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INTERSECTIONALITY OF CLIMATE CHANGE AND SDGs IN THE GLOBAL SOUTH

Lighthouse Cases and Learnings from India

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EDITORS

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Climate Change and the SDGs: Understanding Intersectionality and Causality

Nilanjan Ghosh

AS THE MID-TERM REVIEW of the SDGs approaches in September 2023, it will not be an exaggeration to state that the global development paradigm is at a critical crossroad. The COVID-19 pandemic exposed the vulnerabilities of economies, globally, irrespective of their positions in the development curve, and just when post-pandemic economic revival seemed to be in the offing, the Ukraine-Russia war emerged as another exogenous shock to the global economy, thereby further derailing the development goals.

With this global backdrop, India assumed the G20 presidency in December 2022. Many observers claim that India is the mid-point of the G20 troika of the Global South, with Indonesia being its predecessor and Brazil the successor in taking up the presidency. However, India's position, more aptly, should be taken as the second corner of the quadrilateral of the Global South as South Africa is slated to take over the G20 presidency after Brazil. While the G20, under various presidential dispensations, has always taken up the SDGs as one of its key verticals, this Global South quadrilateral presidency will be in a position to represent the concerns of developing countries even more vociferously.

However, there is a perennial stressor for the global development ambitions: global warming and climate change. No doubt, the SDGs, which are the cornerstone of global development governance, have been impeded by this "global common bad" (as opposed to the good[a]). The G20 under the Indian presidency adequately appreciates this, as seen in various communiqués.[1,2]

In 2015 the era of the millennium development goals ended, and the development agenda found a more comprehensive form in the 2030 Agenda for Sustainable Development involving the global call for adoption of the 17 Sustainable Development Goals (SDGs) that speak of reconciling sustainable living, distributive justice, and economic progress (Figure 1). This brings about a critical dimension in the global paradigm of development governance that can more aptly be

[a] A "good" is defined as a commodity or a service that provides benefits to human communities. As opposed to that, a "bad" is defined as that commodity or service that is harmful.

described as the reconciliation between the "irreconcilable trinity" of equity, efficiency, and sustainability. This trinity delineates what development economist Mohan Munasinghe calls the "discourse of Sustainomics"[3] (Figure 2).

Figure 1: UN Sustainable Development Goals

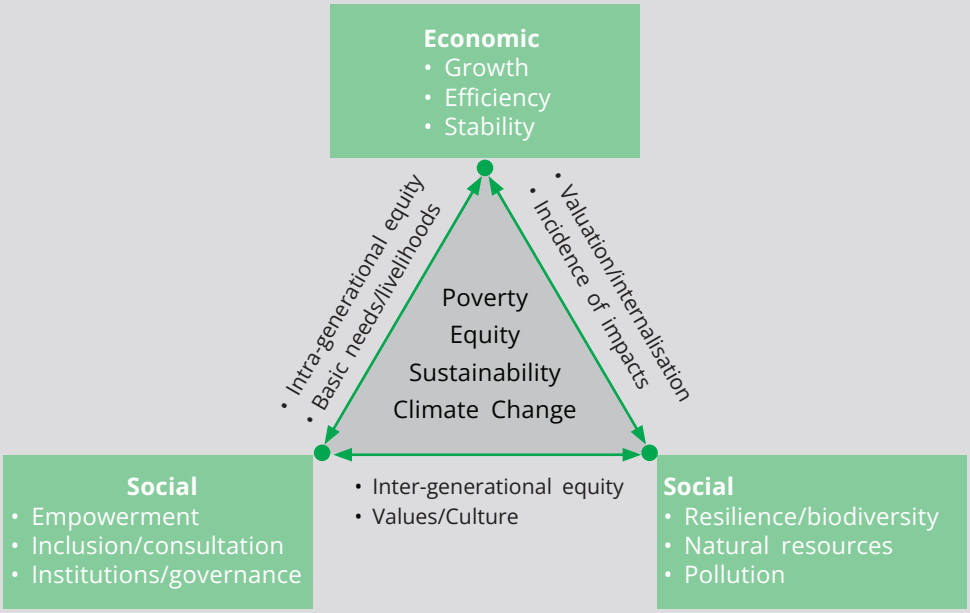
Source: https://www.un.org/sustainabledevelopment/blog/2015/12/sustainable-development-goals-kick-off-with-start-of-new-year/#

The 17 SDGs are not always in consonance with each other, and in many cases, can indeed be conflictual. It can often happen that the ecosystem-based SDGs, through the ways they have been attempted to be achieved traditionally, can go against the equity-based SDGs. For example, conservation efforts by governments in more traditional set-ups have resulted in uprooting human habitat from and around protected areas, thereby adding to the miseries of the poor who are dependent on the ecosystem services. The challenge of development governance therefore requires a reconciliation between these goals. In the course of this reconciliation, the SDGs highlight the importance of co-existence of human societies and natural ecosystems: after all, the former is dependent on these ecosystems for the goods and services they provide free of cost. In other words, destruction and degradation of biodiversity brings about insurmountable losses in the capacity of the natural ecosystem to provide fundamental services to human communities, thereby raising questions on the long-term sustainability of lives and livelihoods. Therefore, in the SDGs, one finds the co-existence of various equity goals (e.g., ending poverty and deprivations, reducing inequality, improving human capital), efficiency parameters (e.g., economic growth and industrialisation) and goals on conservation of the natural ecosystem that are sustainability oriented. Finally, global partnership to realise the remaining 16 goals is espoused under SDG17.

Compounding the challenge is that all the SDGs need to be achieved while combating forces of global warming. SDG13 therefore talks of climate action to combat climate change either through mitigation and/or adaptation. Climate change has ubiquitous impacts on all human endeavours, thereby affecting SDG achievements.

This present volume deals with the intersectionality of SDGs with climate change, and in all cases hindering their achievements. It takes up the Indian case in the year of its G20 presidency and highlights all these intersectionalities in the Indian context. The statement for India definitely fits into the narrative posed by the stylised facts as obtained from various global experiences, and yet—as this volume highlights—there are Indian nuances that have yet to be explicitly addressed in the literature. This is the gap that this volume attempts to bridge.

Figure 2: The 'Sustainomics' Triangle



Source: Ghosh (2017)[4]

Climate Change and SDGs: The Bidirectional Causality

The intersectionality of climate change and SDGs is complex and multifaceted. Though 'intersectionality' emerged as a popular concept from the discipline of critical race theory, it has found its application in other domains including gender studies, environmental studies, and sustainability. Intersectionality acknowledges that different aspects of a person's identity—such as race, gender, sexuality, and class—interact with each other, creating unique experiences of oppression and privilege. In the context of climate change and sustainable development, intersectionality recognises that environmental problems and solutions are not isolated from other social and economic issues but are instead interconnected and interdependent. The intersectionality problem posed here therefore takes up the bidirectional causality between climate change and the various SDGs, and therefore highlights the importance of achieving SDG13 in achieving the other SDGs. While climate change is a significant obstacle to achieving the SDGs, progress on the SDGs can help mitigate and adapt to climate change. Understanding the intersectionality of climate change and SDGs is critical for developing effective solutions to both challenges.

1. Climate change affects the achievement of the SDGs. It impacts all aspects of sustainable development, including poverty reduction, health, education, gender equality, and economic growth. For example, climate change can exacerbate food insecurity and malnutrition by reducing agricultural productivity and increasing the frequency and severity of droughts, floods, and other extreme weather events. Climate change can also contribute to the spread of diseases such as malaria and dengue fever, which disproportionately affect the poorest and most vulnerable populations. Thus, climate change hinders the achievement of SDGs, especially in the developing and the underdeveloped world, which are most vulnerable to its impacts.

2. SDGs can help mitigate and adapt to climate change. The SDGs offer a promising framework for addressing climate change. Many of the SDGs have specific targets related to climate change mitigation and adaptation. For example, SDG13 (Climate Action) aims to strengthen resilience and adaptive capacity to climate-related hazards and natural disasters. SDG7 (Affordable and Clean Energy) promotes the use of renewable energy sources, which can help reduce greenhouse gas emissions. SDG11 (Sustainable Cities and Communities) aims to make cities and human settlements inclusive, safe, resilient, and sustainable, which can help reduce vulnerability to climate change impacts. Thus, the SDGs provide a roadmap for addressing climate change and achieving sustainable development.

How Climate Change Affects the SDGs

This intersectionality and the bidirectional causality bring to forth the importance of an integrated and holistic approach to sustainable development. To begin with, climate change is not merely an environmental problem: it is a developmental problem rooted in unbridled human ambitions towards promoting economic development often looked at only through the lens of GDP growth. Such a paradigm creates externalities like emission of CO_2 or equivalent in the atmosphere—the final impacts of which are felt in human lives, livelihoods and various development parameters as delineated by the SDGs. At the same time, the poorer nations with lower levels of educational attainment and economic

prosperity are the ones who have little resilience or shock-absorption capacities to climate change.

Indeed, climate change disproportionately affects the world's poorest communities who are often more reliant on natural resources for their livelihoods and have less capacity to adapt to changing conditions. Often, climate change can alter the ecosystem structure thereby influencing ecosystem functions, and eventually, diminishing the ecosystem services on which the poor are highly reliant. Given how a large portion of the poor's livelihoods emerge from the ecosystem services, these are often called the 'GDP of the poor'.[5] This comes in the way of achieving SDG1 (No Poverty). Again, in the context of SDG2 (Zero Hunger), climate change can lead to reduced crop yields and increased food insecurity, particularly in regions that are already vulnerable to food insecurity.

In the context of SDG3, climate change can have significant impacts on human health, including increased risks of vector-borne diseases, heat stress, and malnutrition. Climate change can disrupt educational systems thereby affecting achievement of SDG4, particularly in regions that are vulnerable to extreme weather events or changes in environmental conditions. This has spillover effects to SDG5, as women and girls are often more vulnerable to the impacts of climate change, particularly in regions where they have limited access to resources and decision-making power. Again, climate change can lead to changes in water availability and quality, which can impact human health and well-being, thereby affecting attainment of SDG6 (Clean Water and Sanitation). However, attainment of SDG7 (affordable and clean energy) helps in climate mitigation efforts by reducing greenhouse gas emissions through transition to clean energy sources, which can support economic development and reduce energy poverty.

At the same time, climate change can have significant impacts on economic stability by reducing human productivity, disrupting supply chains, and causing changes in natural resource availability that are often the most fundamental factors of production. In the process, they affect work conditions and business environment, and hinder economic growth. Therefore, climate change is inimical to SDG8 (decent work and economic growth). Meanwhile, Industry, SDG9 (Innovation and Infrastructure) that aims to "build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation", will require energy that

will also lead to carbon emissions—this goes against SDG13. Therefore, the cross-cutting nature of SDG9 and SDG13 originate from the former being inimical to the latter, while again addressing climate change requires innovation and investment in sustainable infrastructure and technology.

However, climate change is a massive social stressor and can aggravate existing inequalities, worsening poverty. This is also because the poor are more vulnerable to climate change, being bereft of the means of resilience. Therefore, SDG10 (reduced inequality) gets negatively affected in the process. In fact, as far as SDG11 is concerned, cities need to develop adaptive mechanisms as well as mitigative measures to combat the forces of climate change being exposed to risks of flooding, pollution and heat. Reducing greenhouse gas emissions requires changes in consumption and production patterns, including reducing waste and promoting sustainable practices. This creates the inextricable linkage of climate action and SDG12.

There is also ample scientific evidence of SDG14[6] and SDG15[7] (life on earth and under water) being affected by climate change. At the same time, the ocean ecosystem also serves as a crucial carbon sink, thereby helping carbon action. On a similar note, climate change acts as a stressor and impedes achievement of SDG16 of achieving Peace, Justice and Inclusion as important ends in and of themselves. Viewed more deeply, SDG16 is a critical enabler for achieving other SDGs, like ending poverty, ensuring education or conserving oceans. In a world of feud and conflict that is also often exclusionary, it is not possible to achieve the SDGs. Climate change can lead to natural resource conflicts due to scarcity and depletion, and may even lead to exclusion of vulnerable communities.[8] However, SDG17 (global partnerships) is needed urgently, as collective action at the global level is imperative for achieving SDG13.

Climate Action: Adaptation is Crucial for Global South

In many parts of the developing and the underdeveloped world, post-pandemic economic recovery has hinged on promoting economic growth through large-scale capital expenditures on physical infrastructure. India is no exception. Though this may be construed as a continuation of the trend that prevailed even before the pandemic, it is now being taken up with an even greater emphasis in large

parts of the Global South encompassing South Asia, the BRICS (Brazil–Russia–India–China–South Africa) region, and Africa.[9,10] This entails large-scale land-use change from green cover that are carbon sinks and an annual source of carbon sequestration to creating linear infrastructure to meet the needs of growing urbanisation.

The challenge is that large parts of the world view climate action only through the lens of energy transition from fossil fuels to renewable energy sources. Yet, it cannot be overemphasised that energy transition alone is not the panacea to all the problems faced by humankind. Land-use change from forests, grasslands, and coastal ecosystems to physical infrastructure creates losses in the carbon sink and annual carbon sequestration processes.[11] This also results in the release of the historically stored carbon and depletion of some of the critical ecosystem services—such as regulation of carbon sequestration. Mere energy transition cannot substitute for such losses, and unbridled land-use change can counteract the positive impacts that would otherwise have accrued from the energy transition.

At the same time, mitigation efforts are not sufficient at all. The Global South needs adaptation as wherewithal for mitigation might not be available, and at the same time, mitigation may not resolve the entire problem faced by these nations. As an example, in the Indian Sundarbans Delta (ISD) in the state of West Bengal in India, the landmass is shrinking due to sea-level rise and simultaneous decline in sediment flows due to upstream construction over the mainstream Ganges. Ingression of saline waters have made agriculture unviable. Further even, embankments are not turning out to be sustainable solutions due to regular breaching in times of extreme events like cyclones and storm surges. Locally, large tracts of agricultural lands are being converted to fisheries and shrimp culture as an organic adaptation process by the communities.[12] Further, it is feared that certain vulnerable regions might cease to exist by 2040[13] under business-as-usual climate scenario. Suggestions are being made for the "strategic retreat" of populations from the vulnerable regions to more stable regions—such newer modes of adaptation measures become extremely important here.[14]

Despite the importance of adaptation in the Global South, climate financing has been lopsided and biased towards mitigation efforts. This was pointed out by a *Joint Report on Multilateral Development Banks' Climate Finance* published in

2018 and prepared by the European Bank for Reconstruction and Development, together with the African Development Bank, the Asian Development Bank, the European Investment Bank, the Inter-American Development Bank Group, the Islamic Development Bank and the World Bank Group.[15] According to World Bank economist Govinda Timilsina,[16] the apparent bias towards mitigation occurs due to two reasons. First, results from mitigation investment are perceptible in the short run, e.g., returns on investments in energy efficiency or in renewable energy can be perceived through the financial cost savings, as well as from the estimable break-even periods.

The same is not true for adaptation projects. For instance, returns on investment in cyclone-resistant structures might not be perceptible if cyclones do not occur. Further still, it is difficult to find funders for adaptation modes such as the "strategic retreat" of populations to safer zones, since returns on such investments have long gestation periods and their impacts on lives and livelihoods are often difficult to predict. Second, adaptation projects find less traction amongst funding agencies because of the 'public goods' nature of such projects. Large parts of the public-sector climate finance for climate-change mitigation leverages private-sector finance, and the private sector does not consider financing 'public goods' as viable investments. In comparison, the private-sector financing of clean-energy technology is increasing, given their clear linkage with investments and returns.

Even the Green Climate Fund (GCF) initially had a bias towards funding mitigation projects, as opposed to those for adaptation. As of 16 March 2023, 60 percent of nominal funding has gone into mitigation projects, while 40 percent has gone into adaptation funding.[17] This is simply not sufficient. In March 2023, participants in a meeting hosted by Agence Française de Développement and ORF reiterated the overall bias against adaptation projects in terms of initiatives and funding. It seems as if adaptation has largely been a community-driven, organic initiative which often receives little attention from governments and multilaterals. One reason that came out from the meeting for this indifference of policymakers towards adaptation is the varying definitions of "projects" between the MDBs (multilateral development banks) and the CSOs.[18] This often results in many adaptation projects not being considered as worthwhile initiatives to receive funding.

This present volume concerns itself more with the adaptation element of climate action. In the process, the chapters adopt the Drivers-Pressures-State-Impacts-Response (DPSIR) framework to analyse the various initiatives while talking about the intersectionalities, and how climate action largely in the form of adaptation can help combat the impacts of climate change.

The Drivers-Pressures-State-Impacts-Response (DPSIR) Framework[b]

The DPSIR framework helps in understanding the bidirectional causality between societies and natural ecosystems. Initially developed by the OECD,[19] the framework was further modified by the EEA[20] and the UNEP[21] in order to relate human activities to the state of the environment.

Drivers: The drivers are the societal, demographic, and economic movements as well as the accompanying transformations in production methods, ways of life, and overall consumption levels. These drivers originate externally to the environmental system and involve influences or unexpected events arising from the social, economic, and institutional systems. They generate pressures on the environmental condition, either directly or indirectly. These driving forces frequently interact and do not follow a hierarchical structure, influencing the structure and dynamics of the social, economic, political, and environmental systems.[22] The drivers are classified into four categories: primary, secondary, tertiary, and base drivers. The primary driving forces arise from human economic activities such as industry, agriculture, and tourism. The secondary driving forces encompass policies (e.g., forest or wetlands policy, statutes) or policy changes. The tertiary driving forces emerge in the long term and have a broader spatial impact, driven by shifts in perceptions and lifestyle (e.g., media influences, evolving consumption patterns). Lastly, the base driving forces consist of fundamental trends (demographic or cultural) that are shaped by long-term social decisions.

