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Bangladesh Climate Change Resilience Fund

Keraniganj, Bangladesh
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BANGLADESH

the emerging '*hot spot*' where climate threats and action meet

The world is on track to warm by 4°C (degrees Celsius) this century unless nations take urgent, concerted action. Disastrous impacts will spare few countries, and fewer still than Bangladesh. These are some of the findings of *Turn Down the Heat: Climate Extremes, Regional Impacts, and the Case for Resilience*, a June 2013 World Bank report prepared by the Potsdam Institute and reviewed by 25 scientists.[1] So what are the risks? And what is the Bangladesh Climate Change Resilience Fund (BCCRF) doing about them?

The report is not the first to identify Bangladesh as a hot spot of climate risk. The 2011 *Global Adaptation Index* ranks Bangladesh as the 32nd most vulnerable country to climate change, and the 38th least ready for it.[2] The 2013 *Climate Change Vulnerability Index* ranks Bangladesh as the economy most at risk of climate impacts over the next 30 years, and its capital Dhaka as one of the top five cities.[3]

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Putting local communities at the forefront of climate resilience

The latest science points to a string of risks for local communities in Bangladesh from unmitigated climate change, as this edition's feature article reports following the June 2013 World Bank report, *Turn Down the Heat: Climate Extremes, Regional Impacts, and the Case for Resilience*.

In recognition of the importance of community response to climate change, the Bangladesh Climate Change Resilience Fund (BCCRF) sets aside 10 percent of its funding for action with civil society. One result is the *Community Climate Change Project* (CCCP), one of BCCRF's ongoing projects.

Particular risks associated with a potential 2°C to 4°C warming this century include higher sea levels, more intense cyclones, more days of extreme rainfall, greater flooding, longer dry spells, greater groundwater stress, and lower crop yields. These add to hazards that Bangladeshis already face, including regular inundations and contamination of freshwater sources from salinity.

"Recently the weather has become totally unpredictable, making our lives unbearable. Untimely and excessive rain, drought and floods have become a common phenomenon hampering our regular life," says Nur Banu, a resident of Chlimari Upazila of Kurigram District in northern Bangladesh, one of the project's target areas. "As a poor family, we have to face terrible consequences due to these changes as we depend a lot on nature. Our crops either are washed away due to untimely floods or dry up due to drought, pushing us further into poverty."

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Sheltering from Mahasen: Preparing for the future

"It was a nightmare when the cyclone hit our village. I could not imagine what would happen to us and whether we could survive this disaster," recalls Amena Begum, a schoolteacher from Galachipa, Upazila of Patuakhali District, on the Bay of Bengal coast. "We took refuge in the nearest cyclone shelter. The shelter facilities were beyond my imagination. There was a separate toilet facility for women. To my utmost surprise, the shelter also had rooms for pregnant women, tube wells providing safe drinking water, and solar lights."

Cyclone Mahasen, in May 2013, affected over 1.2 million people in eight coastal districts of Bangladesh, including 17 fatalities and 49,000 destroyed homes.[1]

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Feature Story

BANGLADESH

the emerging '*hot spot*' where climate threats and action meet

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Chittagong, Bangladesh | **Photographer:** Spencer Platt / Getty Images

The Government of Bangladesh has long acknowledged the need to act, and it has plans and measures in place to reduce climate risk and cope with unavoidable impacts. However, more resources are needed, says *Arastoo Khan*, additional secretary, Ministry of Finance. The *Bangladesh Climate Change Strategy and Action Plan* 2009 (BCCSAP) includes a 10-year program to build local capacity and resilience to meet climate change challenges in coming decades.[4] In putting the BCCSAP into practice, the government established the Bangladesh Climate Change Resilience Fund (BCCRF) in May 2010. Current pledges total US$188 million from the European Union and the governments of Australia, Denmark, Sweden, Switzerland, the United Kingdom and the United States.

