

# Chapter 29

## Communities, Climate Change Adaptation and Win–Win Solutions



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### Key Messages

- The spatial, social, economic and historical diversity of South Asia suggests that there is no single mechanism to ensure success in adaptation.
- This part of the world provides examples of both success stories and failures in community adaptation.
- Traditional knowledge, new innovations, sensitive state intervention and market incentives all play a role in ensuring that community adaptation is optimal.

### 29.1 Introduction

The Intergovernmental Panel on Climate Change (IPCC) has played a stellar role in sensitising all stakeholders including the academic community, policymakers and local communities on the current state of knowledge on climate change and its potential impacts. The panel is expected to release its sixth assessment report in 2021, but

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there is likely to be little to cheer about for those who have been or are expected to be adversely affected by rising temperatures and resulting extreme events. There is no country that is immune to some adverse effects of climate change but development economics ignores the environment (Dasgupta & Mäler, 1990).

The Paris Agreement of 2015 gave some hope as most countries committed to limit climate change. While mitigation is of immediate concern, adaptation is expected to be an ongoing challenge. The state must play its role, but it will have to work within the bounds of responsiveness and cooperation from individual consumers and producers. There is some evidence from South Asia that non-government stakeholders are willing to come on board to help fulfil NDC pledges, but some would prefer incentive-based policies rather than command and control policies (Haque et al., 2019).

## 29.2 Thinking Global, Acting Local

While climate change is a global problem, there is wide acknowledgement that adaptation to climate change will be a local challenge (Yohe & Moss, 2000). This implies that communities will play a significant role in managing the adaptation. They are capable of creating and adopting innovative strategies that are locally suitable, integrative, cost-effective, resource-efficient and culturally appropriate (Shammin, Firoz, & Hasan, 2021a; Chap. 2 of this volume). There is growing evidence and documentation of these successful efforts from across the global South (Shammin, Haque, & Faisal, 2021b, Chap. 3 of this volume).

## 29.3 Agricultural Adaptation

There are persistent knowledge gaps, for example, on factors that determine farmer adaptation. These include both climatic factors as well as non-climatic factors like demographic and economic characteristics. Most often, farmers' adaptations are driven by market forces, and there exists a significant gap between perceived and actual changes in climatic variables in South Asia (Budhathoki & Zander, 2020; Javed et al., 2020). More studies pertaining to perception and risk attitude behaviour could help evolve suitable policies for better adaptation (Bahinipati & Patnaik, 2021, Chap. 4 of this volume).

Communities are vulnerable not just due to the social hierarchies and inequalities; some are more vulnerable because of where they live and their level of access to technologies and knowledge. The Gangetic delta in South Asia is shared by India and Bangladesh. The communities living in this deltaic region are affected annually by extreme climate events, the severity, and frequency of which is increasing. These mudflats were inhabited about a century and half ago by new settlers. They cleared the mangroves and built an intricate labyrinth of earthen embankments to sustain

their agriculture and protect their homes. Studies reveal that they are responding to climate change in two different ways. In one instance, it was found that out-migration, especially by the educated youth, was being used as a coping mechanism by the settlers (Ghosh & Roy, 2021, Chap. 26 of this volume). Apart from building social capital, larger investments in education could also provide greater resilience to vulnerable populations. Amin and Shammin (2021, Chap. 5 of this volume) find that adaptation initiatives took the form of mangrove rehabilitation, freshwater availability, agricultural productivity, and women’s empowerment. In another instance, Bari, Haque, and Khan (2021, Chap. 14 of this volume) find that farmers are using traditional knowledge to innovate and produce crops using floating beds (*Baira*) in waterlogged areas of coastal Bangladesh. This technique could be replicated and used as an effective adaptation strategy to overcome vulnerability to waterlogging and provide food security simultaneously.

