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Bangladesh

Dr. Haseeb Md. Irfanullah

Over the past 16 years, Haseeb Md. Irfanullah has evolved from being a botanist to an aquatic ecologist, from a conservationist to a development practitioner. He has developed interest in and understanding of climate change adaptation, disaster risk management, natural resource governance and biodiversity conservation – all focusing on human well-being. At the current stage of his evolution, Haseeb finds his niche in nature-people-knowledge nexus. In 2004, he received a Ph.D. in aquatic ecology from the University of Liverpool, U.K. Before that he studied Botany at the University of Dhaka for his B.Sc. and M.Sc. degrees. Haseeb is currently working for IUCN (International Union for Conservation of Nature) as the Programme Coordinator of Bangladesh Country Office in Dhaka. He and his co-workers have so far published 35 research papers; authored, edited and contributed to 37 books and other publications; and written 42 articles and thought pieces on diverse topics - ranging from microscopic plants to freshwater ecosystems to climate change adaptation to poverty-technology link to research communications. In 2014, Haseeb was a member of the Bangladesh delegation on 'Climate Change and Adaptation' under the International Visitor Leadership Program (I.V.L.P.) of the U.S. Department of State.

What Does Bangladesh Tell Us About Innovation In Climate Change Adaptation

Haseeb Md. Irfanullah, *Bangladesh*

Abstract

Bangladesh is often called the 'adaptation capital of the world' because of its exciting progress as one of the most climate vulnerable countries of the world. Given the continuously changing social, economic, political, and climatic regimes at the national, regional and global levels, it is important to keep the pace of adaptation going by taking innovative steps and actions in all relevant arenas – from policy to finance to institutions to technology. Bangladesh prepared the National Adaptation Programme of Action (NAPA) in 2005 – the first ever strategic document to make adaptation an organized effort. The present paper considers three related areas of adaptation: 1) adaptation planning and implementation, 2) nature-based adaptation technology development and diffusion and 3) evolution in programmatic approach, and looks into major developments between 2006 and mid-2016 through an innovation lens. The paper draws examples from the communities on Bangladesh's coast to explain the adaptation approaches followed, opportunities created by them, and their impacts on people and nature. It further discusses the challenges faced by innovation in adaptation and how those could be transformed into opportunities. The paper advocates for evaluation of adaptation innovation, before and after scaling up, to avoid maladaptation. It emphasizes knowledge generation and management as a key component of adaptation projects for informed decision-making. It argues that such initiatives should have a monitoring, learning and evaluation system built within them. Such an arrangement can help to create a dynamic environment for projects to harness innovation at all levels –individual, institutional and policy – and at the same time be effective.

Introduction

The situations we are in, and more importantly, how we respond, often define our persona before others. As in a human society, a country also finds itself associated with a particular identity as a member of the global society. Climate change discussions widely talk about Bangladesh's vulnerability to climate change and natural disasters. Opposite to this rather gloomy reputation, Bangladesh is sometimes called the 'adaptation capital of the world' (Irfanullah, 2013). This deltaic South Asian country of 160 million people has gained such a positive persona because of her significant progress in climate change adaptation despite being one of the most climate vulnerable countries of the world.

Climate change is a combination of long-term, irreversible changes in earth's climatic parameters leading to some global phenomena, like sea level rise. Our mitigation endeavors, the reduction of global carbon emission to a significant effective level, have been like a roller coaster ride over the last couple of decades. Even if efficient mitigation measures are taken now by all countries, the climate will continue changing and impacting nature over the decades to come. Adaptation, a term widely used in biology explaining an organism adjusting, modifying and surviving within its changing environment, has found a new dimension in the climate change discourse. Adaptation to climate change is the adjustments made by humans to the impacts posed by changing climate and variability.

For a human society vulnerable to climate change, adaptation is essentially a collection of measures taken in a given situation, at a specific time. But it is far from stopping there or remaining static. In addition to continuously changing and variable climate, the societal, economic and political regimes also change at local, national, regional and global levels. It is therefore important to keep adaptation momentum going at all levels by taking innovative steps and actions to cope with newer situations. Such innovations are not only to play a role in technology development and promotion, but also in policy formulation and implementation, financial mechanisms and institutional arrangements.

