

# Learning to Live in a Changing Climate

The Impact of Climate Change on Children in Bangladesh

unicef 

| for every child



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**United Nations Children's Fund**

BSL Office Complex  
1, Minto Road, Dhaka-1000  
Bangladesh

Telephone: 0088 02 55668088  
Email: [dhaka@unicef.org](mailto:dhaka@unicef.org)  
Website: [www.unicef.org.bd](http://www.unicef.org.bd)

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*Front Cover Image: After heavy rains, a boy runs across a flooded paddy field, on Astomir Char in Chilmari, an 'upazila' (sub-district) of the northern Kurigram Distric. October 2009.*  
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# **Learning to Live in a Changing Climate: the Impact of Climate Change on Children in Bangladesh**

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*Photo details: Participants from Child Friendly Space Project adolescent focus group discussion, Kalinagar village (Kamarkhola Union, Dacope Upazila, Khulna district), 15<sup>th</sup> November 2015.*

# TABLE OF CONTENTS

<b>ACKNOWLEDGEMENTS</b>	<b>ii</b>
<b>TABLE OF CONTENTS</b>	<b>iii</b>
<b>ACRONYMS</b>	<b>v</b>
<b>EXECUTIVE SUMMARY</b>	<b>1</b>
<b>1 INTRODUCTION</b>	<b>3</b>
1.1 Climate Change and Vulnerability	4
1.2 Vulnerability in Bangladesh	7
1.3 Vulnerability and Children	9
<b>2 BANGLADESH DISASTER PROFILE AND THE IMPACTS OF CLIMATE CHANGE</b>	<b>13</b>
2.1 Bangladesh Climate Change and Disaster Context	14
2.2 Flood and Rainfall Changes	16
2.3 Cyclone and Storm Surge	17
2.4 River Erosion	18
2.5 Salinity and Sea Level Rise	19
2.6 Droughts, Temperature Extremes, and Temperature Changes	20
2.7 Non-Climate Related Hazards	21
<b>3 IMPACTS OF CLIMATE CHANGE ON CHILDREN</b>	<b>23</b>
3.1 Education	24
3.2 Health	26
3.3 Nutrition	28
3.4 Water Sanitation and Hygiene	30
3.5 Child Protection	31
3.6 Cross-cutting: Migration and Urban Slums	32
<b>4 COMMUNITY EXPERIENCES OF HAZARDS AND CLIMATE CHANGE IN SOUTHERN BANGLADESH</b>	<b>35</b>
4.1 Field Work Methodology	36
4.2 Khulna and Satkhira Districts, Khulna Division	37
4.2.1 Summary of Khulna and Satkhira District Findings	39
4.2.2 Flood	40

# TABLE OF CONTENTS

4.2.3	Salinity	41
4.2.4	Cyclone	41
4.2.5	Other Hazards and Changes	42
4.2.6	Children's Perceptions of Impacts of Highest Ranked Hazards and Changes on their Wellbeing	44
4.2.7	Implications for Children and their Communities	48
4.3	Bhola District, Barisal Division	51
4.3.1	Summary of Findings	52
4.3.2	River Erosion	53
4.3.3	Tidal Surge	55
4.3.4	High Tide	55
4.3.5	Flood	55
4.3.6	Other Hazards and Changes	56
4.3.7	Children's Perceptions of Impacts of Highest Ranked Hazards and Changes on their Wellbeing	58
4.3.8	Implications for Children and their Communities	60
<b>5</b>	<b>CONCLUSIONS AND RECOMMENDATIONS</b>	<b>63</b>
5.1	Key Consideration for UNICEF Bangladesh	64
5.2	Implementation Recommendations	66
5.2.1	Capacity Development	66
5.2.2	Evidence Generation	66
5.2.3	Policy Dialogue and Advocacy	67
5.2.4	Partnerships	67
5.2.5	Identification and Promotion of Innovation	68
5.2.6	Support to Integration and Cross-sectoral Linkages	68
5.2.7	Service Delivery	69
5.3	Sectoral Recommendations	70
5.3.1	Education and Climate Change	70
5.3.2	Nutrition and Climate Change	71
5.3.3	Health and Climate Change	71
5.3.4	WASH and Climate Change	72
5.3.5	Child Protection and Climate Change	73
	<b>ANNEXES</b>	<b>75</b>
	<b>SUMMARY OF BANGLADESH CLIMATE CHANGE POLICY CONTEXT</b>	<b>76</b>
	<b>CLIMATE CHANGE AND THE LIFE-CYCLE APPROACH</b>	<b>80</b>
	<b>SUMMARY OF RESEARCH KEY POINTS</b>	<b>82</b>

