CHAPTER 11

Community-based climate change adaptation

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Climate is one of the primary determinants of agricultural productivity. Therefore, climate change and food availability are directly interlinked (Ludi, 2009). Temperature could be negatively or positively related to agriculture value addition (Husnain et al., 2018). Climate change may also initiate the vicious cycle of infectious diseases making affected populations more vulnerable to health risks (Schmidhuber and Tubiello, 2007). A 2°C rise in temperature could lead to a four to five percent reduction in annual income per capita for many countries, primarily due to their dependence on agriculture (Stern, 2007; Nordhaus, 2008). With the galloping population growth, "even small climate shocks can cause irreversible losses and tip a large number of people into destitution" (World Bank, 2009, p. 44).

Not surprisingly, however, governments have poverty alleviation as their most important priority in development planning, rather than environmental governance, since Human Development Index rankings for many of these countries remain dismal. Adaptation to climate change, especially for emerging economies is, therefore, challenging and requires not just national responses, but also collective ones. A key to a sound climate change adaptation strategy lies in strengthening local institutions and community-based adaptation (CBA) initiatives and defining their functions. The functions include information gathering and its dissemination, resource allocation and mobilization, capacity building, application of modern technology (telecommunications and alternative energy), leadership development and social networking. This enhances the capacity to manage climate-sensitive assets and natural resources, and increases the resilience of communities (World Bank, 2009; Agrawal, 2008).

The learning acquired from global CBA projects and initiatives makes it clear that foreign organizations (which include non-governmental organizations (NGOs) and international NGOs) need to win community trust, first and foremost. They must have first-hand knowledge about indigenous community capacities and past/present coping practices before introducing new technologies, ideas or practices. Women's, marginalized groups' and even children's roles need to be recognized, and they must be seen as potential change agents for building community resilience against climate vulnerability. Finally, adaptation initiatives (whether local, regional or national) are about learning-by-doing. For sustainable and climate-resilient development, especially in South Asia, adaptation measures should focus on strengthening adaptive capacity of the poor and the marginalized; investment in knowledge sharing; regional cooperation; institutional and technical capacity building; and protecting ecological services.

Global climate change challenges

In 2010-11, Maplecroft—a global risk analysis company—highlighted the "extreme risk" 16 countries, out of 170 surveyed, would be facing from climate change over the next three decades (Maplecroft, 2010). This Vulnerability Index ranked countries like Bangladesh (1st), India (2nd), Nepal (4th), the Philippines (6th), Vietnam (13th), Thailand (14th) and Pakistan (16th) as extreme-risk countries along with Africa (with 12/25 countries most at risk). High levels of poverty, population growth, degradation of natural resources, droughts, dependence on agriculture, floods from heavy rainfall and rising sea levels increase the burden on states leading to greater impoverishment (Jodha et al., 2012; Singh et al., 2011). These make developing and emerging economies especially vulnerable and less resilient to climate change and human-made/natural disasters.

Contrary to a popular misconception, sea-level rise will not only inundate heavily populated coastlines and delta systems, but will also impact arable regions. This, in turn could lead to salinity in agricultural lands and drinking water sources, causing food insecurity, water shortages and water-borne diseases with both aquaculture industry and farming communities severely affected. Climate scenarios predict that islands like the Maldives, parts of Sri Lanka and Bangladesh could vanish in extreme coastal storms. Water shortages in the north of Pakistan and sea-level rise along the coasts of Pakistan and Bangladesh could result in millions of environmental refugees flooding major inland cities. This will make climate change both an inter- and intra-regional security threat (Nelson et al., 2010; Alam, 2009).

As mentioned earlier, environmental health risks will accelerate with climate change as water shortages become more acute, forcing more environmental refugees to flock to urban hubs. The WHO (2012) estimates that global warming since the 1970s had caused over 140,000 excess deaths annually by 2004. Husnain et al. (2017) report "that temperature and different measures of mortality are strongly and positively linked. However, females are more vulnerable to temperature [increases] than males. The vulnerability of females to temperature increases further as the age decreases. This shows that infants, particularly females, are more vulnerable to rising temperature as the coefficient on temperature has [a] larger magnitude in female mortality regressions."