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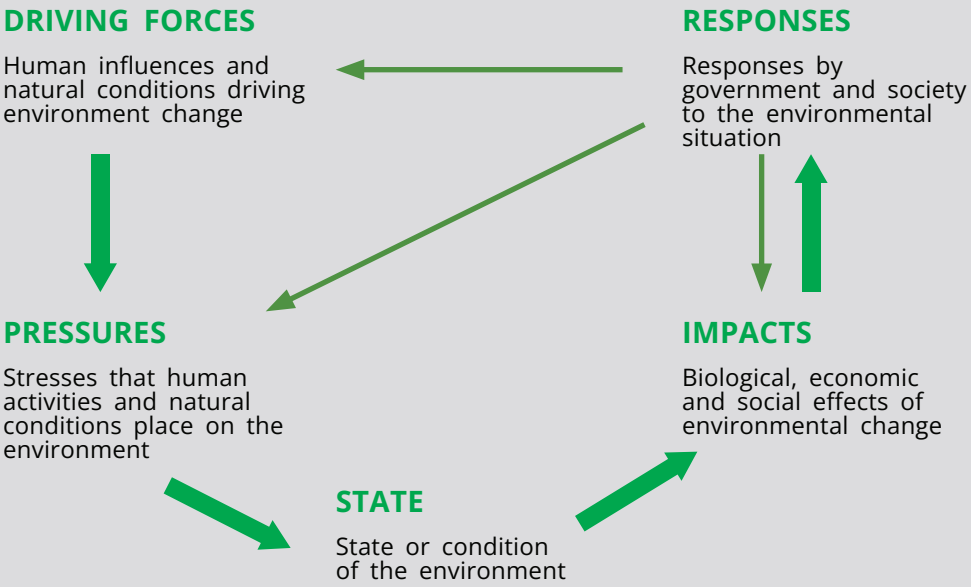
[b] Large portions of this section take inspiration from: Jayanta Bandyopadhyay, Nilanjan Ghosh and Chandan Mahanta, *IRBM for Brahmaputra Sub-basin: Water Governance, Environmental Security, and Human Well-Being* (New Delhi: Observer Research Foundation, 2016.)

Fig. 1: The Generic DPSIR framework



Source: Bandyopadhyay et al[23]

Pressures: Pressures emerge as the direct results of the drivers. They are human-induced forces entailing environmental impacts. EEA's definition of pressures is as follows: "... developments in release of substances (emissions), physical and biological agents, the use of resources and the use of land by human activities."[24]

State: The existing condition of a system, whether natural or socio-economic or the interface of the two, delineates the State. This entails both qualitative and the quantitative facets of the social or the natural ecosystem, human society, quality of life indicators to even larger socio-economic issues.

Impacts: Drivers exert pressures on the existing State. These pressures make their presence felt through *Impacts* that entail changes in a social-ecological space. The changes may be observed in the local or regional economy, or the natural ecosystem and concomitant ecosystem functions and services, thereby affecting environmental, social and economic dimensions. These might be in the form of water and air quality, soil fertility, and health or social cohesion.[25] Essentially, Impacts entail the resulting influences on human well-being through various channels that may be human-induced or natural.

Response: Impacts trigger responses either in the form of an organic mode from within a community or through a policy action. Either way, the Responses are actions driven towards mitigation or adaptation processes to combat the impacts either through elimination or reduction of their negative consequences or promotion of positive consequences. Social groups, individuals, governments, civil society groups can come up with the responses. Essentially, it is a feedback loop of impacts that help initiate responses. In turn, responses can influence trends in the drivers, which in turn, can alter or modify the entire loop.

It would be useful to go back to the case of the Indian Sundarbans Delta discussed earlier in this chapter. The key driver in this case is resuscitation of the Kolkata port that was getting sedimented, for which the Farakka barrage was constructed in the mainstream Ganges. The pressure point emerges from the streamflow depletion and sediment deposition in the upstream of the Farakka and also from sea-level rise. While sea-level rise has been historically leading to subsidence of land, the land resuscitation from the sediment flow through the creeks and canals are not sufficient due to decline in sediment flow. This leads to the *state*, i.e., the delta ecosystem to shrink on one hand, and on the other, salinity ingression has led to salination of the soil thereby making the agricultural lands unsuitable for paddy cultivation.

What is the community level *response* mechanism? This has been in the form of adaptation through conversion of agricultural land to brackish water fishery. What is the *policy level response mechanism?* This is through construction of embankments that are also getting breached in the process. Here, the response mechanism is more from an adaptation perspective rather than mitigation. One also will note the adoption of solar energy in the Indian Sundarbans region, where fossil fuel-based electricity could not penetrate at scale. How does the feedback loop work here? The feedback loop therefore shows that the responses can neither address the drivers, nor the pressure points. Rather it only addresses the *state*, thereby implying that a different model of adaptation needs to be utilised.

About this Volume

This volume delves into the intersectionality of climate action with a few selected SDGs—namely, SDG2, SDG3, SDG5, SDG11, SDG12, SDG15, and SDG17. Although the authors and editors chose these SDGs for this volume, the other goals are equally important. There are two overarching rationales for focusing on these SDGs. First, these SDGs are proverbial low-hanging fruits in terms of understanding their multiple points of intersectionalities with the forces of climate change at both conceptual and human perceptive levels. Second, given the cross-cutting nature and the inextricable linkages of these SDGs with others that have not been considered in these articles, the analyses can lead to separate and more informed evaluations of the intersectionalities between climate change and the other SDGs. Certain indications can be made out from this volume.

There are seven chapters in this compendium that seek to address the intersectionalities. DPSIR is adopted as a cross-cutting framework for analysing the various cases and for documenting best practices from across the world. With its focus largely on adaptation and building resilience, the volume takes up Indian cases and identifies appropriate mechanisms that can inform policymakers as they intervene in this domain. Chapter 2, authored by *Promit Mookherjee,* takes up SDG15 (Life on Earth)—the goal that is fundamental to the existence of largely terrestrial and non-oceanic life forms on the planet, and assesses how climate change interacts and intersects with this goal. In Chapter 3, *Gopalika Arora* and *Aparna Roy* outline the challenges posed by climate change to the urbanscape or the ecosystem of cities. *Anirban Sarma,* in Chapter 4, then weaves the story of the intersectionality between climate change and health, and highlights some of the responses from India, being an important representative of countries in the Global South. *Shoba Suri* writes about climate-resilient food systems in Chapter 5, highlighting the dynamic interactions between climate change and food production and thereby addressing SDG2's intersectionality with the forces of climate change. Chapter 6 by *Swati Prabhu* takes on an interesting challenge: it looks at how global climate change intersects with SDG17 while considering the gender equality dimension as propounded by SDG5. The last essay, Chapter 7, by *Akshay Shetty* and *Kirti Jain* evaluates the multi-stakeholder approach to climate action and highlights the roles of civil society organisations (CSOs).

The volume further seeks to highlight innovative interventions and solutions that address the issues posed by these intersectionalities, especially for India's most vulnerable and marginalised communities. These cases not only provide insights, best practices and lessons shared by diverse actors on driving equitable climate action and strengthening community resilience, but they also offer replicable frameworks for application in the Global South with comparable settings. Therefore, in that sense, the Indian cases presented here can serve as 'lighthouse' cases and applications that show plausible pathways for many other nations grappling with similar problems.

Despite climate change being posed as a global common, its impacts are differentiated and it is untenable to pose the hypothesis of a "common future" for the planet. Together, these articles take up the case for a differentiated future, keeping in mind the concerns of the Global South; they make the case for an "uncommon" future. At the same time, this volume attempts, in the year of India's G20 presidency, to create a platform for showcasing, on one hand, the Indian leadership in the domain of climate action, and on the other, learnings for India from best practices in other parts of the globe.

> *"Climate change is not merely an environmental problem: it is a developmental problem rooted in unbridled human ambitions often viewed only through the lens of GDP.*

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2

An Inimical Intersection: Climate Change and Life on Land

Promit Mookherjee

HUMANKIND FACES TWO veritable environmental crises: climate change and biodiversity loss. The 1.2-degrees-Celsius rise in global mean temperatures, since the pre-industrial period, has been accompanied by a rapid decimation of natural capital. Progress on SDG15 related to preserving life on land has been slow and shows wide geographical differences. *The Living Planet Report 2022* estimates a staggering 69 percent average decline in species populations since the 1970s.[1] Meanwhile, the 2022 SDG progress report estimates a net loss of around 100 million hectares of forest area between 2000 and 2020, although Asia, Europe, and North America showed an increase in forest cover largely due to afforestation efforts in those countries.[2] Ecosystem services underpinned by biodiversity are now declining at an unprecedented rate, putting at risk the well-being of present and future generations.

The Intersection of Climate Change and SDG15

Agriculture and urbanisation have historically been the primary drivers of terrestrial biodiversity loss through relentless land-use changes. However, climate change is increasingly becoming a significant contributor to the decline of biodiversity. Climate and biodiversity are interlinked in several ways and this nexus has substantial implications for several other SDGs:

- As climate-related extreme weather events accelerate, they also cause substantial damage to natural ecosystems. This often leads to habitat loss and fragmentation, negatively affecting biodiversity, particularly in vulnerable ecosystems such as tropical rainforests, coral reefs, mangroves, and grasslands. For example, the 2019 cyclone Fani wiped out 800,000 trees and damaged 90 percent of the forest landscape of Balukhand Wildlife Sanctuary in Odisha. This led to the loss of essential ecosystem services that support biodiversity, leading to the death and out-migration of many wildlife species. Many of these species also escaped to nearby human habitation, exacerbating animal-human conflicts.[3] While the economic and social costs of extreme events are accounted for in institutionalised loss and damage assessments, the environmental costs are often ignored.

To be sure, policymakers have developed a number of strategies to safeguard losses related to human life, property, and livelihoods. There is still, however, a lack of focus on developing strategies to conserve biodiversity and wildlife following such disasters. This has a further knock-on effect because much of the natural capital also acts as a natural barrier to these disasters and is a key determinant of adaptive capacity. The loss of biodiversity, therefore, exacerbates the damage from future disasters in these regions.

° Changing climatic variables are altering basic ecosystem structures and functions, negatively affecting their ability to provide ecosystem services. Natural ecosystems provide services that are essential for human well-being. These include provisioning services, such as food and timber, which have a market value and contribute directly to economic activities. They also provide certain regulating and supporting services, such as climate regulation and water regulation, which underpin many other activities. Climate change is affecting all these services. Changing temperatures have affected agriculture yields, with estimates projecting that a 2.5-degrees-Celsius rise in temperatures across India could lower yields for wheat and rice by 41 percent and 32 percent, respectively.[4] This could have a substantial impact on food security in the future—a critical issue for India and large parts of the Global South.[5]

The ability of ecosystems to provide regulatory services such as maintaining air quality, climate regulation, pollination, and preventing soil erosion are also affected by the changing climate. For example, ecosystems and their associated biomass are a critical store of carbon. Changing land use in these regions as well as wildfires, plants dying due to droughts, and glacial melting all end up releasing the stored carbon into the atmosphere, turning these critical carbon stores into sources of emissions. However, regulatory and supporting services are not traded in markets and thus are not associated with a clear monetary value; losses to these services are left unaccounted for despite their impact on several SDGs.

- Finally, measures for mitigating climate change can harm biodiversity. The key to reducing carbon emissions will be shifting from a traditional fossil fuel-based energy system to one dependent on renewable energy. However, large-scale renewable energy projects also use massive areas of land. As per estimates by the CEEW, achieving India's net-zero targets would require around 4 percent of India's land to be utilised for power generation by 2050.[6] This will necessitate large-scale land use changes that in turn will affect ecosystems, particularly forests and grasslands. A famous example of this has been the loss of habitat for the critically endangered Great Indian Bustard in Rajasthan due to the land being taken over for wind and solar projects.[7] Startling images of Great Indian Bustards electrocuted by overhead power transmission wires have in many ways come to symbolise the trade-offs between biodiversity and green energy. These conflicts are likely to accelerate much quicker in the future, unless clear metrics are developed to assess renewable projects in terms of their environmental impacts.

Although the connection between these two environmental crises is evident and becoming more pronounced, policies implemented to address these issues often overlook their interdependence. There is need at the global, national, and local levels of government to better account for the linkages between these two crises and prioritise solutions that can ensure nature-positive climate action.

Responses: Nature-Based Solutions

Both the Paris Agreement and the Global Biodiversity Framework list 'nature-based solutions (NbS)' as a key means for achieving their respective targets. When designed and implemented correctly, NbS provides the clearest pathway to achieving climate and biodiversity targets in a most cost-effective manner. India is home to around 8 percent of all recorded species in the world and has a long history of sustainable existence with nature, making it perfectly placed to implement NbS solutions at scale. Table 1 highlights some key sectors where NbS initiatives have the potential to synergise climate action with biodiversity goals.

Table 1: Potential for Nature-Based Solutions in India

Sector	Potential
Protecting existing natural ecosystems	Forest and tree cover make up 24.62 percent of India's land area. However, only 5 percent of India's land area is classified as protected areas where human activities are regulated.8 Thus, there exists substantial potential to identify critical habitats which already provide high carbon storage and biodiversity value and bring these under the aegis of 'protected areas'. The ambit of protected areas could also be expanded to include non-forest habitats as well such as grasslands and mangroves. However, care needs to be taken to ensure that communities living in these regions are made part of the conservation process and not excluded from the benefits of these habitats.
Ecological restoration of degraded ecosystems	Around 96.4 million hectares or 30 percent of India's land is currently classified as degraded.9 While there is some question over the definition of 'degraded' land, it is fairly clear that restoration of these regions could lead to a substantial increase in the supply of ecosystem services. India has already committed to restoring 21 million hectares by 2030 but a clear roadmap is required. To maximise the benefits of restoration it will be essential to ensure that it is carried out according to sound ecological principles and preserves the original ecosystem structures.

Nature-based solutions for adaptation	Nature-based solutions could be effective in providing climate adaptation services including reducing soil erosion, controlling stormwater run-off, and reducing saline ingress in farmlands. In many cases, these solutions provide the most cost-effective adaptation measures that also reduce the need for large-scale financing for adaptation efforts. In particular, mangroves provide a highly effective solution for reducing the impact of extreme weather events while also providing carbon storage. India announced the Mangrove Initiative for Shoreline Habitats & Tangible Incomes (MISHTI) in this year's budget which could act as a catalyst for improved mangrove plantation projects.
Nature-based city planning	India is expected to be the fastest urbanising country in the next decade. NbS solutions in cities including improving green cover, green buildings, and encouraging blue-green infrastructure could be effective in building adaptive capacity, mitigating emissions, and reducing the air pollution burden, while also encouraging the growth of urban biodiversity.
Agro-forestry	Agriculture has been one of the major causes of the loss of forest lands. Agri-forestry offers the potential to bridge biodiversity goals with expanding agricultural output. Around 50 percent of all land in India is currently under cultivation. Agro-forestry initiatives involve a broad range of land-use practices where cropping practices are integrated with trees and shrubs. India was the first country to implement a National Agroforestry Policy and is a leader in this space. However, while the climate benefits of agro-forestry have been emphasised, a clearer focus on the biodiversity benefits of these practices is needed to ensure agro-forestry initiatives are aligned with sound ecological principles.

With its diverse environmental challenges and rich biodiversity, India needs collective effort between government agencies, non-government organisations (NGOs), local communities, and individuals to protect and restore its natural ecosystems.

The following paragraphs illustrate the experiences of two civil society organisations that are playing a crucial role in implementing NbS for conservation and restoration of natural ecosystem. Their activities emphasise participatory processes of program development for the benefit of vulnerable communities.

a. ATREE (Ashoka Trust for Research in Ecology and the Environment)[a]

The Ashoka Trust for Research in Ecology and the Environment (ATREE) is a research and advocacy organisation engaged in interdisciplinary research to drive policy and practice towards sustainability. It integrates climate change as a cross-disciplinary theme across its work on conservation and sustainability, to ensure socially just development in India. Through its four research centres, it is working on issues pertaining to biodiversity conservation, water management, governance of land and forests, and climate change mitigation strategies. Leveraging the knowledge that is created through its research initiatives, ATREE seeks to inform policymaking through knowledge-sharing sessions with policymakers, scholars, and activists, and works with grassroots NGOs to implement community-based conservation programmes.

Over the 25 years that ATREE has been around, it has developed and implemented initiatives in various parts of the country. This includes projects for enabling community-led forest conservation in India's Western Ghats, conceptualisation of lake restoration programmes in Bengaluru, and encouraging rooftop solar energy in towns in Karnataka, among others.

[a] This case study is based on interviews conducted with the personnel of ATREE.

ATREE's interventions are based on in-depth situational analyses of the needs of and challenges faced by local communities, and engagements with local governance institutions such as panchayats to develop solutions that are contextually relevant.

A Closer Look: Alliance for Reversing Ecosystem Service and Threats

The Alliance for Reversing Ecosystem Service and Threats (AREST) is a joint program led by ATREE, Columbia University, Environmental Defense Fund, Foundation for Ecological Security, and International Council for Research in Agroforestry. It works to restore ecosystems across semi-arid and sub-humid zones of peninsular India with emphasis on four types of habitats—lands infested with invaded species (mainly Lantana), open and natural habitats, riparian zones, and degraded agricultural lands.

Pilots have been held in north Karnataka and Maharashtra, while adopting a demand-based approach centred on community needs. Based on an analysis of community requirements, interventions such as agroforestry, low- or no-till agriculture, mixed cropping, planning for natural fallow, were recommended. The organisation also identified climate-resilient and economically feasible indigenous species of bamboo and millets suitable for degraded agricultural lands, which could create economic opportunities for the local communities.