The *Turn Down the Heat* report reinforces the value of BCCRF projects and sheds new light on the risks that Bangladesh and other countries worldwide face if the world does not limit greenhouse gas emissions. Through original modeling and a literature review, it builds on a *previous report* finding that the earth's average surface temperature is on course to become 2°C higher than in preindustrial times by the 2040s and 4°C higher by the 2080s.

These global warming numbers take on a new significance once one examines their local implications for Bangladesh. The report shows that risks from higher temperatures, sea-level rise, and changed patterns of river flows and rainfall combine to affect agriculture, human health, settlements, and infrastructure to the detriment of the economy and especially the poor. Even without climate change, the future damages from extreme weather are likely to increase because, as incomes rise, the projected value of assets in high-risk areas will increase. This adds to the case for resilience to avoid the risk that climate change will 'undo' recent and future gains in poverty reduction and economic development.

"Sea-level rise, already under way in the Bay of Bengal, emerges as a key risk for Bangladesh. *Turn Down the Heat* finds that the sea level near Dhaka has more than a 66 percent chance of rising 30 centimeters by 2040 and exceeding 1 meter by the 2100." (Figure 1). The report cites evidence that if seas rise by 50 centimeters, a 1-in-100-year coastal flood in 2070 would affect more than 11 million people in Dhaka alone.[5] A rise of 62 centimeters could lead to a 30-40 percent loss in agricultural production in the south central regions of Patuakhali and Khulna.[6] Inundation from a 1 meter rise could displace 13 million Bangladeshis.[7]

The Ganges-Brahmaputra Delta, which defines Bangladesh's geography, is ranked a "delta in peril." Sediment aggradation no longer exceeds relative sea-level rise. In this century, rates of sea-level rise may overwhelm the delta due to lower sediment inflow of 30 percent. In this context, BCCRF is supporting is a *feasibility study* on a government proposal for dam and silt works in the delta to increase cultivatable land area.

Although *Turn Down the Heat* focuses on outcomes in this century, it also suggests that sea level could actually rise to 5 or more meters after 2100, citing research that the West Antarctic ice sheet is responding rapidly to global warming and that the Greenland ice sheet could lose mass irreversibly at 1.6°C warming. In this case, the report warns, a multimeter sea-level rise would compound risks for Bangladesh and could pose an existential risk to the country in coming centuries.[8]

Greater tropical storm intensity and impact also resalt from the higher, and warmer seas. In 2007, Cyclone Sidr inundated the land of 3.45 million Bangladeshis with damages and losses equal to 2.6

1. *World Bank. 2013. Turn Down the Heat: Climate Extremes, Regional Impacts, and the Case for Resilience. Washington, DC: World Bank.*
2. *Global Adaptation Institute. 2011. "Notre Dame Global Adaptation Index (ND-GAIN)." Project of the Global Adaptation Institute, University of Notre Dame, South Bend, IN.*
3. *Maplecroft. 2013. "Climate Change Vulnerability Index." In Climate Change and Environmental Risk Atlas, 5th ed., edited by James Allan, Olivia Dobson, and Richard Hewston. Bath, U.K.: Maplecroft.*
4. *Government of Bangladesh. 2009. Bangladesh Climate Strategy and Action Plan 2009. Dhaka: Ministry of Environment and Forests, Government of the People's Republic of Bangladesh. http://www.sdnbd.org/moef.pdf.*
5. *Hanson, Susan, Robert Nicholls, N. Ranger, S. Hallegatte, J. Corfee-Morlot, C. Herweijer, and J. Chateau. 2011. "A Global Ranking of Port Cities with High Exposure to Climate Extremes." Climatic Change 104 (1): 89–111. doi: 10.1007/s10584-010-9977-4.*
6. *Yu, W. H., M. Alam, A. Hassan, A. S. Khan, A. C. Ruane, C. Rosenzweig, D. C. Major, and J. Thurlow. 2010. Climate Change Risks and Food Security in Bangladesh. Washington, DC: World Bank.Yu, W. H., M. Alam, A. Hassan, A. S. Khan, A. C. Ruane, C. Rosenzweig, D. C. Major, and J. Thurlow. 2010. Climate Change Risks and Food Security in Bangladesh. Washington, DC: World Bank.*
7. *Huq, S., S. I. Ali, and A. A. Rahman. 1995. "Sea-Level Rise and Bangladesh: A Preliminary Analysis." Journal of Coastal Research Special Issue 14: 44–53.*
8. *"Severe stunting" indicates a height more than three standard deviations below mean height-for-age of the reference population (Lloyd, S.J., R. S. Kovats, and Z. Chalabi. 2011. "Climate Change, Crop Yields, and Undernutrition: Development of a Model to Quantify the Impact of Climate Scenarios on Child Undernutrition." Environmental Health Perspectives 119 (12): 1817–23. doi: 10.1289/ehp.1003311.)*