An increase of 3–4ºC in the average temperature would result in a 100 percent increase in the reproduction rate of dengue virus and meningitis due to droughts (World Bank, 2010). Carbon emissions are positively associated with the number of infant deaths (Husnain et al., 2016). Climate-sensitive diseases such as malaria, diarrhoea, cholera, rift valley fever, typhoid, chagas disease, schistosomiasis, river blindness, sleeping sickness and cataract blindness are also projected to increase with changes in temperature (WHO, 2012, 2008; World Bank, 2010), along with indirect risks of increased malnutrition due to food insecurity. The effects of climate change, whether environmental, economic or social, are a threat to the resilience of communities, especially for those directly dependent on ecosystems for their livelihoods, shelter, food security and access to basic services like water, sanitation and energy. Significant steps toward climate change mitigation are unlikely to have a major impact, unless the world's largest emitters, the United States and China, take the lead.

Community-based adaptation: Global best practices

"Eighty five percent of all priority projects as identified by the NAPAs (National Adaptation Programmes of Action) pay little to no attention to local institutions" (Agrawal et al., 2009).

The role of grassroots institutions achieving development goals under climate constraints has received much attention from development scholars, policy makers and government agencies (Agrawal, 2008; Jütting, 2003). Several studies also show a positive impact of local-level, community-based institutions on natural resource management (Ostrom, 1990; Mazzucato and Niemeijer, 2000).

Institutions are required to structure social interactions. These are the rules humans use to facilitate their repetitive and structured situations at multiple levels of analysis (Ostrom, 2005, 2008; North, 2005). In order to overcome the myriad challenges posed by climate change as well as to bridge policy and implementation gaps, participation of affected individuals in decision making regarding natural resources is critical for sustainable development (Ostrom, 1990). Citizens' participation and their empowerment at the local level is a prerequisite for sustainable communities (Deb, 2009).

The effects of climate change will be felt, first, at the household (and individual) level. Dealing with these effects requires a variety of policy approaches, not just mitigation. These include technological innovations, empowering local communities with the tools and information they need to adapt and setting up mechanisms to provide relief to those suffering from the effects of climate change. According to Reid and Huq (2007), the contemporary discourse about adaptation to climate change increasingly recognizes adaptation as a critical, inductive and autonomous process. The process evolves at the micro level through existing coping strategies of the most vulnerable and at-risk communities and individuals. It builds on bottom-up solutions. "Adaptation strategies do not have to start from scratch: People have been managing (or failing to manage) climate hazards for centuries" (Prowse and Scott, 2008, p. 45). It is from this recognition of the importance of adaptation that the relatively nascent, bottom-up concept of CBA was born.

> CBA begins by identifying the communities in the developing world that are most vulnerable to climate change. These are generally very poor, depend on natural resources and occupy areas already prone to shocks such as floods or droughts. Once a community's vulnerability has been established, the process of engagement with the communities can begin using the best available science on climate change impacts (Reid and Huq, 2007).

CBA is, therefore, a participatory approach (Sekine et al., 2009). It not only harvests local knowledge and coping techniques, but also explores new adaptive measures (Prowse and Scott, 2008) and advocates adaptive decision making (Bharwani et al., 2005). For example, small and medium-sized farmers in Thailand are reducing rice cultivation during the dry season, and going for more drought-sensitive crops instead, to find additional income. Bigger farmers are growing more crops near water sources and building farm ponds to supplement water needs (Bantilan et al., 2013).

Bangladesh

Unnayan Onneshan, Gono Unnayan Kendra, Gono Kalyan Sangstha and Shariatpur Development Society are implementing a programme titled "Regenerative Agriculture and Sustainable Livelihoods for Vulnerable Ecosystems" (RESOLVE). Some of their CBA initiatives are discussed below.