# ACRONYMS

CBA	Community Based Adaptation
CCA	Climate Change Adaptation
DRR	Disaster Risk Reduction
FAO	Food and Agriculture Organisation of the United Nations
FGD	Focus Group Discussion
GDP	Gross Domestic Product
GHG	Greenhouse gases
IPCC	Intergovernmental Panel on Climate Change
IOM	International Organisation for Migration
MAR	Managed Aquifer Recharge
SLR	Sea Level Rise
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations Children's Fund
UNISDR	United Nations Office for Disaster Risk Reduction
VCA	Vulnerability and Capacity Analysis
WASH	Water, Sanitation, and Hygiene





# EXECUTIVE SUMMARY

Climate change presents one of the greatest development challenges of our time, and it is now clear that the eradication of poverty and inequality cannot be achieved without also addressing the causes and consequences of climate change. This is particularly urgent for Bangladesh as one of the most vulnerable countries in the world to climate change impacts. With high existing levels of poverty and inequality, as well as frequent disaster events, climate change is exacerbating the challenges that girls, boys, women, and men in Bangladesh face every day. Climate change is threatening to reverse development gains Bangladesh has achieved towards universal access to primary education, health services, safe water, as well as ending child marriage and child labour, and eradicating hunger and malnutrition. As communities struggle to cope with the increased frequency and severity of disasters caused by climate change, girls are at increased risk of child marriage or trafficking and boys of child labour. As farmers struggle to produce staple crops in bad year after bad year from changing seasonal patterns, risk of malnutrition and related health and development consequences increases. As changes to rainfall patterns, temperatures increases, and storms increase salinity and water scarcity, more people will be without adequate quality and quantity of water to meet even their most basic health and hygiene needs.

Progress achieved to date on these development priorities now cannot be taken for granted and must be shored-up against climate change impacts. Where progress is still needed, this will now be much harder to achieve across all sectors in a changing and more changeable climate. Further, capacities are needed to adapt to climate change. Today's children will be facing unfolding climatic changes for the rest of their lives, so now more than ever achievement of an educated, healthy, and safe population with access to adequate nutritious food, clean water, and public services, is vital for Bangladesh to thrive now and into the future.

Unaddressed, climate change will harm the poorest and most vulnerable children first, hardest, and longest. The types of climate risks confronting children are diverse, ranging from direct physical impacts, such as cyclones, storm surges, and extreme temperatures, to impacts on their education, psychological stress, and nutritional challenges. Children are more likely than adults to die or be injured during disasters and, as a result of flooding, experience prolonged school closures as well as illness due to unsafe drinking water and skin diseases from washing with saline or polluted water. Families who lose their livelihood due to climate change may be forced to migrate, often to urban slums, which in turn lack adequate basic services to provide for children's needs.

Climate change is a threat multiplier that is exacerbating inequality; therefore a focus on the most vulnerable girls and boys across Bangladesh is needed. It is important for UNICEF to understand the ways in which climate change may undermine efforts towards achieving the goals set out in the 2017-2020 Bangladesh Country Programme. Adjustments to current programming approaches may be necessary, as well as developing new areas of work where UNICEF may be able to offer a comparative advantage. With an understanding that

vulnerability to climate change is a product of sensitivity, exposure, and adaptive capacity; UNICEF can prioritise actions to target the most vulnerable children and adolescents in Bangladesh to help stem this growing inequality.

### **Climate change makes all UNICEF priority areas more vital**

Achieving UNICEF's mandate in Bangladesh has become both more important to achieve in the face of climate change, and more difficult to achieve because of climate change. Achieving Education, Health, Nutrition, WASH, and Child Protection outcomes are vital for reducing vulnerability and actively build the adaptive capacity of children and adolescents in Bangladesh.

### **Who is vulnerable and what success looks like has changed**

The vulnerability context for children in Bangladesh is dramatically changing, therefore the Country Programme 2017-2020 must be oriented towards meeting the needs of children and adolescents vulnerable to climate change impacts and its associated increased disaster risks. Efforts to prevent backsliding of development gains as a result of climate change, as much as progress forward, must be prioritised in the Country Programme 2017-2020. New approaches might be needed to achieve the same things, or tried and tested approaches may no-longer work or not be the most appropriate.

