup>

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<sup>8</sup> Lechner, A. M., Gomes, R. L., Rodrigues, L., Ashfold, M. J., Selvam, S. B., Wong, E. P., ... & Gibbins, C. (2020). Challenges and considerations of applying nature-based solutions in low-and middle-income countries in Southeast and East Asia. *Blue-Green Systems*, 2(1), 331-351.

<sup>9</sup> Patra, J. 2016. Review of Current and Planned Adaptation Action in India. CARIAA Working Paper no. 10. International Development Research Centre, Ottawa, Canada and UK Aid, London, United Kingdom. Available online at: [www.idrc.ca/cariaa](http://www.idrc.ca/cariaa).

<sup>10</sup> Liu, H.-Y., Jay, M., & Chen, X. (2021). The Role of Nature-Based Solutions for Improving Environmental Quality, Health and Well-Being. *Sustainability*, 13(19), 10950. <https://doi.org/10.3390/su131910950>

**Financial and governance challenges** are major barriers to implementing NbS at scale. Reforms are required for governments to break down departmental silos and allow flexible urban governance structures that support collaborative bottom-up processes, such as grass root and civil society initiatives. For businesses, it is essential to make a financial case for NbS, synthesizing the existing practices on sustainable and innovative financing of NbS, bringing actors working on social innovations together, and developing promotional strategies and business models.<sup>9</sup>

In addition, budgetary allocation for climate change adaptation programs in India is very low (2.68% of GDP) and majority of the allocation is through traditional development programs. This indicates a lack of integration between development and adaptation programs, highlighting the need to internalize the development-adaptation continuum and climate-proof the country's development investments and gains.<sup>8</sup>

Finally, greater investment in research and development is essential to identify and address the specific challenges and opportunities of implementing NbS and EbA in India. Bulk of the research undertaken on NbS currently is focused on developed, high income countries with low population growth rates and regulated urban planning.<sup>7</sup>

When it comes to implementing NbS, it is recommended to assess the ability of complex models in making useful predictions at relevant spatial and temporal scales, considering the critical issues of scale in nature-based solutions (NbS). An assessment should be conducted to identify the most suitable model(s) for specific purposes and to suggest improvements that can enhance the accuracy and usefulness of complex models in NbS.<sup>4</sup>

## **Case Studies**

Nature and ecology based approaches have been successfully adopted globally to a great success, such as the restoration of mangrove forests in the Philippines, use of green infrastructure in New York City, etc. These provide several benefits for instance, reduced flooding, improved water quality, as well as multiple co-benefits of improved air quality, increased biodiversity, and enhanced urban aesthetics.

The cost-benefit analysis (CBA) of watershed development (WSD) in the Kumbharwadi rain-fed watershed in Maharashtra revealed market-benefits, such as improved crop and livestock sales, and non-market benefits, including carbon sequestration, improved biodiversity, and

community development.<sup>11</sup> The WSD project had a net present value ranging from US\$5.07 to US\$7.43 million, benefits of US\$5573 to US\$8172 per hectare treated, and a cost-benefit ratio ranging from 2.28 to 3.7, making it a successful investment.<sup>10</sup>

A watershed development project (WSD) in Kodikitundas village of Orissa by Agrabamee, a local NGO, aimed to rehabilitate and preserve the natural resources of the community. The project involved several activities such as soil and water conservation, tree planting, and strengthening of people's institutions to facilitate infrastructure maintenance and product marketing. The project resulted in improved agricultural land, more efficient use of resources, and new sources of income, including significant additional income from the sales of fruits, non-timber forest products, and timber. Additionally, the project cultivated fast-growing tree species, allowing the villagers to generate greater income from wood sales annually. As a result, most households in Kodikitundas were able to invest in new housing and send their children to school due to improved income.<sup>12</sup>

Numerous other examples from India such as restoration of the Chilika Lake ecosystem in Odisha, the restoration of the Kumbhalgarh Wildlife Sanctuary in Rajasthan, the watershed management programs done by National Rural Livelihoods Mission (NRLM), Joint Forest Management program, involving the participation of local communities in the conservation and management of forests etc., have proven the benefits of using nature based solutions and ecology based approaches in disaster risk reduction and climate change adaptations.

## **Recommendations**

To promote the adoption of EbA and NbS, policymakers can take the following actions:

1. Increase awareness and understanding of EbA and NbS concepts through capacity building and awareness-raising programs for policymakers, practitioners, and the general public.
2. Develop national and local policies that promote the use of EbA and NbS in DRR and climate resilience strategies. This can be achieved through inter-sectoral and inter-

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<sup>11</sup> Gray and Srinidhi (2013). (2013). Watershed Development in India: Economic valuation and adaptation considerations. Working Paper. Washington, DC: World Resources Institute. Pp. Available online at: <http://www.wri.org/publication/watershed-development-indiaeconomicvaluation-adaptation-considerations>

<sup>12</sup> Pande, P. and Akermann, K. (2011). Adaptation of small-scale farmers to climatic risks in India. New Delhi, India: Sustainet. Pp. 101. Available online through: [www.sustainet.org](http://www.sustainet.org)

governmental coordination and collaboration in the development of policy frameworks and guidelines.

3. Strengthen institutional capacity and resources for the implementation of EbA and NbS through the establishment of dedicated agencies, funds, and partnerships. Capacity building for stakeholders, including local communities, is also essential for effective implementation.
4. Develop monitoring and evaluation frameworks to assess the effectiveness of EbA and NbS in enhancing DRR and climate resilience. This will ensure that initiatives like NbS or EbA are effectively implemented and will prioritize actions to better understand the process.
5. Foster innovative financing mechanisms, such as green bonds, public-private partnerships, and impact investing, to increase access to finance for EbA and NbS projects.
6. The government should also leverage community time contributions<sup>13</sup> or involvement to reduce the financial challenges of implementing NBS in developing countries.
7. Additionally, developing robust scientific evidence on climate change impacts at subnational and district levels is crucial in prioritizing actions and effectively implementing EbA and NbS initiatives.

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<sup>13</sup> Hagedoorn, L. C., Koetse, M. J., van Beukering, P. J., & Brander, L. M. (2021). Reducing the finance gap for nature-based solutions with time contributions. *Ecosystem Services*, 52, 101371.

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