Sandbar cropping

In Bangladesh, floods not only "destroy homes, villages and livelihoods, but also leave a crippling legacy when the water subsides" (Practical Action, n.d.). Silted sand plains (sandbars) appear during the dry season due to a decline in water flow. However, a thin layer of silt which is part of the sandbars can be used for cultivation (*ibid*.) of crops such as potatoes, chilli, onion, garlic, millet, tobacco and maize.

> Sandbars with coarse sand as a main component remained unused previously due to infertility and lack of water-retaining capability. In this type of sandbar, pit cultivation technology is being practised by simply digging holes in these sandy residues and filling them with manure and compost. In this agricultural practice, farmers make several pits, one cubic metre each, in their sandy land after flood waters recede from the river basin making it dry from mid-October to November. Ten to 15 kg compost/cow dung is mixed with the pit soil and left for 15 days. Next, four to six seeds are planted in each pit and the pit is filled with water. After germination, two to three healthy seedlings are kept in each pit and the rest uprooted. The pits are then covered with straw mulch to conserve moisture. Farmers soak the pits two to three times a week with water carried in pitchers or buckets. When the seedlings are 25–30 days old, quick compost is applied at a rate of one kg/pit and by 60–65 days, it is reapplied at the same rate. After that, the compost is mixed well with the soil and irrigated immediately (Anik, 2012, pp. 5–6).

Floating gardens

Baira, commonly recognized as floating gardens, are an ancient practice of the southern floodplains of Bangladesh. Floating platforms or rafts are made using aquatic plants such as water hyacinth. On these rafts, vegetables and other crops like red amaranth, Indian spinach, coriander leaves, cauliflower, cabbage, tomato, lady-finger, cucumber, bitter gourd, bottle gourd, snake gourd, ash gourd, sweet pumpkin, bean, radish, eggplant, potato, chilli, onion, garlic, turmeric and mustard are cultivated. They survive during flood and water-logging periods. "This floating vegetable garden can provide multiple benefits in terms of food, nutrition and employment. It is an efficient adaptation strategy, which reduces vulnerability of people living in low lying areas" (Anik, n.d.).

Hanging vegetable cultivation

Developed by Bangladesh's south-western communities, hanging gardens aid in vegetable cultivation in water-logged situations. An earthen platform is set over a triangular bamboo frame which is filled with fertile surface soil, cow dung and fertilizers. "The platform is placed in areas where water inundation takes place and endured for five to six months and where most of the places go under four to five feet of water daily. Usually, the platform is raised five to six feet (1.52m–1.83 m) above the ground. Main cultivable crops are hyacinth bean, sweet gourd, bottle gourd, wax gourd, ribbed gourd, cucumber and Indian spinach" (Anik, n.d.).

India

The forest-dependent, vulnerable tribal women of Bhil tribe have been coping with droughts using CBA strategies. According to Agarwal (2001), tribal women, in particular, suffer from the greatest impact of poverty, droughts and land alienation. This is especially the case with the Bhil women, where male household members are forced to migrate for work during recurring droughts. This leaves women to manage internal and external household activities (Bose, 2010).

Following a severe drought in 2008 and 2009, Bhil men were forced to migrate for daily wage employment for several months during drought seasons. Since droughts are getting extended to longer periods and due to forest degradation, women have started to work collectively to tackle the tasks they face. This includes challenges arising from climate variability and local government and village forest institutions. The latter are gender insensitive and exclude women from decision making. One particular adaptation strategy has been the formulation of informal women's committees. The committees revitalize traditional and scientific strategies to cope with droughts by introducing horticulture on farmlands, and kitchen gardens and sowing drought-resistant millets (Bose, 2010).

In another village, women built community grain storage facilities to help extremely poor households. During the drought season, they negotiated with the district tribal development office for the ability to market *jatropha* seeds. With strong networking links, the tribal women were able to get the market price by eliminating the "middle man" altogether. Collective selling results in higher prices. The profits are then distributed according to each woman's seed production.

Mozambique

In the province of Zambezia, Mozambique, a community-based carbon project is being implemented since 2008. It is a forestry sink project aimed at benefitting poor small farmers which would be managed locally, following the country's decentralization policy. The project draws on the experiences of payment for ecosystem services schemes, including voluntary carbon markets. It has designed a payment scheme, which will keep the costs involved to a minimum in contracting, monitoring carbon, transferring payments to individual farmers and enforcing contracts (Chishakwe et al., 2012).