### **Predictable disruptions must be planned for**

Access to education services, healthcare provision, and safe drinking water will require different considerations in different locations in light of climate change impacts, particularly in areas suffering chronic crisis where there is no longer a distinction between disaster periods and normal periods. Climate change impacts must be factored into planning for continuity of service provision.

### **Projects and policies must be climate risk screened**

UNICEF and Government of Bangladesh investments must now be suitable and sustainable in the face of climate change. Climate change and disaster risk analysis must be mainstreamed across UNICEF's portfolio to ensure investments are not undermined by climate change and disaster risks, or indeed inadvertently make people more vulnerable.

### **New investments are needed to adapt to climate change**

New policies and initiatives are needed for Bangladesh to adapt to climate change, therefore there is a role for UNICEF to ensure that the voices, perspectives, and needs of children and adolescents are brought into these processes, and there may be new climate change adaptation initiatives that UNICEF has a comparative advantage to lead on.

# 1

## INTRODUCTION

## 1.1 CLIMATE CHANGE AND VULNERABILITY



*Climate change and environmental degradation are already harming children, especially those that are most disadvantaged. Unless action is taken, future impacts will be far more dramatic, undermining much of the progress made for children over the last decades. Each of the seven Outcomes Areas of the UNICEF Strategic Plan 2014-2017 – health, nutrition, HIV, water and sanitation, child protection, social inclusion and education – is affected in some way by climate change and/or environmental degradation.*



*UNICEF Strategic Framework on Environmental Sustainability for Children 2016-2017.*

Climate change presents one of the greatest development challenges of our time, and it is now clear that the eradication of poverty and inequality cannot be achieved without also addressing the causes and consequences of climate change. At the global level this requires a twin-track approach, of both curbing the actions that are causing climate change, and learning to live with the now unavoidable climatic changes that are and will continue to unfold. To curb further climate change requires mitigation actions that reduce greenhouse gases (GHGs) in the atmosphere; primarily by reducing the volume of GHGs emitted into the atmosphere through the burning of fossil fuels. Large scale decarbonisation of economies is required in order to deliver the scale of mitigation required to slow down climate change, limiting global warming to “well below 2°C<sup>1</sup>” as agreed last year in the UNFCCC Paris agreement; and crucially also to create space for some increase in emissions from developing countries in order to support poverty reduction and address global inequality.

Even with concerted action on mitigation, adapting to climate change is now unavoidable as significant changes are already locked into the climate system caused by the excess of GHGs built up in the atmosphere since industrialisation. Those climatic changes are undermining livelihoods, degrading vital natural resources, and putting lives at risks through increasing frequency and severity of climate-related disasters. In this way climate change is undermining development opportunities, setting back progress already made, and actually exacerbating poverty and inequality.

Bangladesh is often considered to be the country most vulnerable to climate change.<sup>2</sup> In addition Bangladesh has high levels of existing poverty and inequality (43.3 per cent of the population lives below the international poverty line of US\$1.25 per day<sup>3</sup>), and low per capita GHG emissions at just one ton per person (compared with nearly 20 tonnes per person in the USA).<sup>4</sup> Therefore for Bangladesh adapting to climate change is an urgent priority over mitigation action. For many people in Bangladesh climate change is compounding existing drivers of poverty and inequality, starting to push important development gains out of reach, and potentially putting into reverse progress on a wide variety of development issues including access to safe water, educational attainment, and the eradication of child marriage.



## Why is climate change adaptation needed?

- Climate change undermines the sustainability of livelihoods;
- Climate change overwhelms the natural resource base on which peoples' lives depend;
- Climate change increases climate-related disaster risk.

## Who is most vulnerable to climate change, and why?

- Those who depend on climate-sensitive resources and ecosystems for their families' livelihoods, such as agriculture, fisheries, and forests.
- Those who live in marginalised and more hazard prone areas, such as flood plains, urban slums, and deforested hillsides.
- Those with limited assets and political voice to enable them to respond to the impacts of climate change (lower adaptive capacity).

## What is climate change adaptation?

Climate change adaptation refers to the actions that people and institutions make in anticipation of, or in response to, a changing climate. This includes changes to the things they do and/or the way they do them.

The purpose of climate change adaptation is to create the conditions where people become increasingly able to make informed and appropriate decisions about their lives and livelihoods in a changing climate. The goal is the ability for everyone to thrive in spite of a changing climate.