percent of Gross Domestic Product (GDP). The report suggests that a cyclone like Sidr (once-in-10-years) would inundate 88 percent more land in 2050 than it would today, and expose 9.7 million people to severe floods more than 3 meters deep. To face the increasing threat of such disasters, BCCRF is supporting analysis of ways to *help finance disaster risk.* Management BCCRF is also supporting *construction of 61 multipurpose cyclone shelters* and 11.5 kilometers of emergency roads (see the sidebar, "Sheltering from Mahasen: Preparing for the future").

Floods, drought, and heat are also likely to worsen with higher sea levels, more intense cyclones, and changed rainfall patterns. Bangladesh currently experiences regular flooding on up to two-thirds of its land area every three to five years, and drought every five years. Droughts are especially frequent in rainfed agricultural areas such as in Bangladesh's northwest. Groundwater in Bangladesh is also stressed, especially in coastal areas where salinity affects 20 million people.

In a 2°C world, flooding will affect 29 percent more land in Bangladesh by 2040, with areas of high poverty at the highest risk. By 2070, coastal floods would affect coastal city homes of 1.5 million people. "Under the 4°C scenario, northern Bangladesh shifts to a new climatic regime with *high temperatures* above any levels seen in the past 100 years and monthly deviations five to six times beyond the standard, that the *Turn Down the Heat* report finds." Dry spells would lengthen and *groundwater stress* increase.

In greater Dhaka, BCCRF is helping to *assess flood risk and response options* through analysis and advice, as well as to *reduce flood risk through engineering.* Through local NGOs, BCCRF also helps 28 communities to prepare for flood, drought, and saltwater intrusion through the *Community Climate Change Project* (see the sidebar "Putting local communities at the forefront of climate resilience").

Food shortages, already persistent in Bangladesh, will worsen with climate change. Warming if 4°C would severely threaten crops, especially rice grown during annual monsoons. Yields would decrease despite any potentially positive effects of warming. BCCRF is *preparing farmers for climate change* with better seed choices and warning systems. It will also help *build food stores* for emergencies.

"Health issues also worsen with climate change. Currently 43 percent of Bangladeshi children have low height-for-age due to undernutrition—one of the highest rates in the world. If not for climate change, the rate would likely decrease, but warming of not even 2°C by 2050 could increase by 62 percent the relative incidence of South Asian children with severe undernutrition. Malaria risk is also projects to increase by 5 percent and diarrheal disease risk by 1.4 percent. BCCRF is conducting a study to assess and *prepare for emerging health risks* such as these."

There is a lot of truth in the saying that "an ounce of prevention is worth a pound of cure". "*The World Bank's World Development Report 2014* confirms that the benefits of early action to reduce greenhouse gas emissions far outweigh the costs." Bangladesh is a small emitter relative to other countries, yet its efforts to reduce greenhouse gas emissions will also bring a range of other local benefits.