Pakistan's climate change challenges

Pakistan is located not only in a geo-politically strategic and volatile zone (Breyman and Salman, 2010) but also in a sensitive geographical area (GoP, 2010), and is vulnerable to climate variability. The country's climate diversity matches its scenery in variability. It has cold winters and hot summers in the north and a mild climate in the south moderated by the influence of the Arabian Sea. The central parts have extremely hot summers with temperatures rising to 45°C (113°F), followed by very cold winters, with temperatures often falling below freezing. There is very little rainfall, ranging from less than 250 millimeters to more than 1,250 millimeters (9.8–49.2 in), mostly brought by the unreliable monsoon winds during the late summer.

Greenhouse gas emissions, temperature and precipitation

Pakistan's mean temperature during 1901–2000 shows an average 0.6°C rise. It recorded an increase of 0.35°C since 1960 (average of 0.08°C per decade), especially during the October–December months. Since 1960, incidences of hot days and nights have increased annually, and those of cold days and nights have decreased. "The average number of 'hot' days per year in Pakistan has increased by 20 (an additional 5.5 percent of days)—(while) average number of 'hot' nights per year increased by 23 (an additional 6.4 percent of nights) between 1960 and 2003. The average number of 'cold' days per year has decreased by 9.7 (2.7 percent of days) and 'cold' nights per year has decreased by 13 (3.6 percent of days) between 1960 and 2003" (McSweeney, 2008, pp.1–2).

According to various World Bank figures (World Bank, 2010), Pakistan's per capita CO2 emissions from fossil fuel burning, cement manufacture and gas flaring, from 1990 to 2006, have shown an increasing trend, at 0.6, 0.8 and 0.9 metric tons, respectively. Cumulative emissions during 1850–2005 are calculated at 2.4 metric tons (billions). Its total greenhouse gas emissions were 181.7 million tons of CO2 equivalent (GoP, 2003) in 1994. In 2008, it increased to 309.4 million tons (GoP, 2010). In a doubled CO2 scenario of climate change, Pakistan is likely to have longer warm spells (Islam et al., 2009).

Agriculture

Higher temperatures lead to low agricultural output and a contraction of industrial output and aggregate investment in poor countries, thus leading to increased political instability (Dell et al., 2008). Given Pakistan's dependence on agriculture and the nature of its irrigation system, climate change is likely to cause an overall reduction in agricultural productivity and yields. Wheat production is likely to go down by six to nine percent in sub-humid, semi-arid, and arid areas if temperatures rise by 1°C (Sultana and Ali, 2006).

Agriculture is the mainstay of Pakistan's economy. The sector has a 21.8 percent share in gross domestic product (GDP) and employs 44.7 percent of the country's workforce (GoP, 2009). Most of the people living in rural areas (65.9 percent) are directly or indirectly linked with agriculture for their livelihood. The frequent fluctuations in the agriculture sector's performance, between 2000 and 2013, were mainly blamed on climate variability and extreme weather conditions the country went through during those years. However, the poor performance could also be attributed to data manipulations by the various governments in power.

Natural resources, ecosystems and biodiversity

The livelihoods of more than 60 percent of Pakistan's rural population depend on natural resources—forests, rangelands, fisheries and biodiversity. Forests are the natural climate change "mitigators" that trap and store large amounts of CO2. In spite of the implementation of legislation and policies, such as forest management plans, the area covered by the country's mature/old-growth forests has declined, covering only 4.8 percent of the country's land mass. Land degradation in Pakistan is also visible in the form of soil degradation, rangeland degradation, declining soil productivity and deforestation.