Bangladesh's first practical attempt to make adaptation an organized national endeavor took shape in 2005 through the

National Adaptation Programme of Action (NAPA). In the pre-2005 era, pioneering programs like ‘Reducing Vulnerability to Climate Change’ upheld the needs and the importance of adaptation actions on the ground, with the people. Over the last decade, such understanding continued to grow; adaptation in Bangladesh has basically become collections of people-oriented actions on the ground highly depending on cost-effective, affordable technologies. In recent years, Bangladesh has become a part of regional and global resilience-building efforts. The ‘Mangroves for the Future’ (MFF) (www.mangrovesforthefuture.org), for example, is a regional initiative in the wake of tsunami 2004 now expanding from Pakistan to Vietnam. As in other 10 countries, the MFF in Bangladesh has connected the coastal people with the nature to improve their adaptive capacity, mostly through ecosystem-based solutions. Such participatory, community-led actions are, however, not sustainable unless they are supported by public policies, strategies and plans, and implemented. This context allows us to identify three related areas of adaptation: 1) adaptation planning and implementation, 2) nature-based adaptation technology development and diffusion, and 3) evolution in programmatic approach.

In this article, I first take a look into the major progress, achievements and trends between 2006 and mid-2016 in the areas of adaptation planning, technology and programmatic approach, through the lens of innovation. I give examples of vulnerable communities from all over Bangladesh, particularly from the coast, to explain the adaptation approaches taken, opportunities created by them, and their impacts on the people and the nature. I further discuss the major challenges faced by innovation in adaptation and how those could be transformed into opportunities to build community resilience.

Adaptation in Bangladesh: Through an Innovation Lens

Adaptation planning and implementation

Bangladesh first prepared the NAPA in 2005. The document proposed 15 programs to improve the country’s adaptive capacity. In 2009, the ‘Community Based Adaptation to Climate Change through Coastal Afforestation’ project started as one of

the first projects outlined in the NAPA with support from the Least Developed Countries Fund (LDCF). During 2008-2010, the Government of Bangladesh took some unprecedentedly prompt actions in climate change policy and strategy formulation. In 2008, it formulated the Bangladesh Climate Change Strategy and Action Plan (BCCSAP), and revised it in the following year (MoEF, 2009). The BCCSAP has 44 programs clustered into six themes. These thematic areas include food security, social protection and health; comprehensive disaster management; infrastructure; research and knowledge management; mitigation and low carbon development; and capacity building and institutional strengthening. One important aspect of the BCCSAP is, unlike its predecessor the NAPA, it was not developed to meet a national commitment to the United Nations Framework Convention on Climate Change (UNFCCC). Rather, it was a nation-driven initiative, prepared as a part of the country's overall development strategy. In 2009, the NAPA was also revised; but the BCCSAP has remained the core national document to guide nationally-coordinated climate change adaptation efforts since 2009.

The enthusiasm and political commitment from the government around the BCCSAP did not stop with its formulation. It was followed by putting in place legal instruments (Bangladesh Climate Change Trust Act 2010) and institutional setup (Bangladesh Climate Change Trust). These allowed resource allocation in the form of the Bangladesh Climate Change Trust Fund (BCCTF) to ensure effective implementation of the BCCSAP. Such an arrangement has never been seen before in Bangladesh. Before the BCCSAP, a number of environment-related planning documents were prepared by the government under different multilateral environmental agreements (MEAs), as they are called. In addition to the NAPA (2005) under the UNFCCC, other examples include, the Bangladesh National Action Programme (BNAP) for Combating Desertification (2005) under the United Nations Convention on Combating Desertification (UNCCD), the National Biodiversity Strategy and Action Plan (2006) for the Convention on Biological Diversity (CBD), and the National Capacity Self-Assessment (2007) encompassing the above three conventions. None of those was supported by a dedicated institution and financing mechanism like the BCCSAP.