Under the *Solar Irrigation Program*, which BCCRF supports, solar-powered water pumps will help farmers replace diesel to save 6,000 metric tons of greenhouse gases each year, and avoid toxic air pollution. BCCRF is also supporting work through the World Bank's *Climate Resilient Participatory Afforestation and Reforestation Project* with communities in nine districts to protect and grow forests, which will not only take carbon out of the atmosphere but also provide a natural buffer to storms.

Finally, the *Turn Down the Heat* reports identifies areas for future work, such as better understanding climate impacts at the local level. To this end, BCCRF will help develop *projections of climate change in Bangladesh* to 2100 under different scenarios, at a resolution of 50 kilometers. Other areas for future research could include the effects on ecosystem services.

With the known impacts of a warmer world already rapidly approaching, we don't have to wait for more analysis to know the time to act is now. Through the BCCRF projects under way, the Government of Bangladesh and its partners are helping Bangladesh become a hot spot of positive action, to gain the benefits of climate resilience for current and future generations.

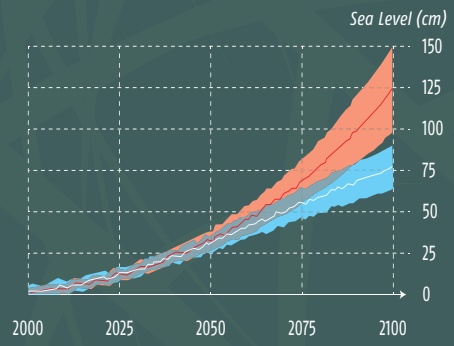

Figure 1: Projected sea-level rise near Dhaka, Bangladesh, under two global warming scenarios, 2000–2100

Note: The blue shading shows the projected sea-level rise if global warming increases by 2°C during this century. The red shading shows the rise if warming increases by 4°C. The baseline is the 1986–2005 mean sea level, excluding observed sea-level rises of several centimeters earlier in the 20th century. The shaded area indicates a 66 percent uncertainty range (the difference between the percentage rise projected under the 2°C scenario and the 4°C scenario). The data also exclude the factor of local change from land subsidence by natural or human causes.

Source: *World Bank. 2013. Turn Down the Heat: Climate Extremes, Regional Impacts, and the Case for Resilience. Washington, DC: World Bank.*

INTERVIEWS

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Putting local communities at the forefront of climate resilience

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"About 25 years ago we could grow crops in the Satkhira area in abundance. But due to increased saline intrusion now, we have very limited cultivatable land, and every year it is substantially reducing," says Amina Begum, a resident of Joforpur village in Kaliganz Upazila of Satkhira District, another coastal target area. "We also face severe scarcity of drinking water. Even our household plinth is affected by high tide every day."

To help address such challenges, CCCP provides grants of US$20,000 to US$1 million to local nongovernmental organizations (NGOs). The Government of Bangladesh designated the nonprofit *Palli Karma-Sahayak Foundation* (PKSF) to administer the project.

CCCP activities align with the thematic pillars of the *Bangladesh Climate Change Strategy and Action Plan 2009*. Initial work focuses on upazilas (subdistricts) that are highly vulnerable. They include salinity-affected coastal areas, flood-affected chars (silt islands in rivers), and river basins as well as arid or drought-affected areas. The areas have been selected based on poverty level and vulnerability to the effects of climate change.

In December 2012, 496 NGOs submitted concept notes for activities that build community resilience to climate change impacts. Qualified NGOs were invited to submit a full proposal for final selection. After reviewing the proposals, PKSF has to date selected 11 NGOs to implement activities, with more to follow. The activities chosen to date include the following components:

- Raise homestead plinths
- Repair roads and plant trees to strengthen road embankments
- Install environment-friendly cooking stoves and latrines, solar irrigation systems, and semideep tubewells with platforms for safe drinking water
- Harvest rainwater at the household level
- Reexcavate traditional ponds in water-scarce villages
- Establish "banks" to store grain for lean periods
- Cultivate sweet pumpkin and other saline-tolerant vegetables in sandbar areas, flood-tolerant rice varieties, and drought-resilient fodder

Women in rural village, Southern Bangladesh
Video Still: Stephan Bachenheimer, The World Bank

These activities will bring a range of benefits in addition to climate resilience, including low-carbon energy from solar irrigation systems, better health through cleaner drinking water, and greater food security from agricultural yields.