Coastal areas are particularly vulnerable. Rising sea surface temperatures and atmospheric water vapour are likely to cause an increase in tropical hurricane intensity and rainfall. Overfishing and polluted waters are contributing to the reduction of productivity of marine and inland fisheries, as well as posing direct health threats to local fishing communities and their livelihoods (Salman, 2011a). Fishery, as a sub-sector of agriculture, plays a significant role in the national economy and contributes to the food security of the country. It reduces the pressure on demand for mutton, beef and poultry. It contributes, on an average, about 0.3 percent to the total GDP and 1.3 percent to agriculture. Unfortunately, as admitted in the latest government report on climate change (GoP, 2010), the fishery sector has largely remained neglected.

Fresh water quantity and quality

The drinking water for much of India and Pakistan comes from the Himalayan, Karakoram and Hindu Kush glaciers that are already beginning to melt from warmer temperatures (Jianchu et al., 2009). An analysis of the potential impacts of climate change on the Indus River basin concludes that the total annual run-off from the upper basin is likely to increase by 11 to 16 percent. It estimates that, although increased run-off could be advantageous for water supply and hydropower production, it could aggravate problems of flooding, water logging and salinity in the upper basin. Climate models indicate that this melting will accelerate in the coming years with unknown but severe consequences for drinking water, agricultural irrigation and human health. There would be ecological chaos due to accelerated melting of the Himalayas (LEAD, 2008).

Pakistan's water resources are not evenly distributed and are often not located where there is the greatest demand. Water management problems pose a difficult challenge for the country. There is unequal access and distribution (less water is available for Sindh and Balochistan Provinces than for Punjab and poor farmers). A growing population, urbanization, progressive industrialization and increased demand for drinking water and sanitation and storage capacity add to those challenges. Now, climate risk makes them all the more complex. Pakistan was water-abundant in the past. Now, it is a water-stressed country, by 1,300 cubic metres per capita.

Climate change adaptation practices in Pakistan

The case of Shigar Valley

Shigar Valley lies on the right bank of Indus River in Central Karakoram and is known for its architectural monuments like khanqas, mosques and forts. The town of Shigar alone has more than 20 important historical sites. Every household has about 10 to 15 kanals of land and most of the irrigated land is used as cropland. Salman (2011; 2011b) analyzed climate change impacts in the area over the 1989–2009 period. Accordingly, the community perceived the climate of Shigar to be changing greatly over the past 20 years affecting the natural environment, lifestyle and livelihoods of the local population. He reported that the Valley has recorded changes in winter temperature and precipitation (rain and snow), and unusual weather patterns.

While changes in precipitation and temperature have a slow onset, they often lead to long-term losses in agriculture, biodiversity and livelihoods (UNFCCC, 2007). Therefore, it is imperative to recognize, document and understand past environmental changes, in comparison to present experiences, in order to deal with and plan for climate variability. Shigar does not face any immediate water availability issues for irrigation and domestic use. Still, community-managed and -owned water filtration plants have been set up by a local NGO. Due to the rise in population and subsequent escalation in demand for clean water, localized rainwater harvesting and surface water storage are also being encouraged (Salman, 2011, 2011b).

The case of Keti Bunder

Keti Bunder is part of the Thatta District in Pakistan's Sindh Province, located 200 km southeast of Karachi. The entire area faces a number of severe socio-ecological problems and the resulting loss of livelihood opportunities. Until a few decades ago, the people of Keti Bunder had multiple options for economic subsistence. A decline in fresh water sources forced a major change in occupation, from agriculture and livestock to fishing. Due to inadequate alternate employment opportunities, the pressure on fisheries resources is intense. The demise of fisheries would directly affect the livelihoods of everyone in Keti Bunder. The direct economic effect of the loss of fresh water has been the complete loss of the agricultural sector. Indirect effects are: an increased incidence of water-borne diseases, a lack of fresh drinking water and the disappearance of several fresh-water fish species.

How are the communities in Keti Bunder responding to and coping with their changing environment and its socio-economic impacts? Findings by Salman (2012; 2011a) and Gowdy and Salman (2011) indicate that local traditional institutions are being revived and revitalized by non-government actors working extensively, with the participation of the communities, in Keti Bunder. Communities are practising different adaptation measures like storage of water, food, medicine, livestock; communal pooling including mangrove re-plantation, information gathering, disaster-safe infrastructure development and diversification. Mobility is temporary. Households, with relatives or contacts in urban areas, do tend to migrate. Exchange, however, is the least applied strategy due to limited infrastructure and administrative issues like absence of banks and insurance companies.