These activities are meant to create an additional carbon sink of 2.5-3 billion tonnes of CO_2 equivalent from forest and tree cover, which will help India meet its climate pledges as part of the Nationally Determined Contributions (NDCs) under the Paris Agreement, and the Land Degradation Neutrality Target (LDN) of restoration of 26 MHa of degraded lands. AREST unites land users, governments, grassroots organisations and funders towards restoring 12 million hectares of land in 204 districts in 13 states, affecting 90 million households.

b. Foundation for Ecological Security[b]

The Foundation for Ecological Security (FES) works for the sustainable management of common resources such as forests, agricultural lands, natural habitats and water bodies as vital means to mitigate the impacts of climate change. Sanjay Joshie, Executive Director, FES shares that the organisation started out with work around commons, "but over the years they understood the relations between these lands, agriculture and the livelihoods of people. The organisation began to look at the landscape as a continuum where there was a relation between the uplands (commons) and the lowlands (farming systems)."

FES places village institutions, which could be formal or informal groups of like-minded citizens, at the centre of their engagement strategy, as they believe that ecological security is a problem best addressed through collective action. FES equips these village institutions to adopt ecologically, socially, and economically sustainable practices, by providing technical assistance and helping them access financial aid. It also provides a platform for the concerns of the people behind these institutions, and relays these in its inputs to governments on issues of forest and water-related land-use policies.

Key Intervention: Promise of Commons

The 'Promise of Commons' is a collaborative initiative with 22 actors to address the systemic barriers to ecological security through resource management planning, securing land rights and ensuring access to resources. The program is driven by local communities, particularly women, through village institutions.

Through the programme, FES aims to create sustainable livelihoods for 38 million rural poor by strengthening local governance and conserving 30 million acres of Commons in India totalling a fifth of India's total Commons land. The core five work streams identified are: improving policies and programmes; strengthening narratives on the importance of ecological

[b] This case study is based on interviews conducted with the personnel of FES.

conservation; expanding economic opportunities; assessing Commons; and building a platform for ecosystem engagements.

As part of the initiative, FES facilitates partnerships with key government departments such as NITI Aayog, Ministry of Rural Development, and the Panchayati Raj to promote climate action via resilient livelihoods, water security and strong local governance. They also worked closely with 124 Gram Panchayats on creating Gram Panchayat Development Plans that focus on community interests to better integrate nature conservation efforts.

Going forward, the organisation aims to build an 'Alliance for Commons' for strengthening collaboration between public and private actors that translates into research for implementation at scale. To further such engagements, FES plans to convene key national and international stakeholders to foster cross-learning and knowledge sharing of best practices.

Recommendations

Some recommendations for sustainably scaling up NbS initiatives in India are highlighted in the following paragraphs.

- **Matching demand and supply:** A sector-wise pipeline of NbS projects is still absent, leading to discoverability issues for such projects. The mapping of NbS potential across India could be a useful exercise to bridge this gap. There is also a need to establish a platform that can bring together different stakeholders to showcase NbS projects and connect implementers with the potential financier. This will also go a long way in building awareness around NbS and mainstreaming this into the policy discourse around both climate change and nature conservation.

- **Financing NbS:** While the potential of NbS is well recognised, financial flows to such projects remain severely limited. One of the crucial challenges relates to the fact that the benefits of NbS are often non-marketable. They are thus difficult to capitalise on, and the challenge for financial entities is in identifying clear business cases for such projects. At present, funding for such projects is provided largely by public and multilateral sources and is focused on forestry. Moreover, NbS projects may not be suitable for all kinds of financial instruments, and loans in particular may not be ideal for such projects as they can end up imposing additional financial burdens on vulnerable communities. Increased financing for such projects can come from consortiums of different stakeholders including governments, companies, and communities which can utilise their strengths to finance such projects. There is a need for clear blended finance and other risk-sharing arrangements rather than a dependence on simple debt finance. Public development banks and philanthropies, in particular, can play a catalytic role in this regard by taking the lead in funding high-potential projects and creating a clear value proposition for different types of financial institutions to fund such projects.

- **Prioritising biodiversity:** While the climate benefits of most NbS measures are fairly clear, the biodiversity aspects require careful consideration. In trying to ensure multiple goals, NbS measures often face trade-offs between climate mitigation and biodiversity. While globally there is a substantial correlation between species richness and carbon storage, without specific principles to measure biodiversity benefits, specific projects often sacrifice biodiversity gains for the carbon storage value.

  For example, from a biodiversity perspective, preserving native forests or regeneration of existing forests provide greater benefits than newer plantation forests. However, compensatory afforestation efforts or carbon offset projects often do not account for the biodiversity aspects. As a result, much of the funds from these sources are utilised for newer plantation forests since these projects are faster to implement and can be justified based on the carbon storage value. Moreover, the specific tree species chosen for a plantation project are often based on carbon sequestration capabilities, leading to monoculture plantations which often do not compensate for the rich biodiversity in mixed naturally grown forests. Thus, NbS projects work best when the biodiversity aspects are correctly prioritised and incorporated during planning.

Conclusion

This chapter aimed to examine the intersection between climate change and life on earth. As is evident, global climate change has created a pressure point on biodiversity or the natural capital stock, thereby impeding on the various ecosystem services. One aspect that needs to be kept in mind is that climate change, on one hand, leads to destruction of the fundamental natural capital base that provides the critical 'umbrella' ecosystem service, i.e., supporting service of the ecosystem that further depletes the ecosystem's ability to provide for the various provisioning and regulating services. At the same time, land-use change through sheer anthropogenic interventions destroying the natural capital exacerbates the problem of climate change. This is because the natural carbon absorption capacity of the ecosystem is disrupted: important species that sequester carbon are lost, and even carbon stocked in an ecosystem like forest, wetland or an agri-ecosystem gets released in the atmosphere.

Therefore, this chapter has highlighted the importance of nature-based solutions (NbS), which has yet to receive the necessary attention that it deserves. India as a nation has been investing in creating large-scale physical capital to support its growth story. In large components of the Global South, including in India, such development of physical capital has come at the cost of natural capital. Therefore, with NbS being viewed as a pathway through this impasse, India needs to embrace NbS and act as a leader of the Global South in creating innovative solutions.

> *"Changing climatic variables are altering basic ecosystem structures and functions, negatively affecting their ability to provide ecosystem services.*

Endnotes

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3

Rethinking Urban Futures: Weaving Climate Action with Sustainable Urban Paradigms

Gopalika Arora and Aparna Roy

OVER 50 PERCENT OF THE GLOBAL population currently reside in cities, and the proportion is projected to increase to 70 percent by 2050. Urban settlements are crucial catalysts of economic development and are responsible for over 80 percent of the world's gross domestic product (GDP). They also generate more than 70 percent of the planet's greenhouse gas (GHG) emissions.[1] India has witnessed rapid urbanisation, with more than 30 percent of its population living in urban areas; this share is expected to rise to 40 percent by 2030.[2] As Indian cities attend to swelling populations, they confront multifarious challenges in the provisioning of essential services such as housing and transportation. This, in turn, engenders a surge in demand for energy and water, exacerbates GHG emissions and waste generation, leads to deteriorating air quality, and gives rise to a host of health impacts.[3]

While the COVID-19 pandemic has rightfully gained significant global attention since 2020, it is not the sole threat facing the future of cities. Cities are experiencing growing and multi-dimensional climate risks, often exacerbated by underinvestment in resilient infrastructure and sustainable human settlements. Average annual urban losses from disasters were estimated at US$314 billion globally in 2015 and may rise to US$415 billion by 2030.[4] Cities in developing countries, which will be home to the majority of new urban residents, face greater climate risks and high economic losses. The imperative is to build the resilience of urban spaces to multi-dimensional climate threats to secure their development gains.

This chapter analyses the interrelated challenges and impacts of climate change on Indian cities and explores how alternative resilient urban futures can be developed. The rationale of the chapter follows an examination of the drivers, pressures, state and impact of the cascading climate crises and to highlight the importance of sustainable urban development. It underlines the need for strengthening the resilience of cities and provides appropriate response strategies for ensuring synergy between climate action and SDG11 (Sustainable Cities and Communities).

The Impacts of Climate Change on Cities: An Overview

The IPCC's Sixth Assessment Report predicts that India and other tropical countries will bear increased impacts of extreme weather events and climate hazards such as heatwaves, cold waves, floods and cyclones in the coming years. It projects more intense and frequent heatwaves and episodes of humidity in South Asia, coupled with an increase in annual and summer monsoon precipitation during the 21st century. In India, for example, there has been a steady rise in extreme weather events over the past two decades,[6] which have resulted in massive losses of life and property. The Kerala floods of 2018 alone,[7] cost US$3.56 billion (INR 27,000 crore); and the Chennai floods in 2015,[8] US$3 billion (INR 22,000 crore).

Many Indian cities are in coastal or other geographically vulnerable regions prone to climate hazards. The urban poor who settle in these environmentally vulnerable areas have limited access to basic services and are particularly vulnerable to the impacts of climate change and natural hazards. This can be blamed on the lack of infrastructure in Indian cities, particularly storm water drains—a significant number of cities have drains coverage of only about 30-50 percent.[9] Overall, India's urban areas have high concentrations of people and housing—coupled with inadequate infrastructure, this makes them particularly susceptible to the impacts of climate change. Given how important infrastructure is typically situated in cities, the economic and societal consequences of climate change are likely to be more severe in these regions.

Urban Heat Stress

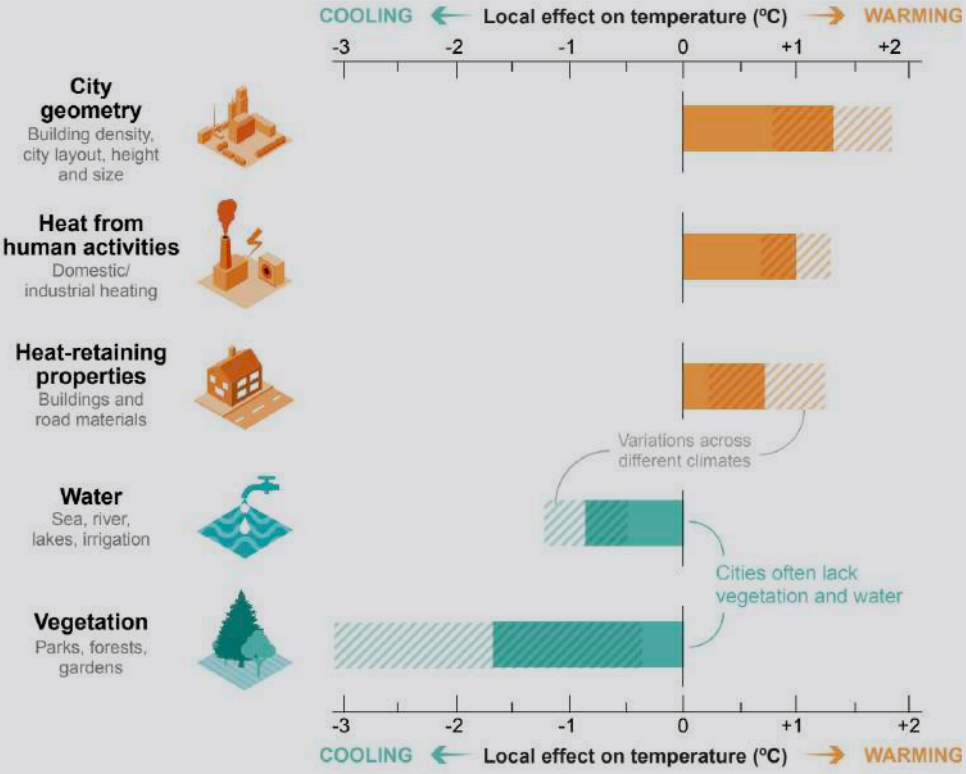
India's historically hot summers are being intensified by climate change, with deadly consequences. Severe heat waves in Indian cities endanger the lives and health of people living in poorly ventilated and crowded homes. In 2010, the city of Ahmedabad in Gujarat state suffered a record-breaking heat wave that killed more than 1,300 people.[10]

With increasing temperatures across the country, there is also a rise in cooling demands, in turn pushing the demand for energy.[11] This impacts the pollution

level in cities, worsening air quality and heightening the 'heat island' effect. Cities are also usually warmer than their surrounding areas due to various factors including the following:

- Urban geometry: Due to the close proximity of tall buildings, there is less natural ventilation and heat trapping
- Anthropogenic activities: Heat is generated from domestic and industrial cooling systems and running engines. Urban temperatures are further enhanced by anthropogenic heat from vehicular transport and heat waste from buildings.
- Materials that make up the infrastructure in the cities: Concrete and other urban building materials have heat-absorbing properties.
- Other factors: Most cities have limited amount of vegetation and water bodies.

Figure 1: Cities as Hotspots of Global Warming



Source: IPCC's Sixth Assessment Report (2021)[12]

Sinking Coasts

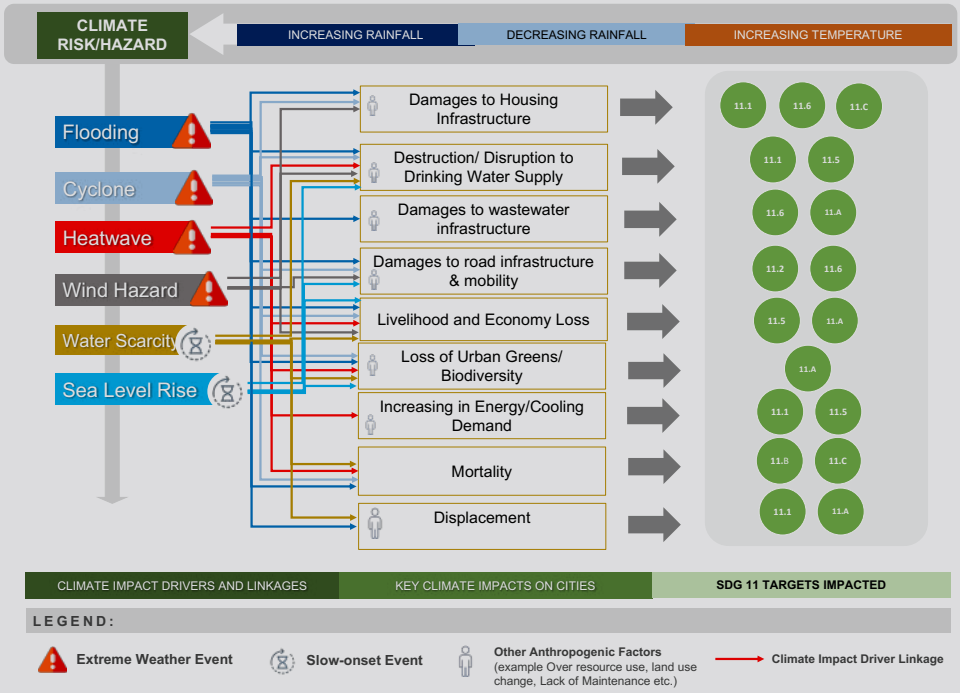
India boasts one of the lengthiest coastlines in Asia, measuring 7,500 km. Based on the 2011 census, this expanse comprises over 486 urban centres, with a combined population of roughly 41.7 million people.[13] These coastal areas are projected to face a sea-level rise of 0.1 metre to 0.3 metre in the next two to three decades. Coastal cities such as Kochi, Mumbai, Chennai and Visakhapatnam will be impacted by sea-level rise in varying degrees, from 0.57-0.82 metres by the year 2100.[14] Key infrastructure in many cities along India's coastline is likely to get submerged by 2050 due to significant sea level rise and inundation.[15]

Urban Water Woes: Rising Tides and Parched Cities

There has been an increase in flood disasters in India over the last decade which have severely affected cities in the country. There is evidence of rapid climate change across the country, evident in the heavy monsoons that hit Bihar, Himachal Pradesh, and Uttarakhand in July 2021, resulting in flooding and landslides.[16] Water scarcity is also costly as it impacts the provision of basic services, critical infrastructure, housing, human livelihoods, and health.[17] Cities source their water supply from faraway places, often outside urban limits. In the event of a flood or drought in the region, the entire water supply and demand disturbance creates water woes. These slow-onset climate disasters can cause water shortages, food-demand fluctuations, and disruption of hydroelectricity, which can further lead to large-scale displacement of people to urban areas, thereby adding even greater pressures on cities.

The impacts of extreme weather and slow-onset events on cities and the targets of SDG11 are illustrated in Figure 2.

Figure 2: Impacts of Climate Change on Cities and SDG11 Targets



Source: Authors' own

Recommendations for Sustainable Urban Futures

A transformative approach is required in dealing with climate change in cities—one that comprises a robust amalgamation of co-benefits between mitigation, adaptation, and sustainable development. The development of climate adaptation and mitigation strategies at the city level is crucial for India, given the country's urbanisation prospects, and would be instrumental in helping the country achieve its international commitments on climate change, such as the Paris Agreement and the Sustainable Development Goals, as well as the commitments contained in its Nationally Determined Contributions (NDC).[18] There is an urgent need to build resilience for sustainable urban futures, which is a multi-sectoral, multi-dimensional, and multi-stakeholder effort that requires effective collaboration across all levels of governance as the various dimensions of resilience are interrelated and mutually reinforcing.

Table 1: Potential for Nature-Based Solutions in India

Recommendations	SDG Linkage	NDC Linkage
Mainstreaming climate resilience and pollution mitigation actions into urban governance	SDG 11, SDG 13	NDC 06
Building climate resilient housing infrastructure	SDG 9, SDG 11, SDG 13	NDC 06
Developing climate resilient urban water infrastructure and storm water drainage	SDG 06, SDG 09 SDG 11, SDG 13	NDC 02, NDC 06
Developing climate resilient waste management infrastructure	SDG 06, SDG 11 SDG 12, SDG 13	NDC 02, NDC 06, NDC 07
Building climate resilient road infrastructure and low carbon mobility options	SDG 07, SDG 09 SDG 11, SDG 13	NDC 02, NDC 03, NDC 06

a. Mainstreaming climate resilience and pollution mitigation actions into urban governance

Cities are particularly vulnerable to the impacts of climate change. By mainstreaming climate resilience in urban governance, it is possible to develop policies, plans, and strategies that can help cities adapt and become more resilient to climate change impacts. It can also help promote sustainable development, reduce greenhouse gas emissions, and create more liveable and equitable cities.