## What is adaptive capacity?

Adaptive capacity refers to the *potential* of individuals, communities, and societies to be actively involved in the processes of change, in order to minimise negative impacts and maximise any benefits from changes in the climate. This potential is undermined in situations of poverty and inequality, and points to the wider socio-economic factors that influence how households and communities manage risk on a daily basis, and relates to the successes and failures of development and poverty reduction.<sup>5</sup>



## What is resilience?

Resilience means many things to many people, and there is no universally applied definition within the international development and humanitarian sector. Notions of resilience tend to be similar to adaptive capacity, but often focusing more on shocks and hazards (such as disaster events) than on longer term changes (such as changes to average seasonal conditions over decades).

The UNISDR definition of resilience is *"the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions."*<sup>6</sup>

The vulnerability of a society to climate change is influenced by its development path, physical exposures, the distribution of resources, prior stresses, and social and government institutions.<sup>7</sup> Following the UNISDR definition<sup>8</sup>, in this report vulnerability refers to the characteristics and circumstances of a person, community, system or asset that make it susceptible to the effects of climate change and other hazards. This is expressed as the combined result of **physical exposure to hazards<sup>9</sup>, sensitivity to the stresses they impose, and capacity to adapt to stresses and changes.**

A vulnerability perspective explains why not every country, and not every person, is affected equally by climate change, beyond just the differing climatic changes they are exposed to in different locations. Even with the same exposure to physical impacts of climate change women, men, girls, and boys will be impacted differently as their lives, livelihoods, and resources are sensitive to the changes in different ways, and their capacities (skills, knowledge, resources, government structures, social position, etc.) to be able to adapt are different as these are determined by a wide range of social, cultural, and economic dynamics. Climate change is therefore often described as a threat multiplier, as it does not impact in isolation to other factors, in fact it tends to exacerbate existing challenges and inequalities. This makes UNICEF's priority focus on equality even more important, as well as more difficult, to achieve.

 *Climate change both feeds on and accentuates inequality.* 

*Anthony Lake, Executive Director, UNICEF (2014)<sup>10</sup>*

## What is climate change?

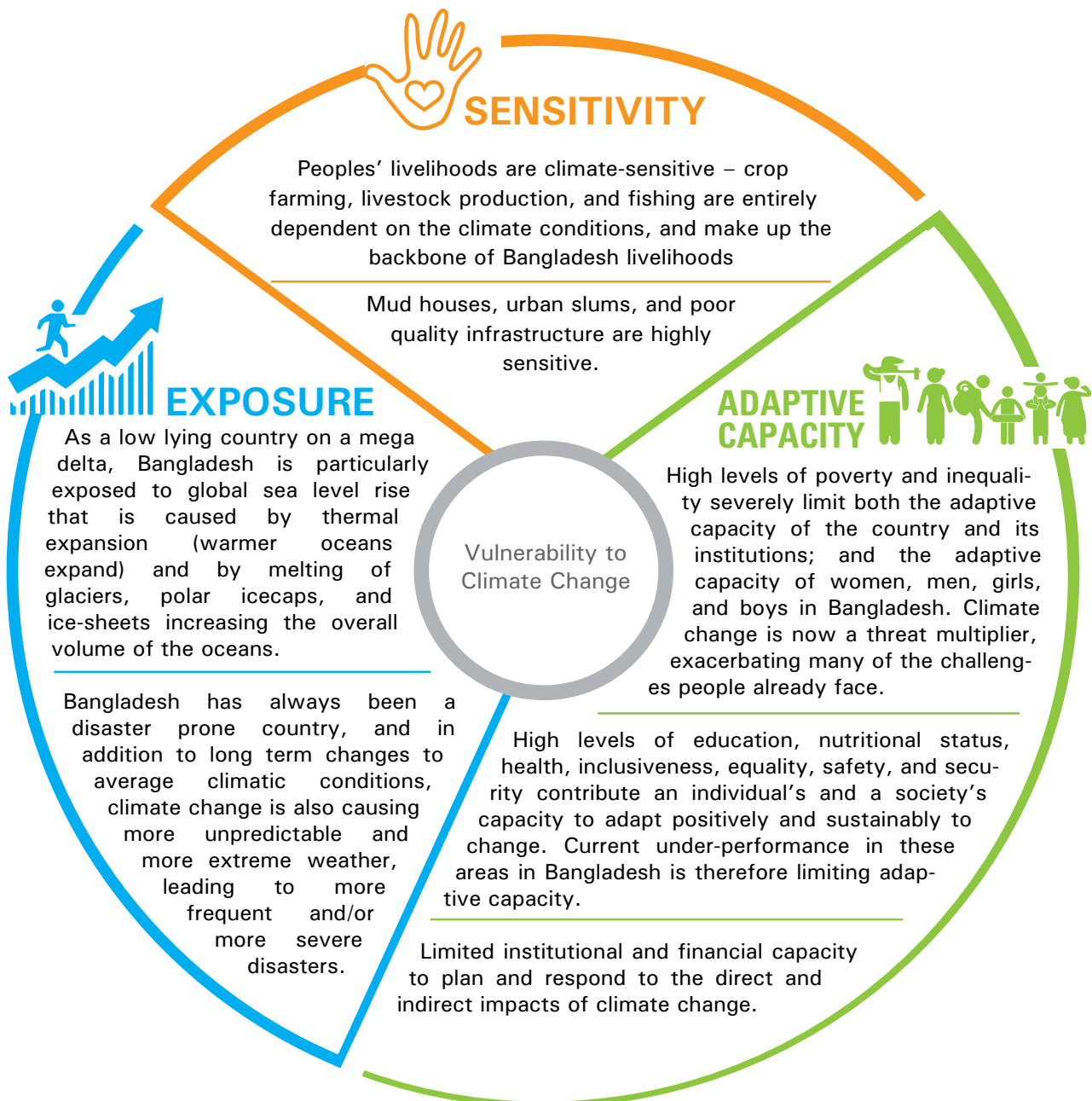
The United Nations Framework Convention on Climate Change (UNFCCC) defines climate change as a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.