Over the eight fiscal years (2009-10 to 2016-17), every year, the Government of Bangladesh has been allocating \$13 million to \$91 million of its own money to the BCCTF (www.bcctf.gov.bd). Up to the current fiscal year (2016-17), approximately \$403 million has been allocated to undertake country-wide climate change adaptation and mitigation actions in light of the BCCSAP. As of June 2016, 440 projects have been funded by the BCCTF. Of those, 377 are being implemented by government or semi-government agencies and the rest by non-governmental organizations (NGOs). Till date, \$3.25 million has been allocated to the NGOs. The Palli Karma-Sahayak Foundation (PKSF) – a 25-year old not-for-profit company having partnership with about 300 NGOs – is responsible for managing the fund for NGOs. So far, 153 BCCTF projects have been completed, of which 110 were implemented by government institutions. An analysis of the BCCTF funding (January 2010-February 2014) showed that more than 70 percent has been under the infrastructure thematic area of the BCCSAP, followed by mitigation and low carbon development (13%) and food security, social protection and health (10%) thematic areas (Pervin and Moin, 2014).

The implementation of the BCCSAP is further supported by a multi-donor fund–Bangladesh Climate Change Resilience Fund (BCCRF)– managed by the World Bank. The governments of Australia, Denmark, the European Union, Sweden, Switzerland, the United Kingdom and the United States channeled more than \$ 188 million to the BCCRF at its inception in 2010 (www.bccrf-bd.org). So far, 10 projects have been funded ranging from disaster risk management to renewable energy promotion to coastal afforestation. There is a \$ 12.5 million component called ‘Community Climate Change Project.’ As in the BCCTF, the PKSF is implementing this BCCRF project to channel funds to NGOs through an open selection process. The BCCRF has also been a novel initiative. The idea of this multi-donor trust fund came about after the UK-Bangladesh Climate Change Conference was held in London in September 2008, where the BCCSAP was launched. Putting multiple donors’ money in one pot to be used by one country to tackle its climate change vulnerability was indeed a unique initiative.

Besides the BCCSAP, a number of long-term, holistic, unique development plans are under preparation where climate change adaptation is being considered as a very important aspect of sustainable growth. The Bangladesh Delta Plan 2100, for example, is being developed by the Bangladesh Planning Commission with financial support from the Government of the Netherlands (www.bangladeshdeltaplan2100.org). This plan envisages this deltaic country's planning process to be long-term, holistic, integrated, adaptive and dynamic. It has identified strategic integration of climate change adaptation in the development planning as one of the key elements.

In addition to national plans and their implementation, sectoral planning could also be seen in recent years to improve climate resilience of the respective sectors. Currently, the Food and Agriculture Organization of the United Nations is helping the Government of Bangladesh formulate the Bangladesh Environment, Forestry and Climate Change Country Investment Plan with support from the US Agency for International Development (USAID). This plan is essentially a five-year framework that identifies priority areas for investment in the above three sectors, and estimates the funding needs to be channeled by the government and the development partners. Very recently, the Plan of Action on Disaster and Climate Risk Management in Agriculture for Department of Agricultural Extension has been prepared for the agriculture sector. Similarly, cross-cutting issues, like gender, have also been addressed in planning processes to make resilience-building gender-sensitive and effective (Bangladesh Climate Change and Gender Action Plan, 2013). But implementation of many of them is yet to attain due momentum.

Nature-Based Adaptation Technology Development and Diffusion

Over the years, many attempts have been made, particularly in the vulnerable, saline-prone coastal region of Bangladesh, to explore nature-based adaptation solutions. Ranging from drinking water options to crop agriculture models to floating gardening, these technological innovations and their promotion have significant positive impacts on improving resilience of the vulnerable people.

Scarcity of freshwater is one of the major impacts of climate change on Bangladesh coast due to salinity ingress as well as trapping of storm surge waters. Any remedy to the situation has direct positive impacts on health, nutrition security and women – the manager of household water supply in rural Bangladesh. To make drinking water available to the people, three main approaches have usually been taken under different initiatives: capturing rainwater, filtering polluted surface water and managing utilization of available safe freshwater. Rainwater harvesting systems have been introduced widely on the southwest coast of Bangladesh, especially after tropical cyclones Sidr (2007) and Aila (2009). Although different types of water storage systems are available, above-ground large plastic tanks are the most popular one.