Keti Bunder residents have also established a Farmer Field School, where Integrated Pest Management (using farmyard manure and lanterns to kill insects) is practiced on a small piece of land. The farmers trained here go on to train other farmers in their villages. This is aimed at re-vitalizing interest in growing vegetables on cultivable barren land. While an NGO provided technical expertise and vegetable seeds for this initiative, farmers themselves pay for their time voluntarily.

The role of NGOs in spreading awareness about ecological conservation in Keti Bunder, as well as supporting CBA, cannot be understated. The local government has managed to set up only three community-based organizations (CBOs)/village organizations on paper with limited impact on community empowerment, while civil society organizations have formed several on a self-help basis with strong community involvement. The locally managed informal institutions are being trained to take up activities like mangrove conservation/plantation collectively to stop mangrove logging and cattle grazing. They also carry out skill development to diversify employment opportunities and improve the management of their livelihoods.

The case of Muzaffargarh District

Muzaffargarh District is one of the oldest districts in Punjab. Sugarcane, rice, wheat and cotton are grown as its major crops, while pomegranates, mangoes and dates are the major fruits. April to September is hot summer. It also has a significantly cold winter from mid-November to early February. The region has a moderate monsoon. Its annual rainfall was 21mm in 2010. In 2011 and 2013, however, rains caused severe damage as the area is located between Chenab and Indus Rivers. According to newspaper reports, more than 165 villages of tehsil Alipur and tehsil Jatoi were flooded, destroying standing cotton, pulses and rice crops in August 2013.

Under its Climate Leadership for Effective Adaptation and Resilience project, LEAD Pakistan facilitated and trained local communities and CBOs to work together with local government officials. The collaboration aimed to develop on-ground Local Adaptation Plans for Action for the district. In December 2013, LEAD conducted Vulnerability Assessment and community-based Focused Group Discussions in the area. It identified "unpredictable monsoons, rise in salinity due to lack of proper drainage system and its harmful impact on crop yields" as the single most important, local and approachable issue for Muzaffargarh District (LEAD, 2013). Partner organizations and community members also identified "rehabilitation/construction of salinity drains and plantation on banks" as the most affordable and realistic solution at the local level.

Mainstreaming community-based adaptation in Pakistan

Mainstreaming means

> …to consider and address risks emanating from natural hazards in medium-term strategic development frameworks, in legislation and institutional structures, in sectoral strategies and policies, in budgetary processes, in the design and implementation of individual projects and in monitoring and evaluating all the above (Benson et al., 2007, p. 6).

Mainstreaming has been applied to poverty alleviation/reduction as well as gender issues. It is certainly not an easy process since it cuts across both sectoral and institutional barriers. However, it is "the most effective way to scale up adaptation across the Asia and Pacific region" (Davis, 2013). Mainstreaming of adaptation and development planning are at multiple levels, including national, sectoral and local levels. "Applying a climate lens to plans and policies can help climate-proof investments and identify key adaptation needs" (*ibid.*).

Many of the initiatives and CBA projects mentioned here were either in pilot stages or had only been in place for a few years. They are overly dependent on either external donor funding or non-state actors. Therefore, a wider uptake and up-scaling of CBA into policy planning needs to have:

- An enabling institutional policy environment;
- Respect for traditional knowledge and institutions;
- The right set of incentives and costs for communities;
- A cooperative regional environment.

An enabling institutional policy environment

An enabling environment is

> ... a set of interrelated conditions—such as legal, organizational, fiscal, informational, political, and cultural—

that impact on the capacity of development actors such as CSOs to engage in development processes in a sustained and effective manner (Thindwa, 2001).

Successful implementation of CBA requires:

- Supportive policies and streamlined institutions;
- Identifying synergies between key approaches and sectors/piggy backing;
- Mainstreaming at local level;
- Understanding ecological value of biodiversity and ecosystems.