Changes to the composition of the global atmosphere occur when greenhouse gases (GHGs) are emitted into the atmosphere in greater volumes than when it occurs naturally from the planet's processes, and when the planet's processes to sequester or 'sink' GHGs (to prevent it reaching the atmosphere) are hampered. Emissions of GHGs from burning fossil fuels, and reduction of sinks through deforestation and cultivation of land are human activities that directly alter the composition of the global atmosphere. Indirect impacts are through feedback loops, where warming caused by these human activities reduces the ability of oceans to sequester due to increased surface temperatures, and reduced coverage of ice sheets (melted by warmer temperatures) increasing warming further through reduced surface area for reflecting back solar heat.

In addition to causing climate change, there are of course other negative consequences of burning fossil fuels and reducing sinks, such as air pollution, degraded land, and resource scarcity. Tackling the causes of climate change will have numerous co-benefits for everyone. For the purposes of climate change work it is important to focus on the causes and consequences of climate change as a political-economy problem not as an environmental problem. This is because climate change is not caused by 'natural' or environmental processes, but by human economic activities that fail to 'cost in' economic, social, cultural, and environmental losses caused by increased risk and instability, with particularly devastating consequences for the most vulnerable across the world.

## 1.2 VULNERABILITY IN BANGLADESH

Bangladesh is particularly vulnerable to climate change for a number of reasons, outlined in Figure 1.



**Figure 1 : Summary of Bangladesh's vulnerability to climate change**

Given Bangladesh's high level of vulnerability to climate change, efforts to eradicate poverty and reduce inequality will not be successful without addressing the causes of climate change at the global level, and adapting to climate change at the local and national levels. Without this, climate change impacts will simply exacerbate the existing poverty and inequality challenges, and erode hard fought for development gains, putting long term sustainable development for all beyond reach.

“

*Maplecroft rates Bangladesh as the country most at risk due to extreme levels of poverty and a high dependency on agriculture, whilst its government has the lowest capacity of all countries to adapt to predicted changes in the climate.*

”

*Maplecroft's Climate Change Vulnerability Index (2011)<sup>11</sup>*



Figure 2 : **Vulnerability composition**



## 1.3 VULNERABILITY AND CHILDREN



*In every crisis, children are the most vulnerable. Climate change is no exception. As escalating droughts and flooding degrade food production, children will bear the greatest burden of hunger and malnutrition. As temperatures increase, together with water scarcity and air pollution, children will feel the deadliest impact of water-borne diseases and dangerous respiratory conditions. As more extreme weather events expand the number of emergencies and humanitarian crises, children will pay the highest price. As the world experiences a steady rise in climate-driven migration, children's lives and futures will be the most disrupted.*



*Anthony Lake, Executive Director, UNICEF (2015)<sup>12</sup>*

Climate change is an issue of vital importance for children, not just because they are one of the most affected groups right now, but also because their future – and their children's future – will be so fundamentally influenced by what actions are taken now to meet this challenge. Children will suffer the effects of climate change and climate change policies longer than adults, making them vital stakeholders in today's decisions about climate change responses.