A number of filtering technologies have been introduced in this region, like pond-sand filter and arsenic-iron removal plant, to clean polluted waters. Practical Action, a UK-based NGO, designed and piloted a novel option, Artificial Aquifer Tube-Well (AATW), in Shyamnagar, a coastal sub-district of Bangladesh. In this system, a 30-foot deep concealed vertical column of sand-gravel layers is installed mimicking the natural aquifer. Polluted water from adjacent pond is allowed to percolate through this column, to accumulate at the bottom, only to be extracted with a handpump tube-well. The hand pump tube-well used in the AATW is an interesting innovation. Instead of the regular tube-well, made fully of cast iron and steel and used all over the country, this one has a concrete body, iron head, handle and piston, and inner glass cylinder to reduce friction with the piston. This concrete-glass-iron structure came from Rangpur of northern Bangladesh, a place 460 km away from Shyamnagar. The young engineer involved in establishing the AATW first saw this innovative concrete-glass-iron tube-well in his grandfather's place where it was popular as thieves do not steal it. Concrete-glass-iron tube-wells are theft-proof since, unlike the iron tube-wells, these do not have any resale value. In saline-prone areas, the salty atmosphere is corrosive to iron. Thus, an innovation as a remedy to theft finds a new purpose as a remedy to salt corrosion.

Although limited in number, the rain-fed ponds of Shyamnagar and other places are brought under a community-based

management system for their optimum utilization. Similar water management systems have also been introduced to uncontaminated underground points from where piped-water is supplied to distant households. Such supply is managed by a local committee to ensure water supply timing, service charges and necessary maintenance. In some saline-prone areas, freshwater sources are also used by water vendors, who collect, carry and sell drinking water to households – a business unimaginable in other parts of Bangladesh. In 2015, the southeastern saline-prone region of Bangladesh has seen introduction of solar desalinization plants. Under a community-based adaptation project, the Department of Environment has established two plants, functioning through reverse osmosis technology, to ease the drinking water scarcity of 5,000 people (DoE, 2015).

Making sufficient water available for crop agriculture is a big challenge in the saline-prone coast. To optimize the water use, drip irrigation using polyvinyl chloride (PVC) pipes and earthen pots, has been tried on a small scale in some areas with limited success. On a larger scale, as seen in last winter in coastal Satkhira district, a canal re-excavated under the Mangroves for the Future (MFF) initiative by Caritas (NGO) changed the whole landscape. The canal held rainwater in monsoon and allowed 400 farmers, under a pre-decided water-sharing system, to cultivate rice and vegetables once again on the land left empty since the cyclone of 2009. To maximize the use of low saline water, Practical Action tried an innovative model in Shyamnagar with support from the Asian Development Bank (ADB). In this model, monsoon rainwater is caught in small ponds to irrigate adjacent rice fields in the winter. The pond owners get payments from the rice farmers for this service. Moreover, pond owners also get benefitted from these tanks by cultivating low-salinity-tolerant fish, almost round-the-year. The Department of Environment has recently built two solar irrigation plants – one in the northeastern Hakaluki Haor (a large wetland) and the other in southeastern Cox's Bazar (DoE, 2015). The haor area faces water scarcity in dry season. This plant makes irrigation water available to the winter crops. On the coast, on the other hand, similar solar irrigation plant helped farmers to grow rice and vegetables in areas where it was impossible in the recent past due to high salinity and shortage of rainfall.

In recent years, agricultural research institutes of Bangladesh have made very good progress in developing new rice and other crop varieties tolerant to salinity, flooding and drought. These inventions have been taken out of the laboratory and field stations by government's extension department as well as NGOs as part of technology diffusion and are being practiced widely. Each salt-tolerant crop variety, however, has a salt-tolerance limit, above which its growth, flowering, or seed setting gets affected. Performance of these varieties also depends on rainfall, which varies widely nowadays, making the adoption and sustenance of these varieties by the farmers a challenge. Development of new varieties, improvement of salinity management, and strengthening of agricultural extension, thus remain a continuous process.

Floating gardening has been a home-grown celebrity adaptation technology of Bangladesh (UNEP, 2014). It has been a traditional agro-practice of south-central Bangladesh where rafts made of rotten water hyacinth are used to raise seedlings and cultivate crops on stagnant waters. In the late 1990s to early 2000s, floating farming was promoted as a means of natural resource management of wetlands supporting local livelihoods. Later on, under CARE's Canadian International Development Agency (CIDA)-funded 'Reducing Vulnerability to Climate Change' project, it was first promoted as a means of overcoming adverse effect of waterlogging – a phenomenon expected to sustain widely under climate change. Until 2012, floating gardening was promoted in different parts of Bangladesh by CARE, IUCN, Bangladesh Centre for Advanced Studies (BCAS) and Practical Action. In 2012, the BCCTF supported the Department of Agricultural Extension to promote floating gardening among 12,000 farmers in nine districts (UNEP, 2014). Apart from introducing to new areas as an innovation, floating gardening itself has not gone through any major changes; except a few sporadic innovations. In Chalan Beel in Pabna, for example, floating gardens were built with empty drums and bamboos, also having fish enclosures and duck huts. In recent months, Practical Action has started testing a similar model – cage aqua-geoponics system – in coastal Satkhira, under the Dutch Government-funded Blue Gold program.