South Asian agriculture is characterised by subsistence farming by smallholders who are one of the most vulnerable groups. Although advances in science and technology help in adaptation, in some instances, reliance on traditional knowledge systems have helped communities to better adapt to climate change in this part of the world. In Bhutan, where more than 57% of the rice farmers are of this type, the communities are using traditional knowledge and experience to build resilience towards climate change. Tshotsho (2021, Chap. 6 of this volume) finds that the use of traditional rice varieties has helped farmers become more resilient to water scarcity compared to farmers using high-yielding varieties. Farmers in Pakistan are responding to climate change induced floods by crop diversification that helps them spread the risks of crop failure (Nazir & Lohano, 2021, Chap. 28 of this volume).

## 29.4 Role of External Support

Despite the community’s best efforts, in some cases, the outcomes could be improved with external support. In the flood-affected Nowshera district of Pakistan, Ahmed (2021, Chap. 7 of this volume) finds that farmers could improve their adaptation outcomes if there was external technical support from the government. This is also evident in Kerala, India where Devi et al., (2021, Chap. 8 of this volume) document how farmer cooperatives with strong support from state agencies helped increase resilience in a post-flood situation. Collective action with state support helps farmers build on existing social networks that provide resilience during climate threats like sea level rise (Shafeeqa & Abeyrathne, 2021, Chap. 9 of this volume).

We find similar stories from mountain communities of Nepal where traditional technology for rainwater harvesting (RWH) has been re-designed with the help of new material and technology for climate change adaptation. The development and spread of RWH among farmers with external financial support and extension services (mainly providing training to the farmers) have helped farmers diversify their crop from subsistence-level cereal production to commercial high-value vegetables that has resulted in higher net income to the farmers (Kattel & Nepal, 2021, Chap. 11

of this volume). Since the up-front cost of adopting RWH technology is high (30% of farmers' annual income), its adoption rate is low despite a very short payback period of two years for the technology, suggesting that external financial support is needed to increase the adoption rate. In areas like Samanalawewa catchment in Sri Lanka, where the land use has changed over time, soil erosion can be a major concern (Udayakumara, 2021, Chap. 19 of this volume). State support by way of training of farmers in soil and water conservation measures and extension support can help farmers reduce risks due to soil erosion.

## 29.5 Energy Adaptation

In South Asia, over 60% of the households rely on solid biomass for cooking and heating, mainly using traditional stoves. In the absence of grid-electricity, low-cost solar home systems have been used in many rural communities, which provides clean lighting options (Shammin & Haque, 2021, Chap. 14 of this volume). But, for cooking, the problem is worse in rural areas where there is an absence of alternative sources of cooking energy and improved stoves for burning fuelwood are rarely available. The excessive use of fuelwood in traditional stoves poses the triple challenge of carbon emission, health hazards and impact on the local environment (deforestation). Governments across different countries in the region have been making attempts to reduce fuelwood use and increase alternate fuel use. In India, a series of initiatives including subsidies to the rural poor have been provided to shift dependence on firewood. The extent of adoption of clean cooking energy (refill of LPG cylinders) has differed across states and districts and was found to be dependent on multiple factors, most importantly on the extent of state support for rural employment generation programmes such as the Mahatma Gandhi National Rural Employment Guarantee Act (Thomas et al., 2021, Chap. 13 of this volume). In Bangladesh, Bari et al., (2021, Chap. 14 of this volume) found that the creation of appropriate market chains for LPG in rural areas could reduce forest dependence, with households voluntarily adopting LPG instead of using firewood for cooking.

## 29.6 Resilience to Extreme Events

Rural communities have dealt with drought and floods by innovating on spatial characteristics of the region they live in. The Small Tank Cascade Systems (STCS) of Sri Lanka (Vidanage, Kotagama, & Dunusinghe, 2021, Chap. 15 of this volume) and rainwater harvesting technology in mountain villages in Nepal (Kattel & Nepal, 2021, Chap. 11 of this volume) are some of the prominent examples. Once the lifeline for survival, these STCS in Sri Lanka became neglected over a period of time due to various reasons. However, with climate change, their revival is being seen as key to adaptation and resilience of rural communities. The cascades that connect water

reservoirs at different levels not only fulfil the need for flood control but store water for the dry months. State support for these systems could help significantly in their revival and provide protection against climate change in future.