Supportive policies and streamlined institutions

From the cases shared, it is clear that national policies, laws and institutional arrangements should not hinder or harm the achievement of CBA; they should rather strengthen community resilience and protect ecosystems from the future impacts of climate change. For example, in the case of Keti Bunder in Pakistan, Salman (2011a) explains how Pakistan's deep-sea fishing policy, formulated in 1982, has seen frequent changes due to the problem of dual jurisdiction. Another example of state policy disjunction in Keti Bunder is that in 1995 the provincial government explicitly banned fine-meshed nylon-based *katra* and *gujjo* nets due to their adverse ecological impacts. However, the ban is almost never implemented, resulting in over-harvesting and depletion of fish stocks and biodiversity (Salman, 2011a).

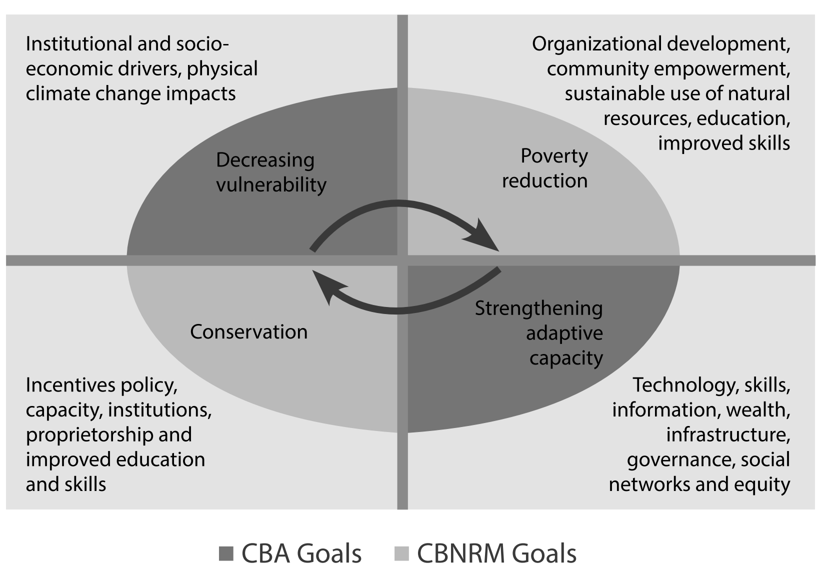
Identifying synergies between key approaches and sectors

Community-based natural resource management (CBNRM) and disaster risk reduction have a longer history, dating back several decades. There is a huge body of case studies and literature. In contrast, CBA is a relatively nascent yet promising area of climate change adaptation. It has fewer documented activities and programmes to its credit and “less established definitions and concepts” (Chishakwe et al., 2012). Figure 11.1 highlights the central pillars of CBA and CBNRM, and how the processes embedded within them overlap each other.

The climate challenges standing in Pakistan’s way are going to affect its irrigation and water resources as indicated earlier. Hence, the water and agriculture sector should also be prioritized for mainstreaming adaptation. Countries like India and Bangladesh are adopting integrated water resources management (IWRM), which could facilitate adaptation planning through participatory processes at the river basin level. The National Climate Change Policy of Pakistan has proposed promoting integrated watershed management, including ecological conservation practices in uphill watersheds (GoP, 2011). This recommendation must not merely remain confined to paper, given the complexity of flooding at Muzaffaragh District in Pakistan.

Figure 11.1

Pillars of community-based adaptation and natural resource management



Source: Chishakwe et al. (2012).

Mainstreaming at local level

Adaptation can be driven by national-level policies and strategies, but it also needs to be tailored to local needs and conditions. That means, mainstreaming adaptation in local government planning and policies. The benefits are clear: local officials have the best view of conditions on the ground and local-level processes can more easily engage vulnerable populations. However, there are major obstacles in addressing climate needs at the local level, e.g., the case of India. Knowledge (or awareness, even empathy) of climate issues is limited both at national and lower levels (as in Shigar Valley, Pakistan). Building the capacity of communities strengthens social capital by "creating strong bonds among members i.e., making them resilient and safe from disasters" (Kuhlicke and Steinführer, 2010). Mainstreaming can, therefore, be achieved by promoting social assimilation and political involvement (*ibid*.).