Evolution in Programmatic Approaches

Climate change adaptation in Bangladesh is essentially based upon natural resource management, directly involving the local vulnerable people. It is therefore not surprising that participatory or community-based natural resource management experiences of Bangladesh have given the basic shape of adaptation initiatives in this country. Most of the adaptation projects here follow a community-based adaptation approach to build community resilience. Community-based adaptation to climate change has gained significant momentum over the past decade. An analysis of some key natural resource management initiatives can show how building community resilience has been mainstreamed over the last decade in Bangladesh.

If we take coastal afforestation, newly accreted land on Bangladesh coast has been brought under forestation since the early 1960s as a means of land improvement. Since the late 2000s, this regular job of Bangladesh Forest Department has been considered as an adaptation option as well. The LDCF-funded 'Community Based Adaptation to Climate Change through Coastal Afforestation' project (2009-2013) and the BCCRF-funded 'Climate Resilient Participatory Afforestation and Reforestation' project (2013-2016) are two important examples where coastal afforestation has been considered as the basic means to improve community resilience, with the communities. Many other projects and organizations have tried coastal afforestation, but on a very limited scale, often focusing on specific communities. The regional MFF program and the USAID-funded 'Climate-Resilient Ecosystems and Livelihoods' (CREL) are two recent examples incorporating coastal afforestation as one of the major project interventions. In all these initiatives, coastal afforestation and reforestation remain a challenging endeavor. Innovations continue in seedling raising and plantation techniques, managing land tenure of the plantation sites, tackling social conflict over land use, convincing and managing the local political leadership, ensuring local participation in protecting the plantation, and overcoming the impacts of natural calamities in these remote areas.

Over the years, shifts in programmatic approach have been seen in development partners' working on the same natural ecosystems. The 'Nishorgo Support Project' (2003-08) and its successor 'Integrated Protected Area Co-management' (IPAC, 2009-12), both funded by the USAID, for example, were essentially Protected Area conservation projects with a co-management approach involving forest-dependent people. The follow-up phase of these projects, the CREL (2013-17), has taken a climate-resilience building approach while conserving nature and supporting the well-being of the people depending on it. Similarly, the Department of Environment of Bangladesh implemented 'Coastal and Wetland Biodiversity Management Project' (CWBMP, 2003-11) with support from the United Nations Development Programme (UNDP). This project was the first comprehensive attempt to improve four ecologically critical areas of Bangladesh taking natural resource governance as the core element. During 2011-15, 'Community Based Adaptation in the Ecologically Critical Areas through Biodiversity Conservation and Social Protection' project (CBA-ECA project) of the Department capitalized on the CWBMP. It took strong community-based adaptation approach to conserve these ecologically critical areas (DoE, 2015). The project had many adaptation interventions, like submersible embankment and green belt creation, swamp and coastal afforestation, livelihoods diversification, and solar irrigation and desalinization plants installation, implemented with support from the UNDP, the BCCTF and the Government of the Netherlands. The CBA-ECA project has created a unique example, by combining community-based ecosystem conservation, community development and resilience building of vulnerable people of some ecologically fragile areas of Bangladesh.

Innovation in Adaptation: Challenges and Opportunities

Since climate change and its impacts are long-term, adaptation initiatives to adjust to these impacts need to be long-term as well. As we know, this has hardly been the case. Projects solely focusing on piloting innovations tend to be for shorter period. Needless to

say adoption of nature-based technologies by the people takes time. If we keep the inherent limitations of projects aside, innovation in adaptation may face three main challenges. We need to transform those challenges into opportunities if we want to see innovations making effective contribution to our adaptation ventures.