Children are affected in many ways by climate change in Bangladesh, both in a worsening of challenges that were already present, and through new challenges arising from changing average climatic conditions becoming the new 'normal'. The types of climate risks confronting children are diverse, ranging from direct physical impacts, such as cyclones, storm surges and extreme temperatures, to impacts on their education, psychological stress and nutritional challenges.<sup>13</sup>



Cyclones, floods, rising sea levels, tidal surges, and river erosion are damaging and destroying infrastructure critical to children's well-being, including schools, health facilities, latrines, houses, and roads.



Floods, increasing salinity, and droughts are destroying crops and trees, disrupting water systems, and contaminate water resources, reducing children's access to safe water and nutritious food.



Seasonal shifts, salinity, increasing temperatures, and more erratic rainfall patterns are eroding livelihoods, increasing poverty and leaving families struggling to meet their most basic needs.



Rising temperatures and changing rainfall patterns are exacerbating the spread of vector-borne diseases such as dengue, which disproportionately affects children.



Land loss from flooding and river erosion, dwindling water supplies, and failing climate-sensitive livelihoods are increasing migration, disrupting families and increasing vulnerability of displaced children.

These impacts are falling unequally on children compared to adults. Children are more vulnerable to vector-borne diseases than adults; under-nutrition and diarrhoeal diseases can much more easily lead to severe and often dire consequences in children; and the physical dangers of disasters pose unique threats to young bodies and minds.<sup>14</sup>



*Unaddressed, climate change will harm the poorest and most vulnerable children first, hardest, and longest.<sup>15</sup>*



UNICEF (2015) *Unless We Act Now*



*Children and young people are particularly vulnerable to the impacts of climate variability and change because they are physiologically and metabolically less able than adults at adapting to heat and other climate-related exposure. Their still-evolving development puts them at higher risk of contracting diseases and succumbing to related complications due to lower functional immunity. Children are also more likely than adults to be killed or injured during disasters: of those affected or killed as a result of disasters globally, half are children. As climate change intensifies, the impacts of weather-related disasters will put more children in harm's way, compounding existing threats to children's health, food security, livelihoods, protection and education. Children are particularly vulnerable in disaster situations. The breakdown of social institutions and livelihood options in devastated areas creates difficulties in securing food and humanitarian supplies, leaving children extremely vulnerable to trafficking, sexual exploitation and often forcing them to work in hazardous labour conditions.*

Source: UNICEF (2011) *Children's Vulnerability to Climate Change and Disaster Impacts in East Asia and the Pacific*

Climate change can create a vicious downward spiral of poverty for those already vulnerable. A child already living in poverty or without adequate water and sanitation before a crisis will be more impacted by a flood, cyclone, or drought, and less able to recover quickly, putting them at even greater risk when the next flood, cyclone, or drought occurs, which is now more frequently than in the past. Whilst this cycle continues, during each period of stress or crisis that child's education is disrupted and health undermined, potentially eroding their adaptive capacity in adulthood. Therefore tackling climate change and its impacts on children is an imperative for equity; reducing inequity between children now will promote their future resilience to climate change and disasters.

**Table 1 : Climate risks to child rights under the United Nations Convention on the Rights of the Child<sup>16</sup>**



Child Rights at Risk	Climate Risk and Interface with Climate Change
Article 2: Right to non-discrimination	<p>The impacts of climate change on vulnerable communities discriminate against children; for example, because of their physiology they are more susceptible to certain impacts. Climate change exacerbates inequity because its impacts often hit children the hardest. To ensure that this right is upheld, priority attention needs to be paid to children in climate change responses and policy.</p> <p>Moreover, poorly implemented climate change responses can continue to put this right at risk. For example, opportunities to discriminate and infringe equal rights arise with regard to adaptation investments and cases of displacement owing to climate change. This right can be threatened if decisions do not recognize the special needs of children; the different needs of girls and boys; or do not give equal rights to refugee children, children of foreign origin, or children of indigenous or minority groups.</p>
Article 3: Best interests of the child must be a top priority	<p>Climate change can be seen to work in opposition to the best interests of children in vulnerable countries. For example, through the increased risk of disease or the growing risk of natural hazards disrupting education and impacting child protection.</p>
Article 4: Protection of rights	<p>The multiple impacts of climate change affect child rights. Action to tackle climate change is therefore essential to fulfil the rights of all children; inadequately responding to climate risks infringes this principle.</p>
Article 6: Right to survival and Development	<p>A child's right to survival is directly challenged by increasing climate-related disasters, and by the increased risk of disease and hunger as a result of climate change.</p>
Article 12: Right to a voice	<p>Decisions on climate change at the local, national and international level will impact on children now and continue to do so in the future. Children will also in the future bear the social, economic and environmental impacts of inadequate and unambitious climate change decision-making today. Limiting their opportunities to voice opinions and provide solutions inhibits this right.</p>
Article 22: Right to protection as Refugees	<p>Climate change is leading to increased migration from areas that it renders dangerous or uninhabitable. Children are negatively affected when they are displaced, meaning that climate change makes their right to refugee protection increasingly necessary.</p>