Understanding value of biodiversity

Evidence suggests that biologically diverse ecosystems are more resilient to environmental shocks than less diverse ones (Tilman and Downing, 1994), although the relationship between resilience and biodiversity is complicated (Robinson, 1992). If a system loses its resilience it can quickly and irreversibly flip to another state (Walker et al., 2004). Furthermore, it is impossible to tell ahead of time what the loss of a species will do to the system. In general, removing keystone species from an ecosystem will have significant (and non-marginal) effects. For example, Brock and Kelt (2004) removed kangaroo rats from a plot of land in southwest United States and the result was a significant increase in plant cover, and significant declines in bare ground and seed predation.

Traditional knowledge and institutions

Pakistan's traditional informal institutions are social and political power structures. They have their origin in the pre-colonial, preindependence institutions like Village Communities, which are now part of the country's grass-roots, local systems of governance (Ghaus-Pasha, 2005).

Local knowledge and capacities exist in Shigar and Keti Bunder (Pakistan). They should be used to complement more centralized and "expert" planning. If vulnerability to change induced by climate variations is to be reduced and the sustainability and improvement of the livelihoods of poor people are to be achieved, there needs to be an understanding of how the poor and vulnerable sustain their livelihoods. In addition to this, a knowledge base needs to be created on the role of CBA in livelihood activities and the scope for adaptation actions that reduce vulnerabilities and increase the resilience of poor people.

The right set of incentives and costs for communities

According to Chishakwe et al. (2012), incentives that motivate communities to act in a particular manner (e.g., conserve and promote mangrove regeneration) are not necessarily financial or quantifiable. It is usually when the "value" of an incentive measure is associated with a particular community need that people weigh the benefits of conserving the resource against the costs incurred. For CBA projects, incentives are critical to motivate communities to implement adaptation actions. However, because the benefits of adaptation are only realized in the long term, the specific nature of incentive measures required to motivate communities in the short term becomes particularly important.

A cooperative regional environment

For sustainable and climate-resilient development in South Asia, adaptation measures should, therefore, focus on the poor; include investment in knowledge sharing; extend to regional (as well as international) cooperation; carry out institutional and technical capacity building; and protect environmental services (World Bank, 2009; M.E.A., 2005). The adoption of the Thimphu Statement on Climate Change by the South Asian Association for Regional Cooperation (SAARC) countries in Bhutan, in April 2010, was a step in the right direction (SAARC, 2010).

Local problem, local solution

Adaptation to climatic variation has occurred for centuries, but anthropogenic climate change poses a challenge of a greater magnitude than ever known before (IPCC, 2007). Adaptive responses take place through adjustments in physical, ecological and human systems to reduce vulnerability or enhance resilience in response to expected changes. Resilience can be defined as "the capacity of linked social-ecological systems to absorb recurrent disturbances such as hurricanes and floods so as to retain essential structures, processes and feedbacks" (Adger et al., 2005). This adaptive capacity is unevenly distributed and those who are poor and marginalized are most at risk, often being the most dependent on natural resources for their livelihoods. In response to environmental risks, the common CBA responses are mobility, storage, diversification, communal pooling and exchange (Agrawal, 2008).

The impact of climate change is diverse and its effects vary in different ecosystems. Consequently, there can be no one-size-fits-all approach in formulating a climate risk management strategy (Agrawal, 2008). The proposed strategy needs to fit local risks and conditions. At the institutional level, local governments play a critical role in the development and implementation of policies and measures to address climate change. However, not only do issues of expertise and awareness loom large, but also, as our cases illustrate, actions by the government and institutions are often either contradictory or outright inequitable or unjust towards the marginalized communities. Approaches that emphasize a bottom-up approach and that recognize rural coping strategies and indigenous knowledge must be understood and documented, since these will add to local adaptive capacities.

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