"Under the CCCP, concerned communities will implement activities at the grassroot level in response to their own and localized needs", says PKSF Chairman Qazi Kholiquzzaman Ahmad. "This is the level where climate change impacts hit home, and where building resilience can help reduce poverty."

See Map >

Sheltering from Mahasen: Preparing for the future

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"The loss of lives was much less than what it could have been because the number of usable cyclone shelters increased, according to the Government of Bangladesh."

Sri Ziten Nag's shelter was one of these, funded under the Multipurpose Cyclone Shelter Construction Project. The Bangladesh Climate Change Resilience Fund (BCCRF) supports this project as a component of the government's *Emergency Cyclone Recovery and Restoration Project* (ECRRP), in line with the B*angladesh Climate Change Strategy and Action Plan 2009*. During Mahasen, an estimated 40,219 people and 4,307 livestock used ECRRP's new and upgraded shelters.

ECRRP started in 2007 after Cyclone Sidr, a supercyclonic storm with winds above 220 kilometers (137 miles) per hour, which led to 3,447 reported deaths (some estimate a total closer to 10,000) and massive economic damage.

Cyclones hit Bangladesh almost every year, with a severe cyclone on average every three years.[2] Destructive cyclones hitting Bangladesh became common over the 20th century,[3] though how much this was due to global warming is uncertain.[4]

As for the future, while cyclone names are already decided (Madi is next in line for South Asia), their patterns are hard to predict. Science gives some clues as reported in the World Bank's 2013 report, *Turn Down the Heat: Climate Extremes, Regional Impacts, and the Case for Resilience* as well as in the September 2013 *Working Group I report* of the Intergovernmental Panel on Climate Change.[5]

The Government of Bangladesh is on track to build 230 new multipurpose cyclone shelters by June 2014, through ECCRP. BCCRF is funding 61 of these shelters as well as 11.5 kilometers of connecting roads in five coastal districts. The communities near the cyclone shelters have been closely involved during the planning phase and provided inputs on the design and how the shelters will be operated during and after cyclones.

1. *IFRC (International Federation of Red Cross and Red Crescent Societies). 2013. "Bangladesh: Tropical Cyclone Mahasen." Operation Update MDRBD013, Disaster Emergency Relief Fund, IFRC, Geneva.*
2. *Government of Bangladesh. 2009. Bangladesh Climate Strategy and Action Plan 2009. Dhaka: Ministry of Environment and Forests, Government of the People's Republic of Bangladesh. http://www.sdnbd.org/moef.pdf.*
3. *Hossain, M. Z., M. T. Islam, T. Sakai, and M. Ishida. 2008. "Impact of Tropical Cyclones on Rural Infrastructures in Bangladesh." Agricultural Engineering International: the CIGR Ejournal 10 (2).*
4. *Dasgupta, S., M. Huq, Z. H. Khan, M. M. Z. Ahmed, N. Mukherjee, M. F. Khan, and K. Pandey. 2010. "Vulnerability of Bangladesh to Cyclones in a Changing Climate: Potential Damages and Adaptation Cost." Policy Research Working Paper 5280, World Bank, Washington, DC.*
5. *IPCC (Intergovernmental Panel on Climate Change). 2013. "Working Group I Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change." In Climate Change 2013: The Physical Science Basis. Geneva: IPCC Secretariat.*

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Government of the People's Republic of Bangladesh

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