**Table 1 : Climate risks to child rights under the United Nations Convention on the Rights of the Child<sup>16</sup>**



Child Rights at Risk	Climate Risk and Interface with Climate Change
Article 24: Right to health	A child's right to health is directly and indirectly threatened by climate change. Some 85 per cent of the burden of disease from climate change affects children, <sup>17</sup> while the risks of water-borne diseases, vector-borne diseases and the complications of malnutrition all increase owing to climate change.
Article 24, 2c: Right to health-nutritious foods and clean drinking-water	Children's right to health is infringed when health-sustaining conditions such as clean water and nutritious food are compromised by climate change. Increasing greenhouse gas emissions, including CO <sub>2</sub> , contribute directly to air pollution, which in turn drives climate change. Air pollution also directly contributes to increased respiratory diseases amongst children and therefore challenges the fulfilment of a child's right to health.
Article 26: Right to social protection	Owing to climate change, developing countries have additional need of resources dedicated to ensuring that children are able to cope. This right is increasingly at risk owing to developed countries' slow progress in providing the additional funds that would help vulnerable countries to adapt to climate change.
Article 27: Right to an adequate standard of living	Climate-induced sea-level rise, flooding and extreme weather events destroy housing and create unsafe living conditions for children.
Article 28: Right to education	Every child has the right to an education. Children are kept from attending school when family livelihoods and financial resources are negatively affected by climate change. In addition, children's access to education can be disrupted when schools are damaged or destroyed by climate-related disasters.
Article 30: Right to indigenous culture and language	Indigenous populations are often marginalized, live in highly climate-sensitive ecosystems (such as the Arctic) and are often among those most vulnerable to climate-related impacts. Loss of traditional species and land, and induced migration owing to climate change, can impact on the right of a child from an indigenous minority to identity (including language and culture).
Articles 34, 35 and 36: Right to protection from exploitation	Climate change will induce stress on livelihoods and communities that will potentially result in children being at risk of exploitation and violence – for example, through increased child labour, abduction, recruitment into fighting forces, sexual violence and labour migration. The greater frequency and ferocity of climate-related disasters is likely to increase the protection risks to children before, during and after those events.



# 2

## **BANGLADESH DISASTER PROFILE AND THE IMPACTS OF CLIMATE CHANGE**

## 2.1 BANGLADESH CLIMATE CHANGE AND DISASTER CONTEXT

Bangladesh is one of the most disaster affected countries in the world.<sup>18</sup> Flood, cyclones, tidal surges, and river erosion are common emergencies affecting millions of people each year.<sup>19</sup>






Bangladesh is located in a low-lying delta, formed by the dense network of the tributaries of the mighty Ganges, the Brahmaputra and the Meghna, between the Himalayas and the Bay of Bengal. It is primarily low and flat land (with the exception of some hilly areas in the northeast and southeast). The country is home to approximately 150 million people and has a population density of 1,033 per km<sup>2</sup>.<sup>20</sup> The country has always suffered various types of geographic and hydro-meteorological disasters, but the situation is worsening due to climate change. According to the Department of Disaster Management in the Ministry of Disaster Management and Relief, the major disaster risks in Bangladesh are floods, cyclones, droughts, tidal surges, tornadoes, earthquakes, river erosion, fire, infrastructure collapse, high arsenic contents of ground water, water logging, water and soil salinity, epidemic, and various forms of pollution.