- Preparing comprehensive climate city action plans: City action planning needs to have a framework for identifying and implementing climate actions (mitigation as well as adaptation) that a city could undertake, in conjunction with its developmental plans and policies to reduce its GHG emissions and increase climate resilience. The climate city action plan also needs to encompass the following:
    - Detailed climate risk and vulnerability assessment
    - GHG emission inventory
    - Drought contingency and flood management
    - Heat response action plan

Box 1: Mumbai Climate City Action Plan, introduced in 2022

The Mumbai Climate Action Plan (MCAP) has laid down a 30-year roadmap for the city to tackle the challenges of climate change by adopting inclusive and robust mitigation and adaptation strategies. These actions are spread across key strategic areas like sustainable waste management, urban greening and biodiversity, urban flooding and water resource management, energy and buildings, air quality, and sustainable mobility.

Box 2: Ahmedabad Heat Action Plan

The Ahmedabad Heat Action Plan includes measures to increase awareness, build community resilience, and improve infrastructure for heat adaptation. This includes measures such as increasing green cover, promoting energy-efficient buildings, and improving access to drinking water.

- Scaling up the installation of continuous ambient air quality monitoring stations (CAAQMS), particularly in smaller cities.
- Assessing areas under crop residue burning in peri-urban areas and developing a scheme to spray bio-decomposers to avoid air pollution and conduct wide-scale awareness for farmers to apply the spray post harvesting.

b. Building climate resilient housing infrastructure

Between 2012 and 2017, urban housing shortage across India stood at 18.78 million houses. The rise in urban population, along with the growth of densely populated areas and informal settlements, has emerged as a significant obstacle for the development of urban areas.[19] With increasing extreme weather events, building climate-resilient housing infrastructure across urban settlements in India becomes imperative. The policies at the city level do not adequately address resource efficiency and climate resilience in buildings. This includes areas such as water efficiency, design features that reduce heat stress, strategies for water retention and recycling, and plans for managing flooding in susceptible areas. Therefore, there is a need to:

- Incorporate climate resilience in building codes and regulations: Building codes and regulations play a critical role in ensuring that new buildings are designed and constructed to withstand climate-related hazards. Many cities are updating their building codes and regulations to include climate-resilient design features such as energy-efficient systems, rainwater harvesting, and flood-resistant building materials.
- Develop a policy to ensure the retrofitting of existing buildings that make them flood-resilient.
- Ensure adherence to green building norms in institutional and commercial buildings.
- Ensure implementation of rainwater harvesting construction norms in housing societies and institutional buildings.

Box 3: Green building norms in Chennai

In 2019, the Greater Chennai Corporation released a draft building by-law that includes provisions for energy-efficient buildings, rainwater harvesting, and green roofs. It also has provisions for flood-resilient construction in areas prone to flooding.

Box 4: Green Building Policy in Pune

The Pune Municipal Corporation has adopted the Green Building Policy, which includes provisions for energy-efficient buildings, water conservation, and use of renewable energy. The policy also includes incentives such as additional floor space index (FSI) for developers who meet certain sustainability standards.

c. Developing climate-resilient urban water infrastructure and storm water drainage

Extreme weather events are placing growing pressure on crucial infrastructure, such as water supply lines and storm drainages. This disrupts the normal flow of demand and supply, highlighting the need for immediate attention and action. Therefore, the following measures are suggested:

- Identification of critical water supply facilities (treatment plants, supply lines) whose services can be potentially interrupted during extreme weather events, especially for flood-prone cities.
- Retrofitting old and building new, separate stormwater drainages to accommodate the draining of increased volumes of water in projected extreme rainfall events.
- Sustainable Drainage Systems (SuDS): SuDS are being promoted in several Indian cities to manage stormwater runoff in a more sustainable way than traditional drainage systems. SuDS include features like swales, ponds, and wetlands that help slow down and treat stormwater runoff. For example, the Greater Chennai Corporation has implemented several SuDS projects, including the

development of artificial lakes and stormwater parks. These parks serve as infiltration basins that help recharge groundwater and reduce the risk of flooding in the city.

- Integrated urban water management in cities: Integrated urban water management seeks to address the challenges of water management in cities by integrating different aspects of water management, such as water supply, wastewater treatment, stormwater management, and groundwater recharge.

Box 5: Integrated Urban Water Management in Chennai and Pune

Chennai is a city that faces severe water scarcity due to its dependence on monsoon rains for water supply. The city has adopted an integrated approach to manage its water resources which includes rainwater harvesting, recharge of groundwater, wastewater recycling, and desalination. The Chennai Metro Water Supply and Sewage Board has set up a comprehensive Water Resource Management Centre that monitors the city's water resources and implements various water management initiatives.

The Pune Municipal Corporation has implemented an integrated water management plan that includes measures such as rainwater harvesting, wastewater treatment, and groundwater recharge. The city has also implemented a water conservation program that aims to reduce water consumption by promoting water-efficient practices in industries, residential areas, and public institutions.

d. Developing climate-resilient waste management infrastructure

Improper waste management can lead to the blockage of drains, which can exacerbate flooding during rainfall events, thus reducing the ability of a city to cope with extreme climate events. All new and existing waste management systems therefore need to be designed to be resilient to climate change. The following series interventions are being suggested in this regard:

- Management of solid waste through:
  - setting up waste-processing facilities
  - creating value chains for waste recycling and reuse (waste to energy and others)
  - setting up sanitary landfills
  - bioremediation/capping of old landfills (legacy waste)
- Establishing protocols for managing and reusing e-waste, hazardous waste, and plastic waste in urban areas and towns.
- Development of policies aimed at implementing economically viable in-situ wastewater treatment, recycling, and reuse at the neighbourhood level. This includes addressing the needs of clusters consisting of housing societies, commercial complexes, and institutional buildings that generate a minimum of 0.5 million litres per day (MLD) of wastewater in urban areas.
- Preparation of faecal sludge and septage management plans in cities.

Box 6: Waste Management Measures in Indore

Indore has been recognised as one of the cleanest cites in India. Waste management is recognised as a critical aspect of Indore's cleanliness efforts, and the city has implemented several initiatives to tackle this issue.

- The Indore Municipal Corporation (IMC) has made waste segregation mandatory in the city. Residents are required to segregate their waste, and the IMC collects and disposes of each type of waste separately.
- Indore has implemented a plastic waste management program, under which the IMC collects and recycles plastic waste. The city has set up a plastic waste recycling plant, where plastic waste is converted into fuel.

Box 7: Waste Management Measures in the Indian Himalayan Region

Waste Warriors is one of the few organisations catalysing systemic change for waste management solutions in the eco-sensitive Indian Himalayan Region. The organisation works with urban local bodies to set up effective waste management systems, involving block, district, and state-level officials in Uttarakhand and Himachal Pradesh to design waste collection and storage systems, including waste banks. It also helps build the capacities of village- and block-level officials, reducing plastic waste in rivers and facilitating cleanliness campaigns in national parks, among other initiatives. Waste Warriors has also helped set up four material recovery facilities (MRF), including the first MRF for the state of Uttarakhand, in Dehradun. The processes of dry-waste recycling and wet-waste composting in these facilities supplement the reduction of GHG emissions. The organisation is also building a strong repository of data and evidence on the externalised costs of plastics, the impacts of waste on wildlife and on human health.

e. Building climate-resilient road infrastructure and low carbon mobility options

India experiences significant disruption to its road network and mobility during extreme events like floods, wind hazards, and storms. Furthermore, the transport sector in India contributes 10.84 percent of total CO_2 emissions within the Land Use, Land-Use Change, and Forestry (LULUCF) sector. Therefore, it is crucial to adopt resilient road infrastructure and transition towards low-carbon mobility options. In this regard, the following steps are being suggested:

- Identify and map vulnerable road infrastructure within cities that are prone to extreme weather events like floods, extreme heat, and cold. Subsequently, it is crucial to establish and implement guidelines for constructing green roads that are resilient to heat, cold, and floods in those identified areas.
- Develop comprehensive mobility plans that integrate GHG mitigation actions in all cities.

- Introduce Smart Traffic Management Systems to ease congestion and smoothen traffic flow.
- Enhance infrastructure to promote non-motorised transport modes such as bicycles and rickshaws.
- Implement the policy of vehicle scrapping for phasing out old vehicles, in all cities, as per national policy.
- Implement an EV policy roadmap in all major cities to ensure adequate EV charging stations and modified building by-laws to incorporate EV charging infrastructure norms as per the MoHUA Amendment to model bye-laws 2019.

Box 8: Electric Vehicle Charging Infrastructure Norms in Cities

The Delhi Electricity Regulatory Commission (DERC) has mandated that all new multi-dwelling units and parking areas built on and after January 1, 2021, must reserve at least 20% of their total parking capacity for EV charging infrastructure.

The Greater Hyderabad Municipal Corporation (GHMC) has announced plans to install charging infrastructure at various public places, including bus stops and metro stations.

The Chennai Metropolitan Development Authority (CMDA) has drafted guidelines for charging infrastructure in new residential and commercial buildings, which are under consideration for adoption.

Conclusion

Heightened extreme weather events and disasters triggered by the climate crisis have added a sense of urgency in the demand for a mass shift away from unsustainable practices. The path to sustainable urban futures can be determined by inclusive and transformative policies to mitigate and adapt to climate change; set the framework for responsive city planning; implement collaborative and integrated systems of urban governance; prioritise public health; and build resilience, which can enable cities to respond to and withstand a wide range of climate shocks.

Climate change is a gradual and ongoing phenomenon and should be urgently addressed in the agenda for cities, since it has various economic, social, and institutional benefits in urban spaces. While cities are significant contributors of GHG emissions, they also have the potential to be models of environmental efficiency as they offer dynamism, stronger linkages, and a greater sense of urgency among residents. Tackling climate change at the city level is an integral part of city planning and management and requires the implementation of polices and actions that can derive co-benefits between mitigation, adaptation, and sustainable development.

> *A transformative approach is required in dealing with climate change in cities—one that comprises an amalgamation of co-benefits between mitigation, adaptation, and sustainable development.*

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4

Evolving Climate-Resilient Health Systems and Responses

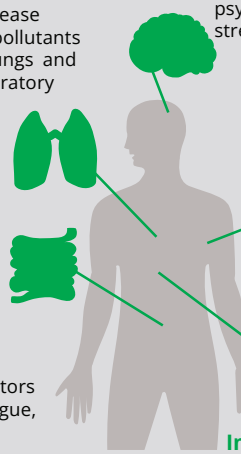
Anirban Sarma

THE WORLD HEALTH ORGANIZATION (WHO) REFERS to climate change as the "single biggest health threat facing humanity".[1] It has observed that climate change directly affects the environmental and social determinants of health, and is likely to cause 250,000 additional deaths per year between 2030 and 2050 from malnutrition, malaria, diarrhoea, and heat stress. The damage costs to health continue to spiral, and are estimated to touch US$2–4 billion by 2030. Areas lacking a sufficiently robust health infrastructure, largely in developing countries in the Global South, are expected to be the most vulnerable to climate-induced health risks.[2]

These trends are also reflected at regional levels. A 2022 Intergovernmental Panel on Climate Change (IPCC) report notes that, in Asia, climate hazards contribute to a broad spectrum of negative health outcomes and a higher incidence of communicable and non-communicable diseases.[3] Climate change has thus emerged as the gravest impediment to achieving goal 3 of the Sustainable Development Goals (SDGs; ensure healthy lives and promote well-being for all at all ages).

The Nexus of Climate and Health in India

Figure 1: Impact of Climate Change on Health



Mental Health

- High ambient temperatures and heatwaves have been associated with increased suicide, self-harm, aggressive behaviors, as well as psychological morbidity and mortality among people with pre-existing mental disorders.
- Acute events such as hurricanes, wildfires and floods can lead to well-understood psychopathologies, including post-traumatic stress disorder and mood disorders.

Respiratory System

- Wildfires and dust storms increase particulate matter and other pollutants causing inflammation of the lungs and exacerbating allergic and respiratory conditions.
- Air pollution may increase susceptibility to respiratory viruses.

Cardiovascular System

- Air pollutants from wildfires increase risk of cardiovascular events such as ischemic stroke, high blood pressure, heart attacks, and cardiac arrhythmias.
- Children exposed to high levels of particulate matter are at increased risk of adverse cardiopulmonary effects early in life.

Pathogens and Disease Transmission

- Increased incidence of certain vector-borne diseases due to factors like increased seasonal transmission and vectors expanding northward (ex. Dengue, Lyme Disease).
- Increased incidence of certain waterborne diseases can occur due to factors like flooding and water contamination (ex. Cholera, Cryptosporidium).

Immunity and Allergy

- Increasing CO2 concentration can increase pollen and mold spore production and dispersion increasing allergic disease.
- Pollen is broken up during thunderstorms increasing their allergenic potency and causing sudden increases in acute asthma attacks.

Source: I Agache et al[4]

India is highly susceptible to climate-related health risks, and there are three ways in which climate is impacting health across the country:

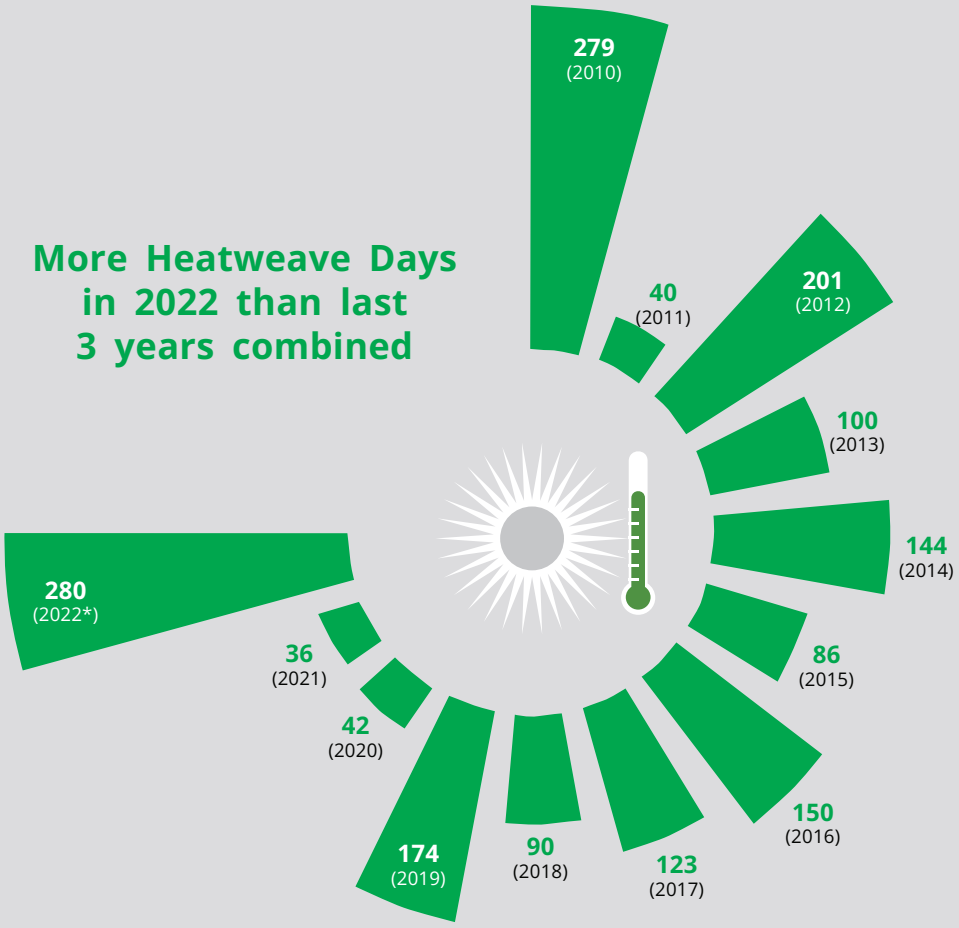
- Climate change and variability directly affect personal health and well-being.
- They affect agricultural yields and food security, with alarming implications for nutrition levels.
- Extreme weather events caused by climate change disrupt healthcare services and systems.

Extreme heat, air pollution, and vector-borne and other diseases

Reports from the Indian Meteorological Department show that Indian summers are growing longer and hotter.[5] Parts of the country experienced the hottest summers on record in 2016, 2021, and 2022;[6] and in 2023, a heatwave alert was issued for western India as early as in February.[7] Indeed, heatwaves are increasing rapidly in frequency, and the number of Indian states hit by heatwaves since 2015 had more than doubled to 23 by 2020.[8]

The health impacts of heatwaves in India are significant. Not only are they exacerbating existing respiratory and cardiovascular diseases, heat-related illnesses such as heat exhaustion and heatstroke and conditions such as dehydration are becoming more common, particularly among demographic groups such as the elderly and children.[9] The enervating effects of heat on the poor, and on outdoor workers engaged in agriculture and urban manual jobs can be hazardous, and sometimes fatal. The drain on health and vitality also affects economic productivity. Experts predict that by 2050, half of the afternoon work hours across various categories of work in India will be lost due to the need for rest breaks.[10]

Figure 2: Spike in Heatwave Days, 2022



*Note: No of heatwave days in year. *March 11 to May 18, 2022*
Source: Center for Science and Environment, as cited in India Today[11]

Recent studies have suggested a "synergistic acute effect" between temperature, the ozone and particulate matter (PM), and premature mortality—meaning that air-pollution-related mortality risks are higher on hot days, and there are higher heat-related mortality risks on polluted days.[12] Indeed, the extreme heat and stagnant air during heat waves increase the amount of ozone pollution and PM; and, in keeping with global patterns, days of extreme heat and extreme air pollution per year are increasing steadily in India. The frequency of days with these twin phenomena is expected to witness a massive increase by 2050, causing a corresponding spike in the number of people affected by the hazards of

such days.[13] In addition, construction, industrial pollutants, transport, and waste burning continue to be significant contributors to air pollution,[14] and have serious long-term impacts on health—particularly for those living in cities—ranging from respiratory and cardiovascular diseases, to cognitive and neurological impairment, and effects on pregnant women and infants. While governments have a key role to play in implementing measures to tackle air pollution, a number of stakeholder collectives and civil society organisations have also emerged as vocal champions of clean air and better health.