We face the first challenge when innovations in adaptation do not properly consider the innovation-evaluation-diffusion cycle. Till now, adaptation innovations continued sporadically, mostly on a pilot basis, as part of short-term projects. A basket-full of novel adaptation technologies are available, but their proper evaluation to ensure their acceptance by the people, and effectiveness in changing social and climate context are missing. We therefore rarely see critical analysis of a nature-based technology, rather only its flawless success stories (Irfanullah, 2016). As a result, scaling up of those piloted innovations are hardly spotted. We have, however, seen introduction and scaling up of indigenous floating gardening – from its center of origin in the south to the north and northeast of Bangladesh – as an innovation. I want to call it ‘backward innovation’. It is because, while introducing it to new areas, we have removed some of its key elements of sustainability (UNEP, 2014). Instead of its natural, self-sustaining, market-driven mode, we made it an artificial, project-dependent, subsistence-focus model to new areas, a disappointing deviation from technology diffusion philosophy. We also forgot to address the possibility that water hyacinth-based floating farming may not sustain in changing climate. Water hyacinth availability directly depends on wetland hydrology and water salinity, both to be affected by climate change. As a result, over the last decade, our ‘mass fascination’ of promoting floating gardening without appropriate evaluation and research represents a potential example of maladaptation (Nobel et al., 2014). To avoid such a disaster, it is therefore important to pass an innovation through the evaluation stage before going for scaling up. Evaluation should continue even at the scaling-up stage to ensure that an innovation remains relevant and produces expected impact.

This brings us to our second challenge – an absence of an in-built knowledge generation and management system within the adaptation initiatives. The knowledge and lessons generated on innovation are often not sufficiently documented and shared

among the stakeholders. As a result, similar innovations are being tested by different agencies in similar contexts, thus reinventing the wheel over and over again. We also need knowledge management to sieve out the best practices, which would otherwise be overlooked. The CBA-ECA project of the Department of Environment is probably one of the rarest examples of government project that has captured the processes and lessons of its four-year life cycle, thus paving the path for similar future initiatives (DoE, 2015). But, such knowledge generation has to be a continuous process throughout the project tenure, with regular outputs. It should not be only an assignment to a team of independent consultants for a couple of months before the end of a project. Generated knowledge and evidence can also help us to make informed, unbiased decisions, as opposed to making choices based upon perceptions, which widely vary from person to person.

The third challenge appears when adaptation projects do not have a monitoring, learning and evaluation (MLE) system integrated into the project design. Monitoring and evaluation is often an integral part of any project, but I am emphasizing the learning component. An MLE mechanism can help adaptation projects to make necessary adjustments throughout the project's lifetime. It gives project participants a space to innovate, to improvise during project implementation. The Bangladesh component of the regional MFF initiative, for example, has such a component in-built in its small and medium grant facilities, which has proven to be very useful. Such an arrangement can help to create a dynamic environment to make projects adaptive to changing situations by harnessing innovation at all levels – individual, institutional and policy – and at the same time be effective.

Conclusion

The BCCSAP of Bangladesh, the funds from the government (BCCTF) and the donors (BCCRF), and facilitating institutions (Bangladesh Climate Change Trust and the World Bank, respectively) exemplify an innovative mechanism to tackle impacts of climate change in years to come. The analysis of recent adaptation projects have shown how the government agencies, the NGOs and the development partners have integrated adaptation concept into livelihoods improvement, biodiversity conservation,

natural resource governance, disaster risk management, or halting ecosystem degradation. To be effective, adaptation initiatives should have mechanisms to evaluate its innovations, should emphasize knowledge generation and management, and should have a built-in monitoring, learning and evaluation system.

The adaptation technological innovations of Bangladesh are mostly nature-based solutions. These offer useful lessons to all societies with similar social, economic, geographic and climatic vulnerabilities. Being the lower riparian country in the Ganges-Brahmaputra-Meghna basin, positioned on the tip of the Bay of Bengal, Bangladesh faces floods from the north and cyclones and saline invasion from the south. Despite that, the country has effectively shown how these vulnerabilities can be transformed into resilience, matching the title given to her – the ‘adaptation capital of the world.’ Her strength lies with her people. The people of Bangladesh know they will remain vulnerable to climate change for decades to come, but are not overwhelmed by this reality. They continue to innovate, improvise and adapt, and inspire the world with their spirit of resilience.

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