Just as climate change has brought in its wake increased frequency as well as intensity of extreme weather events, communities and policymakers are learning how to respond to disasters that follow such events. Shammin, Wang and Sosland (2021c, Chap. 16 of this volume) analyse the disaster management frameworks in Bangladesh which have developed a rich matrix of linked institutions between and across different levels. They combine field level observation with expert responses and find decentralised, community-based practices in some locations that could be replicated in other coastal communities with similar circumstances.

In coastal zones, apart from human-made efforts at minimising the damages caused by tidal waves, surges and cyclones, nature itself provides protection services through mangroves. Das (2021, Chap. 17 of this volume) and Mahmud et al., (2021, Chap. 20 of this volume) examine extreme events in India and Bangladesh. The first one looks at the super cyclone in 1999 (that hit Odisha, India), and the second one looks at *cyclone Sidr* in 2007 and *cyclone Roanu* in 2016 (that hit Bangladesh). The 1999 super cyclone showed how important the mangroves were in providing storm protection (to the extent of USD 68,586 per km width and USD 4335 per ha of mangroves) for those in the vicinity of the mangrove forest. Bangladesh too is regularly hit by cyclones. From the individual's perspective, households' investment in housing is driven by location-specific information. People are now inclined to build storm-resistant homes and locate themselves closer to government-sponsored embankments, mangroves, and cyclone shelters apart from wishing to be in the vicinity of a vehicular road, and primary school. The takeaway for policymakers here is to target relief in the aftermath of an extreme event for households living outside embankments and located further away from the mangrove forest.

Both studies find that protection of the mangrove forest is critical for building natural resilience to extreme events for local populations. This would help avoid the large-scale migration that was noticed by Ghosh and Roy (2021, Chap. 26 of this volume) in the aftermath of the severe cyclone *Aila* that hit India and Bangladesh.

## 29.7 Impact of Information

Communication of weather-related information is critical for reducing risk and building resilience. This is especially true for farmers whose vulnerability and risk-bearing capability is low. Gunathilaka and Samarakoon (2021, Chap. 27 of this volume) and Menon et al. (2021, Chap. 18 of this volume) argue that reliable climate forecasts and weather-related information work well if they are localised, accurate, easy and low-cost to access. Institutions can play a decisive role to enhance resilience if they can help farmers translate this information at the field level.

## 29.8 The Urban Challenge

Nearly 5 billion people are expected to be living in urban areas by 2030, and half of this increase is expected to be in Asia with China and India absorbing 55% of the regional urban growth (Seto, Güneralp, & Hutyra, 2012), suggesting that South Asia will face challenges in making our urban spaces more resilient. Well-known problems in the global South for urban sustainability include the lack of infrastructure, management capability of local governments and fast changing land use both at the centre and periphery of the urban landscape that leads to disintegration of existing institutions and requires the emergence of new ones. If successfully managed it could lead to greater resilience.

Three of the problems that both large and small urban centres in South Asia are facing relate to supply of safe potable water, recurrent flooding due to lack of drainage, and management of municipal waste. Most cities in the region lack sanitary landfill sites and recycling ability. With municipal waste being dumped in open spaces, forests and riverbanks, the accumulated waste blocks the natural flow of stormwater, resulting in waterlogging and urban flooding (Rahmasary et al., 2019). Urban centres have not increased their drainage commensurate with the city's expansion. While floods in big cities receive global attention, there are many smaller urban centres that face similar problems on a regular basis. The challenge for policymakers is how to finance drainage infrastructure.