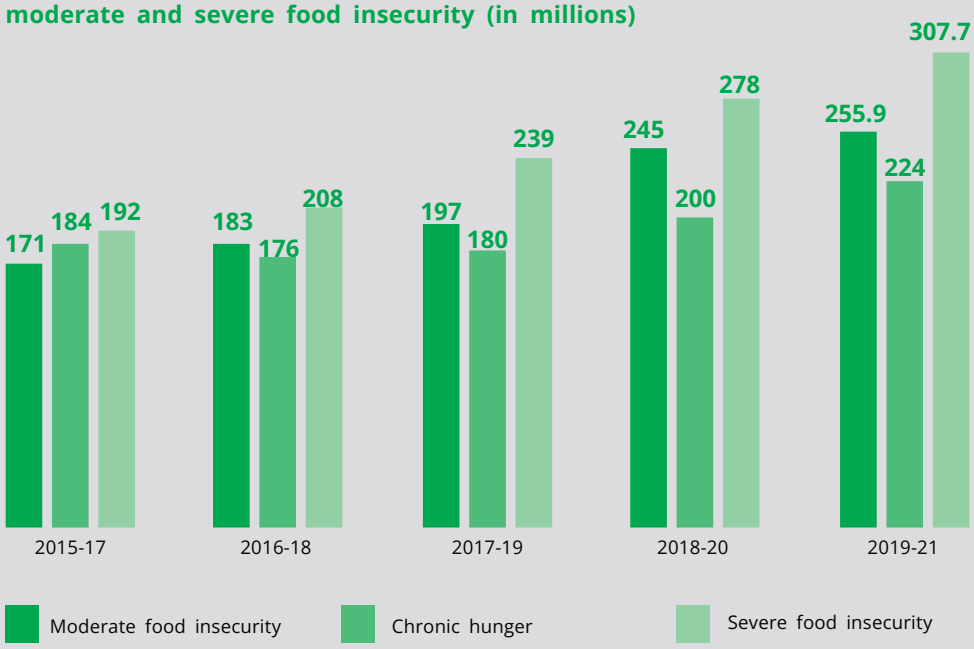
Finally, a warmer climate, the changing frequency and intensity of rainfall, and the prevalence of drought-like conditions have also contributed to an upsurge in vector-borne diseases (VBDs) in India. While the incidence of malaria has exhibited a declining trend, other VBDs such as dengue, chikungunya, the Zika virus, and the Nipah virus have shown signs of becoming endemic.[15] WHO regards the increase of diarrhoeal diseases as a key health challenge stemming from climate change;[16] and in India, the National Family Health Survey shows that the prevalence of childhood diarrhoea has increased from 9 percent to 9.2 percent between 2016 and 2020.[17] Diarrhoea is today the third most common disease responsible for under-five mortality.[18] Climatic conditions are also a contributor to the growing endemicity of cholera in India.[19]

Food insecurity and declining nutrition levels

Multiple studies in India have shown that the changing climate and consequent natural calamities are driving down crop production and the nutritional value of crops, leading to food insecurity and malnutrition on an unprecedented scale.[20] The yield and nutritional content of staple crops such as rice and wheat, for instance, has fallen dramatically.[21] In several states, particularly those like Odisha that are susceptible to recurrent natural disasters, food insecurity has led to chronic long-term malnutrition among children.[22]

Figure 3: Growing Food Insecurity in India

Number of Indians facing chronic hunger, and moderate and severe food insecurity (in millions)



Source: Deccan Herald[23]

Disruptions to health systems and services

India has witnessed numerous instances of extreme weather events that have disrupted health systems and services. In mid-2020, for example, super-cyclone Amphan tore into parts of Odisha and West Bengal, bringing COVID-19 relief efforts and hospital services to a standstill. A mere fortnight later, cyclone Nisarga hit Maharashtra, wreaking havoc on medical rehabilitation services at a time when the state was grappling with the highest number of novel-coronavirus cases in the country.[24] More recently, the devastating Assam floods of 2022 saw health services across affected districts repeatedly interrupted and paralysed, with a cancer hospital in Cachar eventually having to provide chemotherapy to its patients on an open road.[25]

Adaptive Policies, Systems, and Responses

A number of Indian policies and action plans formally recognise the impact of climate on health, but their implementation does not always adequately mainstream a focus on building climate-resilient health systems. India's National Action Plan on Climate Change (NAPCC), for instance, recognises in a limited manner that ailments and diseases related to the changing climate could impact certain social groups; and could increase the spread of VBDs to newer areas. The NAPCC's recommended response, however, is to undertake research into disease patterns, vectors, and causes. As such, a renewed focus on action points such as "enhanc[ing] the provision of primary, secondary, and tertiary health care facilities and implement[ing] public health measures, including vector control, sanitation, and clean drinking water supply" could be of great value.[26]

In a conspicuous omission, the NAPCC's eight constituent national missions do not include one on health. It is, therefore, imperative that the draft National Action Plan for Climate Change and Human Health, presented for approval in 2018, be formalised at the earliest and made available for application at the national and state levels.[27] In the interim, this gap is being addressed, at least in some respects, by the National Programme on Climate Change and Human Health (NPCCHH). The NPCCHH aims to reduce the health impacts of climate change and is working towards this goal by raising stakeholder awareness; building strategic cross-sectoral partnerships; strengthening health preparedness, response, and the capacities of healthcare systems.[28] Moreover, as the CAF case study has shown, among other elements both resulting from and affecting climate and impacting health, air pollution needs to be addressed by development actors on a priority basis. Irrespective of the specific climate-related field a particular funder or implementer may principally be working on, action on air pollution and accompanying policy interventions are likely to strengthen their cause.

A third seminal policy document that adopts a comprehensive and structured approach towards tackling the climate-health combine is the revised National Disaster Management Plan (NDMP) of 2019.[29] Building on the premise that disaster prevention or risk reduction will translate into positive health outcomes, the NDMP provides a template for states to "promote resilient health systems," "develop the capacities and resilience of communities to cope with and recover

from disaster impacts," "integrate disaster risk reduction into all levels of health care," and routinely "involve health professionals and emergency managers in the pre-event planning phase."[30]

The success of the NAPCC and the NDMP will ultimately hinge on the efficacy of their adaptation and implementation by states through their action plans on climate change and disaster management plans. Thus far, however, climate-linked health risks have not always been accorded due priority when rolling out state-level interventions. There is an urgent need to decentralise the execution of plans to the extent possible—collaborating with stakeholders at the state, district, *panchayat*, and community levels—and to sensitise and involve health personnel at every level.

The insights and experiences of health and climate actors must be documented to develop best practices or case studies on adaptation to climate change. Several such compendiums exist in India,[31] but many more instances of health sector resilience need to be brought to the fore and presented as efforts that could productively be replicated in other locales. Concomitantly, open knowledge-sharing platforms should be created to host and disseminate these products, and the media should be co-opted as an ally to raise public awareness about how health can be safeguarded against climate hazards.

Finally, steps should be taken to initiate three structural changes. First, health systems ought to be better customised and equipped to address the unique challenges of the specific climatic zone within which they operate. Local health infrastructure, services, and capacities must therefore be built accordingly.[32] Second, the training of health professionals, including ASHAs, ought to reflect emerging climate risks and changing needs. Therefore, upskilling initiatives need to be instituted on a priority basis. Additionally, cadres of health workers trained to respond to climate-linked health emergencies could be deployed in regions that are especially prone to disasters. Finally, to ensure synergies between climate action and improved health, multiple ministries and government departments must co-design interventions, set common targets, and integrate non-governmental stakeholders into the planning and implementation processes.

CASE STUDY | SELCO Foundation: Promoting Energy Efficient Health Infrastructure[b]

Despite a concerted push to build last-mile healthcare infrastructure to improve the delivery of health services in India in recent years, ensuring reliable access to healthcare and the uninterrupted use of medical equipment and services remains a persistent challenge. Health centres in India typically depend on energy generated from fossil fuels, and often experience an irregular and unreliable energy supply. This disrupts their functioning, and tends to affect basic and crucial healthcare service delivery.

The SELCO Foundation works with local health officers to solve the issue of unreliable access to energy and the lack of appropriate appliances. Based on health centres' building design, energy requirements, available space, and other factors, SELCO devises alternatives such as the installation of solar energy panels, and recommends alternative energy-friendly appliances. Through its interventions, SELCO aims to bring efficiencies to the various processes followed at health centres, such as the deployment of cooling solutions for vaccine storage, and the use of equipment to support newborns (including baby warmers and maternal kits for antenatal check-ups).

Under their Sustainable Energy-Led Climate Action Program, SELCO has been working to create decentralised energy solutions, implementing these in primary health centres in select Indian states. For instance, SELCO studied the energy dependency and efficiency of health services in Meghalaya and Assam, and recommended alternatives that relied on sustainable energy and more efficient appliances. They identified devices with high energy requirements and suggested replacements, set up solar-based energy systems, and recommended building designs that optimise lighting and cooling measures, particularly in heat-stressed regions. Through these interventions, SELCO aims to improve the self-reliance and sustainability of health centres, and to develop local assets for decentralised renewable energy solutions such as solar energy systems and alternative medical equipment.

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[b] This case study is based on interviews conducted with the personnel of SELCO Foundation.

SELCO found that the cost of powering a centre with inefficient appliances is three times more than the cost of powering one with efficient appliances. For example, in Meghalaya, which faces unreliable electricity due to its difficult terrain, SELCO observed a high rate of maternal mortality due to the absence of well-functioning labour rooms. The organisation then partnered with the state's National Health Mission and presented a plan to improve energy access across health sub-centres, beginning with 100 centres whose needs were especially urgent. Their solutions included the use of efficient appliances and solar energy systems for basic energy needs, as well the energy needs for vaccine storage, labour rooms, and staff quarters. It is predicted that for each centre, these solutions could result in savings of more than INR 11 lakhs over a 20-year period.

An aerial view of a Primary Health Centre in Manipur, India./SELCO Foundation

A health practitioner checks on the electricity backup at a Health Centre in Manipur, India./ SELCO Foundation

> *Health systems ought to be better customised and equipped to address the unique challenges of the specific climatic zone in which they operate.*

Conclusion

In 2023, UN member states will reach the mid-point of the 15-year period over which the SDGs are to be met. Globally, progress towards the goals has been uneven, with large-scale setbacks caused by the COVID-19 pandemic. The Indian healthcare system has withstood repeated shocks during 2020–22, and has demonstrated extraordinary resilience overall. Today, India ranks as a 'frontrunner' in terms of its SDG3 performance on ensuring health and well-being, but its rank on climate action (SDG13) is lower.[33]

Across community, state, and national levels, healthcare frameworks could be made more robustly climate-responsive, effective policy-praxis interfaces can be built, and citizens sensitised further about the convergence of climate and health risks. As India continues to refine the climate resilience of its health systems, its health and climate performance are likely to improve, with the gap between them narrowing.

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5

Building Climate-Resilient and Sustainable Food Systems

Shoba Suri

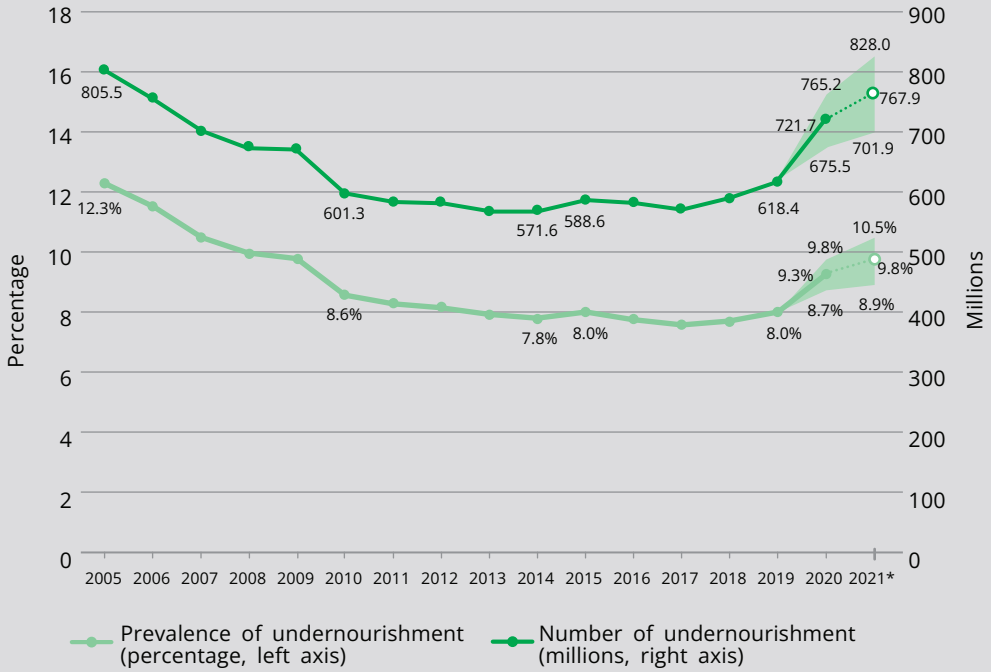
PERHAPS THE BIGGEST CHALLENGE of the 21st century is feeding the world's burgeoning population with healthy and nutritious food without compromising on the sustainability of natural capital that provides essential ecosystem services. Achieving zero hunger, as outlined in Sustainable Development Goal (SDG) 2, goes beyond merely ensuring food security through food production—this was seen in the famines in colonial South Asia (such as the Bengal famine in 1943) and in other parts of the world throughout the past century.

Recognising the role of multiple factors in food security, the United Nations Committee on World Food Security formulated a definition that goes beyond production alone: food security is the state in which "all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their food preferences and dietary needs for an active and healthy life."[1] This definition encompasses a number of key elements: food production to ensure adequate supply; fairness and distribution in their various forms to guarantee access to food; and sustainability of both production and distribution processes to ensure food availability and access for all at all times.

Agricultural practices in countries of the Global South have largely been unsustainable, leading to a decline in the organic yield of the soil. Globally, increased food demand has forced land-use change, increased the exploitation of agricultural land, and led to unsustainable fertiliser use and the production of genetically modified crops—all of which have proved detrimental for the environment and natural ecosystems. This has led to increased greenhouse gas emissions, environmental pollution, biodiversity degradation, deterioration of soil quality, and the destruction of natural capital.

According to the World Health Organization (WHO), 420,000 people die and around 600 million people fall ill annually because of the consequences of consuming adulterated food.[2] Around 40 percent of the burden of food-borne illness is inflicted on children under the age of five.[3] In 2020, three billion people did not obtain sufficient food, and nearly one-third of the world's population did not have access to nutritious food.[4] According to the Food and Agricultural Organization (FAO), between 702 million and 828 million people are undernourished, with an additional 150 million added to the number since the COVID-19 pandemic in 2020 (see Figure 1).[5]

Figure 1: Global Undernourishment (2021)



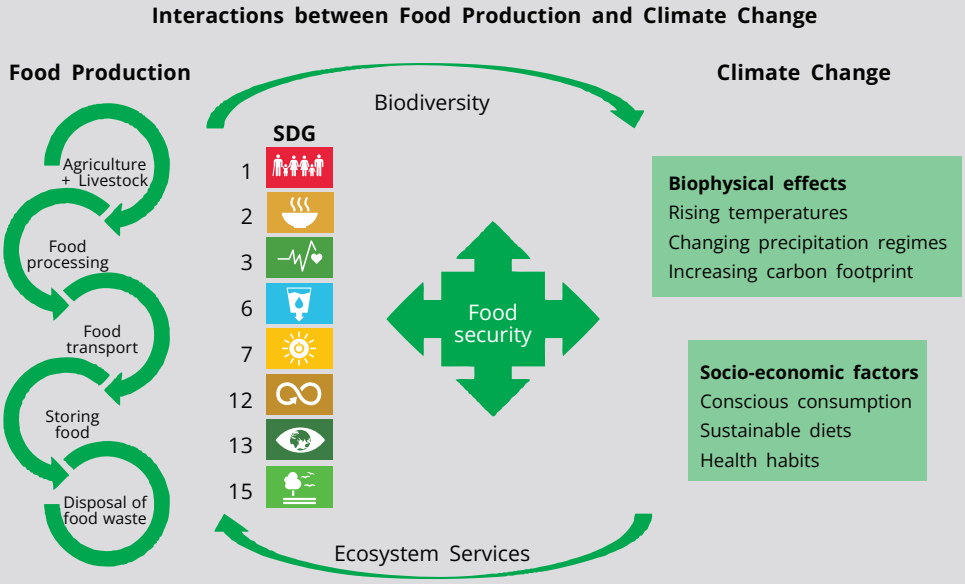
Source: The State of Food Security and Nutrition in the World 2022[6]

Agrochemicals such as pesticides and fertilisers are now widely used to enhance output to meet the food demands of the fast-expanding global population. In the absence of chemical pesticides and other forms of crop protection, about half of the world's crops are lost to pest infestation.[7] The land required for cultivating crops must expand as yield per acre is likely to fall quickly. As a result, the species habitats and natural ecosystems will suffer, and erosion is likely to result in the depletion and degradation of soil quality.[8] Using agrochemicals presents risks for the ecosystem and human health. Chemical contamination alters the biochemical makeup of food and can cause a variety of illnesses, including diarrhoea, cancer, and neurological ailments, as well as alterations in the reproductive system, developmental problems, and respiratory illnesses.[9]

Drivers, Pressures, and Impacts of Climate Change on Food Systems

Food safety is also impacted by climate change, with both biotic and abiotic agricultural factors playing a role (see Figure 2). Abiotic factors that affect soil quality, plant health, and crop productivity include air pollution, malnutrition, and extreme temperature variations. Insects, pests, and soil are examples of biotic factors.[10] As a result, there are cascading dangers related to nutrition, food security, and safety. Climate change also has an impact on ecosystems by disturbing the relationship between crops and pests, weeds, and pollinators.[11]

Figure 2: Climate Change and the Food System



Source: Walter LF et al., Science of the Total Environment, 2022[12]

The COVID-19 pandemic has had significant negative impacts on the food and agriculture industries. During the pandemic, food insecurity, malnutrition, and hunger increased on a global scale due to disruptions in the food supply chain; income and livelihood losses; heightened gender, class, and caste inequities; and disparities and variations in food prices.[13] Research indicates that while the SARS-CoV-2 virus cannot be transferred by food products, it can transmitted during their manufacture and processing, necessitating kitchen sanitation, personal hygiene, and other food safety precautions.[14] There is also evidence to support a decline in food-borne illness outbreaks since the start of the pandemic in 2020.[15] Still, the pandemic's effects on global food supply chains have increased the likelihood of violations in food safety regulations.[16] At the same time, although the pandemic has aggravated existing problems and exposed flaws in the world's food systems, it has also spurred a change in thinking on the nexus between climate change, and food security, safety, and policy.

According to a report on 'Food Security and Gender Equality', the disparity between the food security of men and women is widening globally; in 2021, about 828 million people went hungry, with 150 million more women than men suffering food insecurity.[17] The pandemic has resulted in the worsening of gender disparities in food access. According to FAO, forced confinement due to lockdown measures and the economic consequences of the pandemic increased the risk of spousal abuse for women.[18] Additionally, women's agricultural activities bore greater impact than those of men.[19] Overall, there was a significant impact on the role of women in food systems as providers of home food security and nutrition, as well as wage employees, farmers, and food dealers.[20]

Varalakshmi selling produce from her Kitchen Garden in Karnataka, India. / Buzz Women

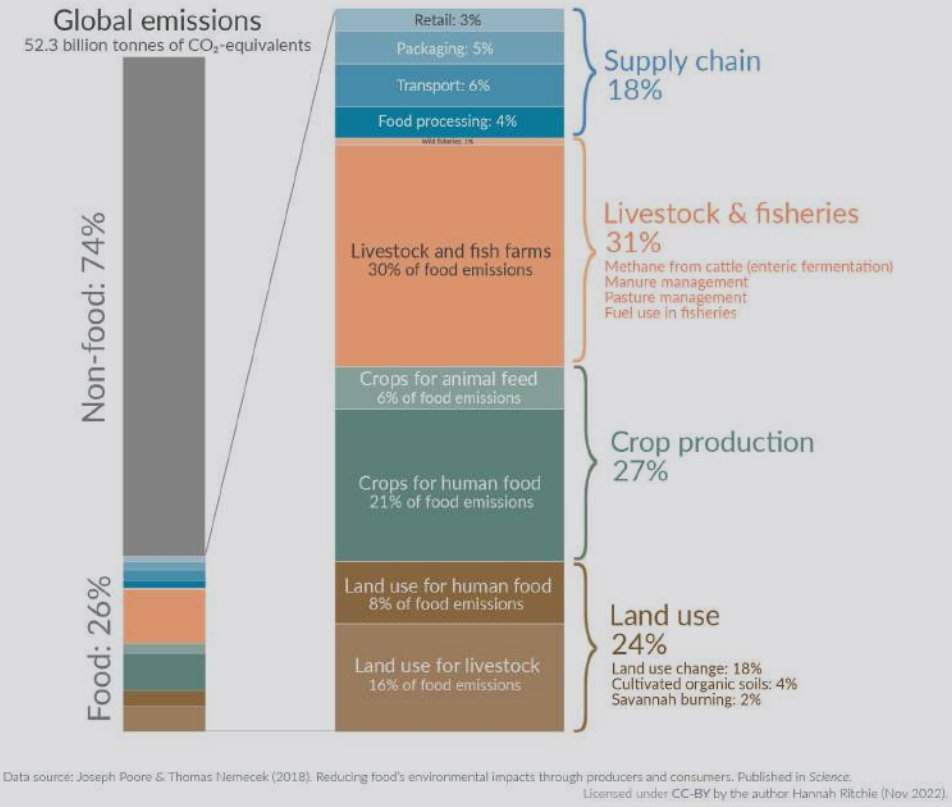
While agricultural production has increased at a pace of 2.5–3 percent annually over the past 10 years, South Asia's population has grown at a rate of 1.5 percent annually.[21] This has meant the region has the necessary food provisions. However, South Asia's performance on the Global Hunger Index (GHI) remains one of the worst globally, second only to Sub-Saharan Africa.[22] Although there have been slight improvements over the past two decades, with the GHI decreasing from 38.2 (classified as 'alarming' on the scale of 35 to 49.9) at the beginning of the millennium to 26 ('serious' on the scale of 20 to 34.9) in 2020, the progress is modest. In comparison, Sub-Saharan Africa's GHI declined from 42.7 to 27.8 over the same period, while Europe and Central Asia saw a drop from 13.5 ('moderate' on the scale of 10 to 19.9) to 5.8 ('low').

These figures indicate that South Asia continues to grapple with long-standing issues related to the distribution of and access to food. Despite the implementation of the National Food Security Act in 2013, which focuses on defining target groups and highlighting the importance of distribution, India faced a critical situation amid the lockdown,[23] revealing the failure of the distribution system and highlighting the crucial role of markets in providing a cushion during times when the distribution systems may fail.

Current Responses

Over 40 percent of the world's land is now used for agriculture, making agroecosystems the planet's largest terrestrial ecosystems.[24] Up to 30 percent of the world's greenhouse gas emissions and 70 percent of freshwater use are attributed to the food industry.[25] The primary cause of biodiversity loss is land-use change for food production (see Figure 3). In comparison to other food groups, foods derived from animals, particularly red meat, have comparatively high environmental footprints per serving. This has an effect on the loss of biodiversity, land use, and greenhouse gas emissions. A shift to healthy diets by 2050 will require substantial dietary changes and significant modification in the food system in order to meet the SDGs and the Paris Agreement goals.[26]

Figure 3: Greenhouse Gas Emissions from Food and Non-Food Sources



Source: Hannah R et al., Our World in Data, 2020[27]

The FAO and WHO are primarily responsible for implementing regulations for strengthening food safety throughout the food value chain and enhancing population health globally. As an example, the FAO/WHO Codex Alimentarius Commission is in charge of carrying out the Joint Food Standards Programme and establishing the Codex Alimentarius, or the 'Food Code,' a collection of standards, recommendations, and rules relating to food safety measures.[28]

Indian Initiatives: International Year of Millets

The Food Safety and Standards Authority of India (FSSAI) has started a massive effort under the 'Eat Right India' programme to transform food systems and ensure access to safe, wholesome, and sustainable food.[29] India has also made a concerted effort to promote the production and consumption of millets—

increasingly being acknowledged as being more nutrient-packed and environment-friendly. Millets were once a staple crop in India but were marginalised after the Green Revolution when the focus shifted to increasing food grain production and productivity using high-yielding varieties of wheat and rice in designated areas.[30]

Millets are small-grained, warm-weather cereals that belong to the grass family. Important millets cultivated in India include *jowar* (sorghum), *bajra* (pearl millet), and *ragi* (finger millet). Small millets like proso (*cheena*), kodo (*kodra*, *arikelu*), fox tail (*kangni/korra*), barnyard (*varai*, *sawa*), and little millet (*kutki*) are also grown in the country. Millets can be grown in semiarid tropical regions with low rainfall and poor soil fertility as they require far less water for cultivation—millets require around 20 percent less water than rice, for instance. They have higher nutrient content than other cereal crops, and contribute to food and nutrition security (see Table 1). Moreover, millets are known for their resilience against droughts and other extreme weather conditions, making them well-suited for such geographic areas.[31]

As concerns about lifestyle diseases and the drawbacks of a 'refined' diet culture grow, consumers are gradually turning to nutrient-rich millets as a suitable alternative to wheat and rice. The COVID-19 pandemic has further accelerated this trend, with both urban and rural consumers choosing millets to improve nutrition and boost immunity.[32]

To promote the production and consumption of millets, the Indian government designated millets as nutri-cereals[a] in April 2018.[33] The government also recommended to the United Nations (UN) that 2023 be proclaimed the International Year of Millets in order to increase the domestic and international demand for millets and the production of nutrient-rich meals.[34] The proposal received support from 72 countries, and in March 2021, the UN General Assembly declared 2023 as the International Year of Millets. Subsequently, in

[a] The millets included in this categorisation include sorghum (jowar), pearl millet (bajra), finger millet (ragi/mandua), minor millets such as foxtail millet (kangani/kakun), proso millet (cheena), kodo millet (kodo), barnyard millet (sawa/sanwa/jhangora), little millet (kutki), and two pseudo-millets, buckwheat (kuttu) and amaranthus (chaulai).

the 2022 Budget announcement, India's finance minister emphasised support for post-harvest value addition, increased domestic consumption, and national and international branding of millet products.[35]

Table 1: Marginal Product of Water in Nutritional Values of Crops

Nutrients Per Litre	Rice	Wheat	Jowar	Ragi	Bajra	Barley
Energy (Calories /Litre)	490	1618	691	1643	1383	1404
Protein (Milligrams/Litre)	10	55	21	37	44	48
Iron (Micrograms/Litre)	1	25	8	20	31	7
Fibre (Milligrams/Litre)	0.3	6	3	18	5	16
Carbohydrates (Milligrams/Litre)	109	331	144	361	259	291
Fats (Milligrams/Litre)	1	7	4	7	19	5
Calcium (Micrograms/Litre)	14	191	50	1723	161	109
Phosphorous (Micrograms/Litre)	270	1423	440	1418	1134	899

Source: ORF[36]

As Table 1 shows, ragi demonstrates the highest efficiency in water usage when it comes to calorie production. Bajra, followed by wheat and ragi, perform well in terms of water efficiency for iron production. In the case of fiber, ragi shows the highest water efficiency, followed by barley and maize, which exhibit comparable water efficiency. Maize is the most water-efficient crop for carbohydrate production, followed by ragi and wheat. Bajra leads in fat production, followed

by ragi and wheat. Ragi also leads in calcium production. Wheat and ragi perform equally well in phosphorus production per unit of water at the margin. As such, promoting the cultivation and consumption of millets is important for both food and nutritional security, and water security perspectives. A millets-focused practice can help establish climate-resilient agriculture systems, and can reverse the trade-off between climate change and food and nutritional security.

Civil society organisations are also increasingly leading the charge on enabling a transition to natural farming systems, which can significantly further food security goals in the country. With a focus on sustainable and organic practices, natural farming can help build climate-resilient agricultural systems. By enhancing soil health, conserving water, promoting biodiversity, and reducing chemical inputs, natural farming offers opportunities for carbon sequestration, water conservation, and sustainable livelihoods for farmers. Embracing natural farming practices on a larger scale has the potential to transform India's agricultural sector into an environment-friendly and resilient system, ensuring long-term food security and sustainability.

Case Study: Rythu Sadhikara Samstha's Community Managed Natural Farming programme[b]

Rythu Sadhikara Samstha (RySS) is a state-owned farmer empowerment organisation, set up in 2014 by the Andhra Pradesh government to implement the Community Managed Natural Farming (CNF) programme. RySS works with farmer groups to promote zero-budget natural farming practices that help reduce cultivation costs, increase crop yields and soil microbial diversity, and create sustainable sources of income for farmers even amid prolonged dry spells or incessant rains.

[b] https://apcnf.in/. This section is based on interviews with representatives of the organisation.

CNF is designed to support participating farmers in the state for at least five years, helping them attain remunerative and sustainable livelihoods, and create the human and social capital necessary for sustainable agricultural production. The programme promotes continuous green cover while increasing cropping intensity, agricultural incomes, and soil fertility by enhancing soil biology.

RySS conducts training and awareness programmes to encourage farmers to shift to CNF, through which it strengthens grassroots institutions such as self-help groups and farmer producer organisations. Master farmers or internal community resource persons are selected from among the promising CNF farmers to act as agents of change and help other farmers adopt natural farming practices. The CNF programme focuses on farmer-to-farmer learning through case studies and training by community resource persons and master trainers on matters of input preparations, crop diversification, increasing cropping intensity, inter-crops, mixed cropping, and adoption of farming-related livelihoods.

A study on the programme's effectiveness found that marginalised and vulnerable groups such as scheduled castes, scheduled tribes, landless tenants, marginal farmers, and women participated more in CNF programmes. In CNF programmes, crop yields increased significantly, between 25 percent and 43 percent, for crops such as paddy, groundnut, Bengal gram, and red gram. Additionally, the gross revenue increased by 8.26 percent and the per household income increased by 19.89 percent on average for among CNF participants, over non-CNF. Because of CNF interventions, the farmers saved INR 469.30 crore instead of buying fertilisers and pesticides.

Case Study: Professional Assistance for Development Action[c]

Professional Assistance for Development Action (PRADAN) believes in enabling communities to develop their own skills and knowledge, and in building their capacity. PRADAN seeks to enhance livelihood opportunities for all by identifying

[c] Professional Assistance for Development Action, https://www.pradan.net/. This section is based on interviews with representatives of the organisation.

agents of change within the community and by supporting the creation of market linkages for their farm produce.

In recent years, PRADAN has worked to create awareness among local communities about the 'new normal' that is the effect of the climate crisis, building knowledge about its causes, and creating strategies to mitigate and adapt to it. Over the years, it has endorsed and pushed for the adoption of sustainable farming practices under the ambit of Regenerative Agriculture, which includes replacing traditional farming methods with practices that seek to sustain soil health and water quality, promote biodiversity and restore ecosystems. PRADAN also actively promotes the identification and conservation of local seed varieties, inter-cropping, multilayer cropping, and setting up bio-input reserves. It has also developed and disseminated various knowledge resources to study the impact of climate change on local ecosystems, shedding light on the critical need to revitalise soil and the hydrology of farm landscapes to sustain agricultural productivity.

Since the 1990s, PRADAN has promoted interventions to conserve natural resources in states such as Jharkhand, West Bengal, and Odisha, in line with its Integrated Natural Resources Management (INRM) approach. The technical solutions under INRM are intended to help enhance the productivity of land, water, forest, and biological resources in the undulating topography of the region, and generate livelihood opportunities for the poor through sustained agricultural productivity. These interventions aim to foster equitable and sustainable economic growth by ensuring food security and eliminating mass poverty.

The INRM approach is 'integrated' as it accounts for natural and human processes. It cuts across government agency responsibilities, government or property boundaries, industry sectors, and scientific disciplines. Instead, bioregions (natural boundaries of resources) are the primary basis for planning and management. INRM recognises the links between natural resources such as soil, water, and vegetation within a natural boundary, and how action in one part, such as deforestation in the upper catchment area, can increase soil erosion and reduce moisture retention in the lower areas. These are causes for low farm productivity.

Since its inception, PRADAN has supported over 165,087 small-holding farmers in building resilience to water variability caused by climate change, through programmes and interventions such as small-scale on-farm water control measures, selecting crops that utilise residual moisture and are more adaptive to water stress and water surplus conditions, and encouraging the adoption of technology for weather prediction.

Recommendations

Climate change has multiple impacts on the various aspects of food systems, including crop productivity and soil fertility, food composition and nutritional bioavailability, pest resistance, and the risk of hunger. To guarantee sustainable diets that are nutritious and aligned to the evolving ecosystem and climate change:

- There is an urgent need for sustainable and resilient food systems combined with climate-smart agriculture to combat climate change and food insecurity, especially in the Global South. India's experience with promoting the use of millets can be replicated in other regions.
- It is necessary to understand the two-way causal interaction between food systems and climate change, and their effect on human health.
- A comprehensive mitigation strategy is important given the connections between the economic, political, social, and cultural elements that contribute to food insecurity and affect food safety.
- There is a need for a multisectoral approach and coordinated leadership that provides adequate funding, rigorous research to make relevant data available for policymaking, building capacity to cope with the quickly evolving nature of global food safety, and the use of technology to identify solutions and gather data.
- Given women's important role in the food value chain, it is important to apply a gender lens to food system transformation to create a sustainable food value chain that entails the dual and associated goals of food and nutritional security.

The issue of equity in food security discourse, particularly regarding food distribution (which became more prominent during the COVID-19-induced lockdowns), has been repeatedly emphasised. However, sustainability in relation to food security has received limited attention in the Global South. The solution is to adopt improved soil and water management practices that can enhance water and land productivity. Additionally, interventions such as the trade of 'virtual water' (or agricultural imports), crop diversification, and changes in cropping patterns can play a crucial role. Therefore, adopting an integrated approach to land-water-ecosystems management is crucial for the Global South to fully embrace SDG2 amid worsening climate change.