Nepal et al. (2021, Chap. 21 of this volume) discuss a similar situation in one of the cities in Nepal (Bharatpur) where the lack of drainage and poor solid waste management has increased the risk of waterlogging and urban flooding. However, they find that households would be willing to pay additional fees for better solid waste management if the city provides waste collection services on a given date and time, so that there is a synchronised disposal and collection of waste by the households and the waste collectors. They also find that at-source segregation of waste helps recycling plastics, papers and metal items that generate a significant amount of revenue for the cities. Cleaner cities have a large price premium for the home owners, suggesting that efficient management of municipal waste generates a win-win situation for the city and its residents. In Sylhet, Bangladesh, Rakib et al., (2021, Chap. 24 of this volume) showed that with little effort at the community level, it was possible to persuade women in the household to segregate their kitchen waste and promote local composting instead of filling up the dumpsites.

Drinking water supply for urban consumption will increasingly be a challenge with climate change. Traditional sources of supply like natural springs in the hills and the mountains and wells in the lowlands are drying up, getting damaged or overdrawn due to poor management. While urban planners have focussed investment on infrastructure for water distribution, the management of water source has often remained unattended. Rai & Nepal (2021, Chap. 23 of this volume) examine the possibility of creating sustainable water supply solutions using an Incentive Payment for Ecosystem Service mechanism between upstream and downstream communities. Local institutions could play the role of intermediary for addressing the missing

market that helps providing uninterrupted drinking water supply to urban residents. If designed appropriately, the payment from the water user community would provide incentives to the upstream community for protecting the water source, so that the downstream community can enjoy uninterrupted water supply.

## 29.9 Resilience and the Role of Women

Women play an important role in the adaptation process. Sharma et al., (2021, Chap. 22 of this volume) examine women’s collective action in Ahmedabad and other cities to show how India’s urban slum areas are adapting to three types of climatic shocks—heat wave, flooding and vector-borne diseases. These groups are able to increase awareness about the effects of climate change and the adaptation choices that these communities can make. They are also well placed to facilitate these urban changes and increase the resilience of the urban poor. Even in aspects of waste management in urban centres, women can play a significant role by creating awareness and promoting home-based segregation that can reduce the pressure on the city’s waste managers (Rakib et al., 2021, Chap. 24 of this volume).

## 29.10 Innovative Experiments

One of the fastest growing sectors in the service economy is tourism, especially nature-based tourism (Balmford et al., 2009). It has provided alternate livelihood opportunities in many regions of the world. Bhutan has managed its tourism in a responsible manner by controlling the ecological footprint of the sector. Dendup et al., (2021, Chap. 25 of this volume) examine the experiment of community tourism as an adaptation mechanism. They find that community-based tourism helps improve the living conditions and assets of participating households, including the poor.

## 29.11 Challenges to Adaptation

It is also true that communities are not always able to undertake collective action. In the absence of either collective action or effective state intervention, the outcomes could be unsustainable, and households become more vulnerable. Devi et al., (2021, Chap. 8 of this volume) draw attention to the situation of water scarcity in Kerala where there was neither any visible collective action by communities nor state presence. This has led to unsustainable levels of resource depletion. In fact, long-term trends indicate that in parts of South Asia, the water table has been declining rapidly. This is driven partly by climatic factors (rising temperature, erratic rainfall and drought), but also government policy that subsidises electricity for agriculture. In

this situation, state subsidy has not been beneficial for sustainable water use. Where groundwater depletion rate is already high, it could trigger unsustainable withdrawal of water. In the long term, this could adversely affect farmers especially small holders. This would pose a bigger challenge if the well density increases in an area where water scarcity is high or the ground water table is already depleted (Balasubramanian & Saravanakumar, 2021, Chap. 10 of this volume). As the impact of climate change begins to adversely affect human wellbeing especially in developing countries, economists will have to deal with issues of the environment as a core thematic in the subject (Dasgupta, 2021, Foreword of this volume).

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