> *Civil society organisations are increasingly leading the charge on enabling a transition to natural farming systems towards food security goals.*

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6

Climate Change, Gender Equality, and Global Partnerships: Examining the Intersectionalities

Swati Prabhu

WITH FLASH FLOODS, CYCLONES, and heat waves becoming more frequent, the world is witnessing the adverse and devastating impacts of climate change. Owing to their socio-economic status and lack of access to resources, women face the maximum risk of these threats.[1] Gender equality and empowering women and girls (SDG5) is a cross-cutting issue and is pivotal for increasing communities' climate resilience in a post-pandemic world. According to the McKinsey Global Institute, US$28 trillion or 26 percent could be added to the GDP by 2025 if women have an equal footing in the labour market.[2] This is more than enough to bridge the climate finance gap needed to finance the fight against climate change, which stood at 530 billion Euro (US$585 billion) per year as of 2020 and is projected to reach 810 billion Euro (US$894 billion) by 2030.[3]

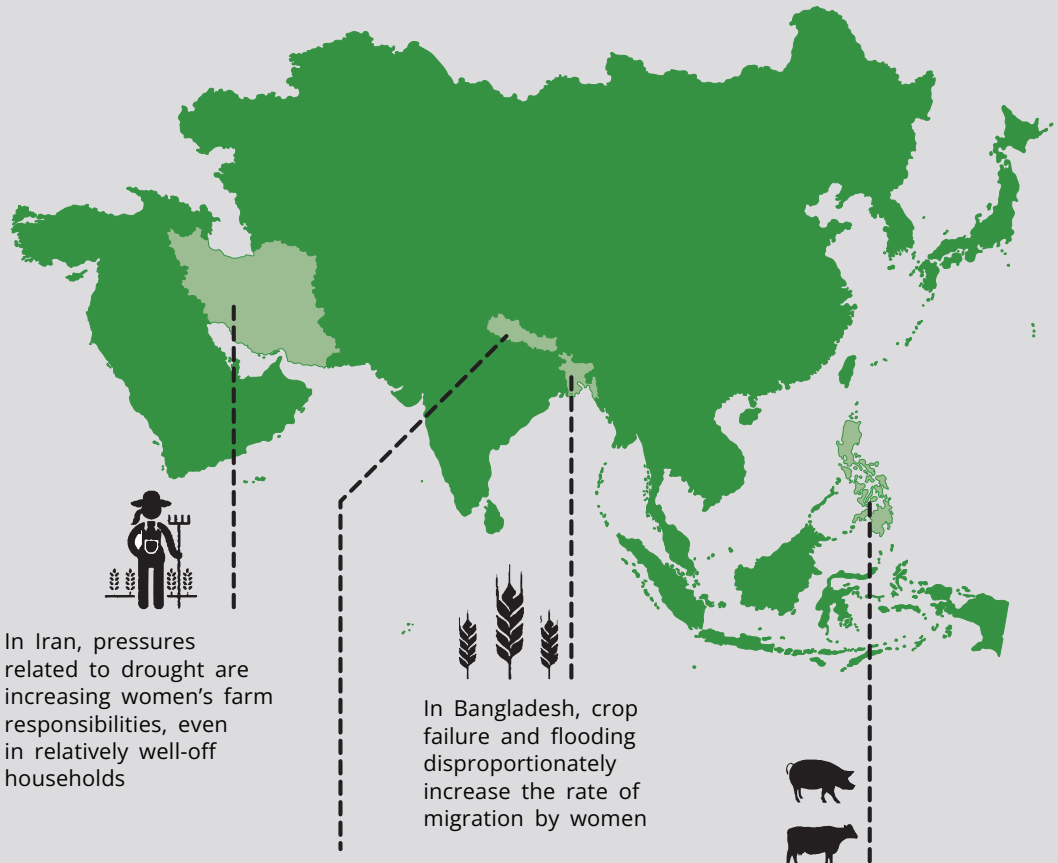
Along similar lines, forging collaborative actions and building robust global partnerships (SDG17) for realising the SDGs is equally threatened by climate change. With the global system facing a multitude of crises across the social, health, and environmental spectrum, there is an urgent need for scaling international cooperation to find solutions. Indeed, exploring development pathways on SDG5 and SDG17 is imperative, given their interconnections with climate change. Here, the inclusion of sub-national agencies like civil society organisations (CSOs), philanthropists, and the private sector becomes important. Indeed, SDG17 envisions encouraging and promoting effective public, public-private, and civil society partnerships, building on the experience and resourcing strategies of partnerships.[4] Using the DPSIR framework, this chapter examines the intersections between climate change and SDG5 and SDG17, and offers policy recommendations for India.

The Myth of 'Gender-Neutral' Climate Change

Women bear the disproportionate impacts of climate change.[5] According to estimates by the United Nations Human Rights Office of the High Commissioner in 2022, almost 80 percent of the populations displaced by climate change are women.[6] Figure 1 illustrates how women in Asia are challenged in their capacities to cope with climate change compared to men. As primary caregivers and providers of food in their households, women are severely exposed to the vulnerabilities of natural disasters.

Figure 1: Gender and Climate Change in Asia

Many countries in Asia are experiencing significant effects associated with climate change, and the capacity of women and men to cope varies widely across settings, depending on local socioeconomic and geographic contexts.



In Iran, pressures related to drought are increasing women's farm responsibilities, even in relatively well-off households

In Bangladesh, crop failure and flooding disproportionately increase the rate of migration by women

Gendered social norms in Nepal often inhibit women from contributing to community discussions on climate adaptation, making it less likely that women's needs will be met in adaptation planning, and in turn, making women more vulnerable to the effects of climate change

In the Philippines, women's farming experience and relatively greater education levels compared to men in this setting are enabling them to take on greater managerial responsibilities, challenging traditional gender roles

Source: WEDO (2016)[7]

According to the 2015 Paris Agreement on Climate Change, women empowerment and gender equality are critical elements in addressing the concerns of climate change. Calling it a "common concern of human kind," it also recognises that these impacts are disproportionate.[8] The climate crisis is not "gender-neutral," and women and girls face greater hurdles while dealing with climate impacts. As unpaid caregivers or domestic workers, they also face the brunt of increased sexual and domestic violence due to the cascading effects of climate change.[9] Figure 2 illustrates how violence against women and girls, coupled with climate change, are the two primary global challenges of our time.

Figure 2: Climate Change and Violence Against Women and Girls

Violence against women and girls (VAWG) and climate change are two of the most pressing global emergencies of our time.

Globally, VAWG affects

1 in 3 women

in their lifetime.

Climate change and slow environmental degradation exacerbate the risks of violence against women and girls due to displacement, resource scarcity and food insecurity and disruption to service provision to survivors.

In Vanuatu, after two tropical cyclones in 2011 there was a **300% increase in domestic violence cases** reported to the Tanna Women's Counselling Centre.

Following Hurricane Katrina, the rate of **rape** among women displaced to trailer parks **rose 53.6 times** the baseline rate in Mississippi for that year.

In Ethiopia there was an increase in girls **sold into early marriage** in exchange for livestock to help families cope with the impacts of prolonged droughts.

Nepal witnessed an **increase in trafficking** from an estimated 3,000-5,000 annually in 1990 to 12,000-20,000 per year after the earthquake.

Source: UN Women (2022)[10]

UN Women observes that most of the female population is engaged in the agriculture sector, particularly those in low- and lower-middle income countries.[11] This is true for India, where about 80 percent of rural women are employed in agriculture.[12] According to NITI Aayog, rural women hold the key towards India's agrarian revolution.[13] Additionally, the presence of rural women in the agriculture sector workforce is seen at all levels of the value chain, i.e., production, pre-harvest, and post-harvest processing, packaging, and marketing.[14]

The societal pressures of working hard to secure incomes and resources for their families are massive. In many regions across the world, although women depend more on natural resources, they lack access to it.[15] In conflict-ridden societies that are also steeped in patriarchal norms, women are subjected to social, political, and economic tensions, with reduced opportunities in decision-making, resulting in disparities in information, capacity-building, training, mobility, and access to resources.

Figure 3: SDG5 (Gender Equality) and Other SDGs

SDG 11 Women have equal rights to the city, and their safety in public spaces is crucial for sustainable urbanisation.

SDG 7 As primary energy managers in households, women can play a powerful role in the successful transition to sustainable energy for all.

SDG 6 Women and girls play a central role in the provision, management and safeguarding of household water and sanitation.

SDG 12 Unsustainable production and consumption patterns are gendered, with women suffering disproportionately from resource scarcity and natural disasters resulting from climate change.

SDG 15 Women's specific knowledge of and dependence on forests makes them key contributors to forest conservation and regeneration.

SDG 17 Mobilising sufficient resources will be critical for meeting the gender equality commitments of the 2030 Agenda.

Source: UN Global Compact Network Canada[16]

Moreover, women's and girls' health are endangered by climate change and disasters, in the midst of which they have limited access to services and healthcare, as well as increased risks related to maternal and child health.[17] Research indicates that extreme heat increases the incidence of stillbirth, and climate change increases the spread of vector-borne illnesses such as malaria, dengue fever, and Zika virus, which are linked to worse maternal and neonatal outcomes.[18]

Case Study: Buzz Women and its Initiative of Uplifting the Women Farmers

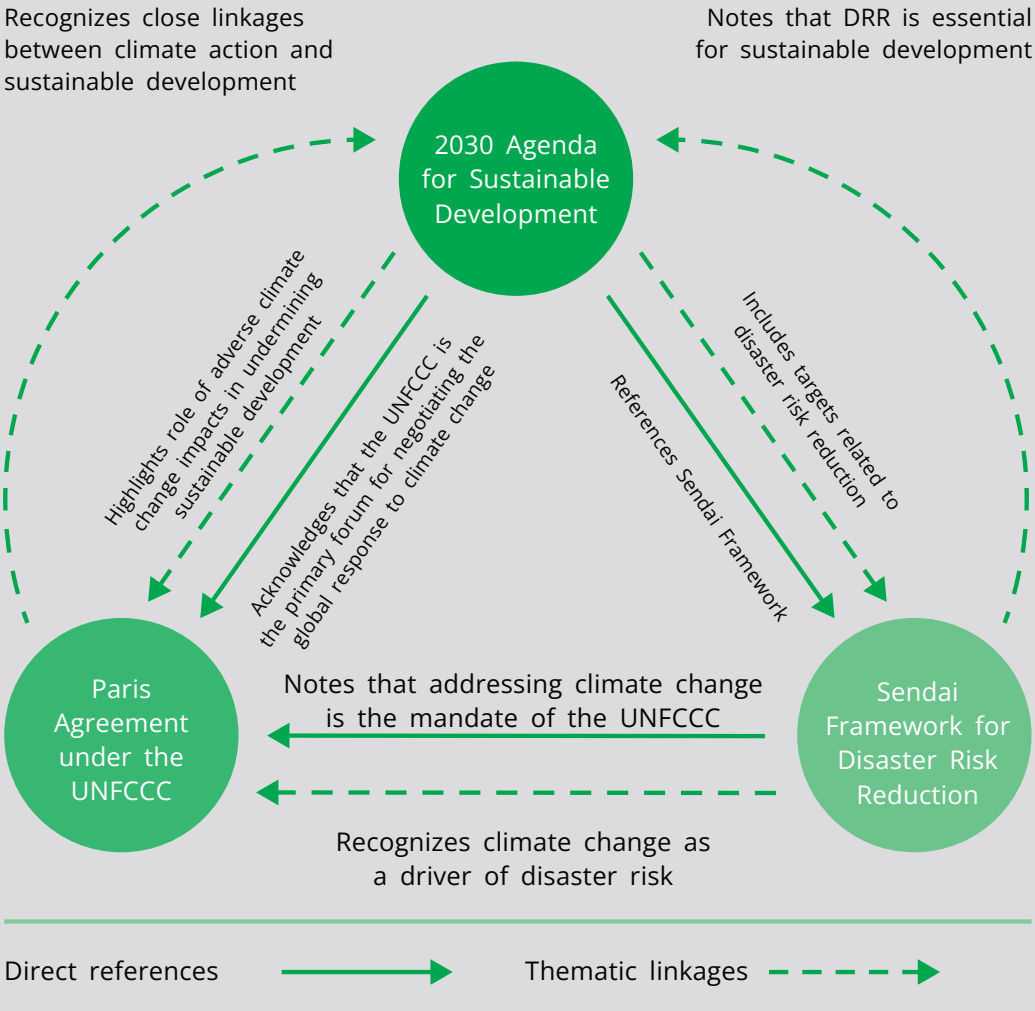
Posing a grave threat to food security, the climate crisis affects the quantum and quality of production, land quality, and resource availability. The double jeopardy of increasing input costs as a producer and soaring food prices as a consumer, disproportionately affects poor farmers. The impacts are also disproportionately higher for women farmers, who are often landless or else are small or marginal holders, and who lack the education and knowledge to access credit and use technology to their benefit. They are also often subject to discrimination in multiple spheres of their lives owing to unfavourable gender and power structures. Climate change tends to exacerbate these challenges.

Buzz Women (BW) works towards training and creating an enabling environment for promoting climate resilience amongst women. Positioning women as catalysts of change, it utilises the 5Cs framework: cash, care, climate, community, and confidence. In the last decade, BW has worked with over 300,000 rural women. Established in 2012, they have trained 299,453 women till date; 74,098 women were trained in 2021 alone. BW's Buzz Green Program focuses on awareness, close-to-home climate action, and eco-entrepreneurship.

Development Partnerships and Climate Change: A Two-Level Game

International development partnerships play a pivotal role in strengthening global response towards climate change. Achieving the 2030 Agenda for Sustainable Development and related frameworks such as the Paris Agreement and the Sendai Framework for Disaster Risk Reduction will require engagement from all stakeholders at all levels and across countries who can leverage their diverse and unique advantages (Figure 3). There is no doubt that South-South cooperation (SSC) and triangular cooperation, as complements to North-South cooperation, will be vital modalities for action.[19]

Figure 4: SDG17 and Climate Change



Source: IISD (2016)[20]

Since the scale of climate change and the challenges in achieving sustainable development are global, it calls for the widest possible cooperation. International development cooperation or partnerships in climate action are essential, particularly to support the efforts of developing countries. Moreover, traditional North-South development cooperation models will not be sufficient on their own for countries to achieve the SDG targets; a more diverse landscape for international cooperation is required that can bring together new partners and new approaches to complement long-standing North-South international development cooperation.[21]

South-South cooperation complements traditional North-South development cooperation in areas like climate change, helping broaden the range and scope of development partnerships through which developing countries can pursue their national sustainable development priorities and objectives.[22] The recent evolution of South-South cooperation and the rising prominence of such cooperation on climate change provides important lessons about the role of South-South cooperation in enhancing ownership and strengthening the capacity of developing countries in their national development efforts as well as in working with each other in mutually supportive and beneficial ways.[23]

According to the UN, South-South cooperation can allow developing countries to voluntarily assist each other in undertaking climate change actions in the context of sustainable development and poverty reduction.[24] In addition to multilateral coordination and cooperation in the UNFCCC negotiations, many developing countries have been active in South-South cooperation activities over the past three decades as part of their respective foreign and economic policy and diplomacy frameworks. Since 2015, some developing countries have incorporated cooperation with other developing countries in addressing climate change impacts and challenges into their South-South portfolios. In addition to growing political momentum, trends in climate-change-related collaboration through South-South cooperation reflect a movement towards increased climate cooperation on the ground.[25]

India's development cooperation is particularly suitable for fulfilling the targets of Agenda 2030. Following a demand-driven model, India's development cooperation is unique. However, it does not explicitly mention sustainable development in its development cooperation programmes, although several of its initiatives organically target Agenda 2030. There are several challenges associated with international development partnerships, ranging from geopolitical to geoeconomic, particularly affecting the developing countries of the Global South.

Civil Society as Drivers of Change

One of the crucial elements for building long-term development partnerships are sub-national agencies. Comprising CSOs, philanthropic bodies, and local development groups, these actors can play a critical role in improving the effectiveness of development cooperation. Thus, this is instrumental in delivering the SDGs.[26] CSOs are important to development cooperation, both as development actors in their own right and also as implementing partners.[27] The strengthened global partnership for achieving SDG17 (global partnership for sustainable development) is meant to involve all levels of government, the private sector, and civil society, among others, in a whole-of-society approach towards SDG achievement.[28] Further, CSOs play a crucial role in facilitating people's participation and the pursuit of accountability.[29]

During the COVID-19 pandemic, CSOs proved their mettle by spearheading a large number of humanitarian activities and providing support to millions of migrants in India. During the lockdown, they supplied food through community kitchens, offered urgent medical care, and also facilitated transportation for the hapless migrants stuck in different parts of the country. For example, NITI Aayog reached out to almost 92,000 CSOs, seeking their support in delivering services to people. Through community mobilisation and sensitisation, CSOs were able to successfully tackle the spread of the COVID-19 virus, with one of the more remarkable examples being Dharavi in Mumbai.[30]

Functioning as a vital bridge between the government and the citizens, CSOs monitor official policies and actions, thereby engaging in advocacy, protecting human rights, and ensuring accountability of the authorities, private sector, and other institutions.[31] According to the OECD, it is essential that donor agencies

(or development partners) create an enabling environment for CSOs.[32] As of 2021, nearly US$21 billion[33] was channelled by traditional donors, constituting 15 percent of all bilateral official development assistance.[34] India's development cooperation model in the decades after it achieved independence in 1947 has been bolstering CSOs through triangular partnerships.[35] Experts believe that India is keen to utilise the triangular format to "spot innovations by Indian CSOs with a view to sharing them with other countries to tackle similar development challenges and also undertaking broad regional and global initiatives."[36]

However, numerous challenges exist that impede the effective functioning of these agencies. It has been observed that, in various parts of the world, governments have restricted the legal, regulatory, and policy space (also called civic space) in which civil society operates.[37] There have also been gaps in information sharing between the government and CSOs, administrative hurdles, and high transaction costs. However, there is considerable scope to leverage the capacities and knowledge of CSOs. Additionally, most of these organisations are often small-scale and constricted in terms of resources to be able to leverage programs and impact.

The Role of Philanthropy

India has a distinct and diverse philanthropic community but its true potential remains untapped, especially in climate action. For example, it represents about 0.5 percent of the overall domestic philanthropic funding in India, which meets only 10 percent of India's climate financing needs. In addition, most of this funding is concentrated in large and developed states of the country, leaving the more vulnerable and smaller states behind. Investments are also primarily focused on sustainable transport or renewable energy rather than building climate resilience. Here, philanthropy can play a crucial role in providing support to CSOs, filling the gap in funding, helping them build capacity in areas that need improvement and promoting open communication for long and effective partnerships. Considering that they have a greater risk tolerance, philanthropy can provide the much-needed stimulus to the efforts of the government, multilateral agencies, and grassroots organisations towards climate action.

Policy Recommendations

a) Mainstreaming gender in international development cooperation is key towards fighting climate change and achieving sustainable development.

b) Including civil society and private sector organisations in development cooperation programmes can help address the challenges of financing for SDG5.

c) Leveraging philanthropy and involving them fully in the process of climate action will help bridge the gap in financing, working together with CSOs in capacity-building and opening avenues for long-term communication.

d) Learning from the best practices of other countries can possibly help India frame its development cooperation programmes. This should be taken up in terms of gender sensitisation programmes, inclusion of women in decision-making processes at the higher level, and reaching the grassroots levels by identifying the problems faced by rural women, among other initiatives.

e) Fostering technology transfer and capacity building programmes on gender between the Global North and the Global South.

f) Scaling up development cooperation efforts, in terms of financing, to address the challenges of climate change and gender equality.

> *"The climate crisis is not 'gender-neutral'; women and girls face greater hurdles while dealing with climate impacts.*

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7

A Multi-Stakeholder Approach to Development Governance Through Climate Action

Akshay Shetty and Kirti Jain

NUMEROUS ENTITIES WITHIN A NATION play important roles in climate action, which involves formulating and implementing policies, regulations, and development priorities aligned with the objectives of the Sustainable Development Goals (SDGs). These actors can be classified into two categories: state and non-state. State actors comprise government organisations at both the central and local levels, while non-state actors refer to entities outside the government involved in climate change programs, such as the business sector, international institutions, and civil society or non-government organisations. Both state and non-state actors share the responsibility of reducing and addressing the impacts of climate change.

While global partnerships between governments are paramount, development cooperation is increasingly recognising the roles that various track-2 stakeholders, such as the private sector, civil society organisations, and philanthropy, play in the climate action ecosystem. SDG 17 also envisions encouraging and promoting effective public-private and civil society partnerships, building on the experience and resourcing strategies of partnerships.[1]

Given India's vulnerability to climate change and its tectonic impacts on the SDGs, there is urgent need for stakeholders to come together and build consensus on the way forward. There is a need to put vulnerable communities and people at the centre of the discourse on climate action and engender collaborative action by exploring pathways of building resilience in societies and systems. All stakeholders, including governments, civil society organisations, philanthropy, and communities, have the potential to scale inclusive and equitable climate action.

Civil Society: At the Frontlines of Climate Action

Civil society organisations (CSOs) are an integral part of climate policy formulation and implementation. India has a vibrant civil society, with over 3.1 lakh million organisations and 19.2 million people working as partners, service providers, facilitators, and enablers of mainstreaming equity to collectively shape the country's development story.[2]

In times of crisis, CSOs have been at the frontlines of action, providing relief and building the resilience of affected communities. For instance, during the

COVID-19 pandemic, CSOs provided humanitarian support to millions of migrants; from sending food supplies via community kitchens, organising medical aid, and making travel arrangements so that migrant workers can return home safely. The central government's apex nodal agency, NITI Aayog, reached out to over 92,000 CSOs, seeking their assistance in delivering services to the poor as well as health and community workers. The Supreme Court also lauded the contribution of CSOs in helping migrant workers with food, water, and transport during the crisis.[3]

As climate change becomes the defining crisis of the century, the role of CSOs in scaling inclusive and equitable climate action will become paramount. While there is no comprehensive data on the number of CSOs driving climate action in the country across sectors, the Government of India's database, NGO Darpan, lists over 45,000 organisations working on the category of 'environment and forests'. The number increases significantly when considering organisations working across climate-intersectional sectors such as agriculture (41,000+), disaster management (25,000+), rural development and poverty alleviation (42,000+), urban development and poverty alleviation (21,000+), and nutrition (20,000+).[4]

While the work of these organisations may not directly fall under the ambit of climate action, there is potential for these organisations to apply a climate lens to their programs. For example, there is a huge network of CSOs that work on climate-adjacent sectors like rural development and poverty alleviation. By integrating a climate lens in their interventions, these organisations can address issues like vulnerability of agricultural systems, farmer livelihoods, food security, land productivity, and water scarcity in the long run, while also strengthening the resilience of communities directly affected by climate change in these sectors. The team at the helm of the ClimateRISE Alliance—a collaborative platform for intersectional climate action in the country—engaged with 100+ CSOs working across climate-adjacent sectors and noted that a vast majority of these organisations are now consciously integrating climate action across programs and interventions, considering the ever-increasing impact of climate crisis on their legacy target groups.[5]

These CSOs are uniquely positioned to be key allies in strengthening climate action in the country, with their proximity to communities, presence in intersectional sectors, understanding of local contexts, and advocacy and mobilisation skills.

CSOs and Their Engagements with Communities

Historically, CSOs in India have worked closely with marginalised and vulnerable communities such as women, people with disabilities, tribal communities, and low-income groups. These populations, because of intersecting vulnerabilities, are also least able to prepare for or recover from the impacts of climate change-induced crises. In a survey of over 800 CSOs in India by Catalyst 2030, 94 percent of organisations reported that some 67 percent of their organisational activities cover target population segments that are underserved or less privileged, or live in regions recording lower performance in the development priorities of governments. Hundreds of these CSOs are also already working for the welfare of these groups across areas such as agriculture, food security, urban systems, conservation, livelihoods, and health, which are affected by the climate crisis.[6]

Employing an intersectional approach and looking at climate intentionally across these sectors and population groups will be key for CSOs in scaling inclusive climate action in the country. CSOs can work closely with these communities, facilitate community-level engagement, strengthen capacities, and enhance climate resilience at the grassroots level through their interventions. Moreover, CSOs are led by people who are proximate leaders, i.e., people who themselves belong to communities affected by marginalisation or vulnerabilities. This enables them to see the complex and multiple root causes behind the climate crisis. As a result, their interventions are more systemic. A growing body of global research indicates that proximate leaders are best equipped to understand community issues and help develop long-term solutions to the climate crisis.[7]

The close access to communities also gives CSOs the comparative advantage of being able to bridge the gap between policy and on-ground implementation. As such, they can actively advocate for the inclusion of community needs and realities across government priorities and global negotiations on climate action.

As the need to move towards the delivery and integration of climate action policy across sectors such as transport, food systems, ecology, and industry is intensifying, government institutions at the central, state, and city levels are seeking support from geographically spread-out CSOs in these sectors to

operationalise the country's climate commitments. CSOs are doing this through the capacity building of officials, supporting government departments with data and research, and acting as a bridge between policy and practice, thus serving the most vulnerable communities effectively. For instance, in a survey of hundreds of CSOs, 35 percent of them said the primary purpose of collaborations with governments was funding and improving service delivery; 26 percent reported that they collaborate with governments to help them achieve scale for impact.[8]

Philanthropy for Intersectional and Equitable Climate Action

While CSOs are at the frontlines of climate action at the grassroots, these organisations are often small-scale and constrained by a lack of resources to scale programs and impact.

Philanthropy can provide crucial support to CSOs driving climate action by helping them with capacity building in areas that need improvement and promoting open communication for long and effective partnerships. It can support grassroots organisations with proximate leadership on climate action, enabling them to cover organisational expenses and adapt to their communities' needs effectively. Philanthropy can provide patient and long-term capital and support grassroots CSOs in building sectoral research and knowledge infrastructure, implementing place-based pilot programs, increasing access and availability of climate change knowledge to these organisations and communities, supporting climate-friendly policy reforms, and providing technical assistance to implement such policies.

While India has a large and vibrant philanthropic community, climate change is yet to receive the resources and attention it needs. Climate action represents 0.5 percent of overall domestic philanthropic funding in India, which meets only 10 percent of the nation's climate financing needs. In climate investments, energy, transport, and carbon dominate the funding landscape. While there is growing interest in waste and circularity as well as built environment, nature restoration and watershed management are also finding

support from innovation-focused philanthropists. Investments are primarily being made in mitigation, with insufficient focus on adaptation and building resilience in communities. Further, philanthropic funding is concentrated in more developed states such as Maharashtra, Karnataka, and Andhra Pradesh, leaving the country's more vulnerable regions in the lurch.[10]

There is a critical need to fill this funding gap. It is estimated that India needs at least US$1.05 trillion in climate investments between 2020 and 2030 across sectors like transport, energy, sustainable agriculture, waste management, and city resilience in order to minimise the worst impacts of climate change.[11] At present, the weight of social-sector commitments is being carried largely by the government, accounting for 95 percent of the spending. However, public funding growth will likely level out to pre-pandemic levels.[12] Therefore, the imperative is on philanthropy to realise its full potential and bridge the funding gap in India. India's large and vibrant philanthropic community is better positioned than governments and the private sector to respond quickly and plug funding gaps. Since philanthropy has a greater risk appetite, it can play a significant and catalytic role in supplementing the efforts of governments and multilateral agencies and strengthening the capacity of grassroots organisations that lead the charge in climate action.

Philanthropists can play a meaningful role in climate action by moving away from looking at climate change as a siloed issue and adopting an intersectional approach by considering its linkages with other development goals such as food security, good health and well-being, life on land, and other sectors in their legacy portfolios. Indeed, philanthropy is moving towards a greater understanding that climate is not a standalone cause but has adverse intersectional impacts across sectors. Givers are now keener to incorporate an environmental and climate lens into their existing portfolios and invest more deliberately in climate solutions. According to the *India Philanthropy Report 2023*, UHNIs, HNIs, and affluent givers are emerging cohorts with a high potential to strengthen the philanthropic ecosystem on climate action. Over 90 percent of Inter-Gen and Now-Gen donors want to be increasingly involved in emerging causes such as climate change and are open to adopting catalytic ways of giving, including willingness to share

insights, unrestricted funding, and collaborative funding. Inter-Gen and Now-Gen donors are also keen to nurture community resilience, strengthen philanthropic infrastructure, and build capacity of non-profits. Along with scale, funders are also factoring in the depth of impact and vulnerabilities of affected communities in their giving journeys. This includes giving to fields such as wildlife conservation, environment, water treatment, sanitation, forestry, and renewable energy.

While this is a positive shift, there is significant room for philanthropy to elevate efforts both in funding and in strengthening the narrative for adaptation and community resilience in a sector that has hitherto primarily focused on mitigation. The G20 presidency for 2023 coming to India not only puts a spotlight on the country but is also an opportunity to drive greater attention to climate change effects in the country. Philanthropy can leverage this opportunity to have a seat at the table, participate in discussions, and enable more intentional climate action.

Conclusion

As highlighted in the previous chapters, every SDG has an intersectionality with climate change. The biggest challenges of global, national, and local development governance, therefore, can only be achieved through continuous combat with the biggest threat faced by humankind, i.e., climate change. This chapter discussed the importance of CSOs in climate action towards aiding in the achievements of the SDGs.

However, climate action requires an integrated effort and approach, and the work cannot take place with CSOs or philanthropy alone. The movement towards a sustainable and inclusive future for communities mandates the collaboration of all actors in the climate action space, such as civil society, governments, philanthropy, producers, and consumers themselves, who need to understand the importance of making the paradigm shift towards an intersectional and

collaborative approach. Bottom of FormIt is also imperative for the diverse stakeholders across these sectors to come together to build consensus and chart a collaborative path towards a more sustainable and prosperous future for all.

Urgent action is required from all stakeholders to address the climate crisis and protect vulnerable communities. Multi-stakeholder platforms can be instrumental in enabling collaboration and consensus among the stakeholder groups and can create common opportunities to drive deeper impact by leveraging collective resources, networks, and diverse skillsets across sectors and actors affected by the climate crisis.

> *Employing an intersectional approach will be key for civil society organisations in scaling inclusive climate action in the country.*

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Annexure: The Climate Change-SDG Intersectionality: CSO Interventions

Janaagraha

Janaagraha works with citizens and governments to transform the quality of life in India's cities and towns through three key levers: citizens' participation; city finance; and urban policy and research. The organisation adopts a cross-disciplinary approach to address the climate crisis, simultaneously looking at public health, gender, and poverty, while striving to build inclusive and improved infrastructure and services for all.

Through primary and secondary research and analyses, Janaagraha identifies pathways of interactions between city systems and environmental policy and provides policy recommendations for better environmental governance at national and state levels, particularly from the lens of equity and social inclusion. It develops green infrastructure guidelines for urban planning and design, creates citizen engagement programs on climate through ward committees, and implements training programs on sustainability and environmental action. It also designs a climate education curriculum for children and recommendations for municipal budgets and staffing for climate action.

A Closer Look: 'City systems for the environment'

To understand the gaps in climate governance in the city of Bengaluru, Janaagraha is employing a 'city systems' framework. The framework provides a comprehensive systems approach to diagnose, and address, the underlying causes of governance and institutional challenges that cities continue to face. The tool used to diagnose issues is called the 'Annual Survey of India's City-Systems' or ASICS.

As part of the initiative, the organisation completed a national-level analysis of 18 ministries across 65 schemes to understand the national, state and ULB roles towards tackling climate change. In its 5th edition, ASICS 2017 highlighted multiple bottlenecks in the governance of cities in India. Among the key findings were the lack of modern planning frameworks and design standards for public utilities, weak financial sustainability and accountability, poor human resource management, fragmented governance across municipalities and state departments, and a total

absence of systematic citizen participation and transparency. These issues also pose significant barriers to the creation of sustainable and resilient habitats that can effectively tackle climate change and ensure equitable development.

Through this framework, Janaagraha aims to identify synergies in existing schemes and advocate for an amendment to empower cities for first-mile governance of environmental sustainability at the national level.

Biome Environmental Trust

Biome is a research, public education, and advocacy organisation that works in the areas of land-use planning, energy, water, and sanitation. The organisation's efforts are underscored by a strong belief that clean water is a fundamental human right, and it acknowledges how land-use policy and sanitation services too, can affect the availability and quality of water for local communities. In this context, it promotes ecological sustainability, and environmentally and socially just water and land-use change and management.

Biome works closely with citizens in a number of ways: translating existing scientific information and regulations into lay language for better understanding; providing case studies and stories of other neighbourhoods that have managed to adopt better water management practices; and, perhaps most critically, connecting them to the people who can help them implement the solutions effectively. By engaging with the local communities, Biome empowers them to take an active role in managing their water resources.

A Closer Look: 'Million Wells for Bengaluru' Campaign

The 'Million Wells for Bengaluru' campaign was initiated in 2015, with the objective of recharging the groundwater table in the city, incentivising ownership and responsibility for water management among local citizens, and creating livelihood opportunities for the local community of traditional well diggers (called Bhovi or Mannu Vaddars) in Karnataka. The campaign is expected to run until 2025.

The campaign seeks to involve citizens by building awareness about shallow aquifers and the importance of recharging them. It is estimated that Bengaluru needs at least 1 million recharge wells, a necessary step to make up for the shortfall in daily water use. These recharge wells also help in urban flood control, as excess water can seep into the ground more easily.

The inspiration for this program came from an intervention that Biome facilitated in Rainbow Drive, a community of about 400 plots near Bengaluru, where there was no water supply from the urban local government body, and citizens had to buy water through tankers. Throughout 2005-06, the residents of Rainbow Drive dug over 250 recharge wells, which enabled them to pump over 100,000 liters of water per day from a single 360-ft. deep borewell. These wells continue to recharge the groundwater in the area till date.

To implement this program, Biome focused on building awareness and educating citizens through events like exposure walks, workshops and discussions, photography exhibitions, sharing stories on social media, and articles in electronic and print media—on how their water usage affects the groundwater table, with the aim of incentivising them to action. Further, Biome ensured that the voices of the marginalised well-digger communities of Karnataka, known as Bhovi or Mannu Vaddars, were heard while designing the program and awareness material. The campaign also created fresh livelihood opportunities for the Mannu Vaddars, as they were involved in digging the recharge wells in various locations in Bengaluru. The campaign succeeded in building a sense of collective ownership over the shallow aquifer, with more than 200,000 recharge wells already dug in the city.

Civic Participation in Climate Action

While the climate crisis is increasingly affecting multiple facets of people's lives, our strategies and policies for climate action have continued to be top-down with limited emphasis on engaging with the citizens and the community, who are at the centre of this impact. Strengthening climate action requires ensuring that diverse voices and perspectives are heard, enabling the development of inclusive and equitable climate policies and initiatives. It empowers individuals to take

ownership of climate action by engaging in sustainable practices, advocating for policy changes, and holding governments and corporations accountable for their actions.

REAP BENEFIT

Reap Benefit seeks to build a tribe of local problem-solving citizens who drive change in their respective communities by solving everyday issues using local data, local solutions and local campaigns. Reap Benefit works closely with the youth through experiential mentorship programs in schools and civic technology platforms that enable them to identify local environmental problems, collect quantitative and qualitative data to foster a deeper understanding of the issues, ideate and pilot solutions and campaigns, and communicate the data and solutions with local governments. The experiential learning is amplified by hands-on activities, Do-It-Yourself Solution kits, games and Reap Benefit's technology platforms, which include a Web App, a WhatsApp Chatbot, and a Civic Forum.

Reap Benefit's work has not only been acknowledged nationally by the Ministry of Drinking Water and Sanitation, MIT GSW, Forbes, Times of India, CNN IBN and Unilever but has also found resonance with the former president of the United States, Barack Obama.

A Closer Look: Paryavaran Mitra

To strengthen the role of citizens in the Delhi Government's efforts to preserve the environment, the Dialogue and Development Commission of Delhi (DDC) collaborated with the Environment Department, GNCTD, to launch the Paryavaran Mitra programme, a unique citizen-engagement initiative which aims to create a network of people from Delhi, who have the awareness, knowledge, commitment, and potential to meet the challenges of environmental sustainability in their own spheres of influence.

Reap Benefit is actively supporting the Government of Delhi on this flagship intervention. Leveraging its experience in creating innovative technological platforms, Reap Benefit helped develop a WhatsApp-based chatbot system through which the project was implemented and thousands of Paryavaran Mitras were engaged. The chatbot enabled interested citizens to join hands with the Government of Delhi for addressing a range of civic and environmental issues. The citizens were also able to connect to volunteer activities in the areas of greening, pollution control, and waste management.

By September 2022, three months after the launch of the program, 5,433 residents had expressed interest in the initiative through the chatbot and 3,333 had registered for the program. Over 175 suggestions and feedback comments on environment-related policies (such as on rainwater harvesting, green action plans, park creation & maintenance, and EV retrofitting) were shared with DDC, for further analysis and deliberation.

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