Climate change is changing the severity, frequency, and distribution of the climate-related hazards, with both immediate disaster impacts as well as slower chronic crises developing, particularly for those already poor and marginalised. UNDP reports a “general upward trend in the number of natural disasters due to hydro-meteorological events (such as cyclones and flooding) in the region.”<sup>21</sup> For the 30-year period 1974-2004, Bangladesh suffered eight major floods of the scale hydrologists would ordinarily expect to occur only once every 20 years.<sup>22</sup>

It is important to note that whilst disasters dominate the focus of climate change impacts in Bangladesh due to its pre-existing disaster prone context, climate change impacts are more wide-reaching than just extreme weather events exacerbating disasters. Both increased variability of weather patterns, and an overall shift in average conditions and seasonal timings, will have significant impacts on agriculture, fishing, food security, food prices, infrastructure, disease prevalence and distribution, energy generation and access, and much more. Unless these changes get sufficient attention, their long term impacts will be just as devastating for the people of Bangladesh as disasters.

*“Overall for Bangladesh, to date, climate models have generally been consistent in simulating warming throughout the country in all seasons, moderate increases in monsoon rainfall and moderate decreases in dry season rainfall.”<sup>23</sup>*

**Table 2 : Summary of key climate change impacts in Bangladesh**

	<p><b>Temperature</b> Increasing temperatures across all seasons, and more extreme hot and cold.</p>
	<p><b>Rainfall</b> More heavy rainfall events during monsoon leading to more flooding. Less number of days of rain overall. Less rain in winter months.</p>
	<p><b>Cyclones and storms</b> More powerful and more frequent cyclones and storms.</p>
	<p><b>Sea level rise</b> More powerful storm surges and river erosion, displacing communities. Increased salinity of farmland and water supplies.</p>
	<p><b>Seasonal shift</b> Anecdotal evidence of change from six seasons to four.<sup>24</sup> IPCC expects timing of monsoon to change over time.</p>

## 2.2 FLOOD AND RAINFALL CHANGES



In Bangladesh the summer is dominated by the southwest monsoon, occurring from June to September, and influencing the seasonal cycles. Floods are a normal phenomenon during the monsoon season.<sup>25</sup> Approximately 60 per cent of the country is susceptible to levels of flooding where 25-30 per cent of the area becomes inundated during a normal flood.<sup>26</sup>

Climate change models indicate a trend in increased rainfall during the summer monsoon. Combined with a warming trend, the warmer, moister atmosphere is also likely to lead to heavier rainfall during the monsoon. The timing of the monsoon may also be shifting.<sup>27</sup> Outside of the monsoon rains, other changes to rainfall patterns are occurring, including a drying of the winter months.<sup>28</sup>

The consequences of these changes are that higher monsoon rainfall across the Ganges-Brahmaputra-Meghna basin as a whole will lead to more frequent and more severe floods from swollen rivers, and less rainfall in the winter will mean lower river levels in the dry season and therefore less water for river-fed irrigation, industry, fisheries, implications for travel by launch or ferry, and increase salinity in coastal areas where fresh rainfall is vital to rinse salinity from the land.<sup>29</sup>

Of course climate change is not the only factor that will influence river flow and flooding. Measures taken by governments and communities to extract more water where it is needed, and to keep out water where it is not wanted, will also influence the changes and hazards that coastal and riverine communities face. The adaptation policies and strategies of all stakeholders across the Ganges-Brahmaputra-Meghna basin will be as influential as the climate change impacts themselves on how climate change impacts are felt by local communities.<sup>30</sup>

### Floods, 2007<sup>31</sup>

In 2007, more than half of Bangladesh was seriously affected by monsoon flooding. Caused by excessive rainfall in catchment areas of Nepal, Bhutan and Northern Indian, floods in July and September affected 13.3 million people – 6 million of them children – in 46 districts.

#### The floods caused

- > 1,100 deaths (90 per cent of them children)
- > 400,000 displaced people
- > 1.1 million damaged or destroyed homes
- > 162,000 cases of diarrhoea
- > 2.2 million acres of damaged cropland. Many farmers lost their crops twice and were unable to replant.



## 2.3 CYCLONES AND STORM SURGES



Cyclone and storm-surges are common annual events during the pre-monsoon and retreating monsoon periods along the coastal belt of Bangladesh,<sup>32</sup> and their impacts are devastating: *“in the 20 years leading up to the turn of the century, 60 per cent of the 250,000 deaths worldwide arising from cyclones occurred in Bangladesh.”*<sup>33</sup> Approximately 25 per cent of the population of Bangladesh lives in coastal areas vulnerable to cyclones.<sup>34</sup>

The interaction between climate change and cyclones is a complex relationship with differing opinions within the scientific community regarding exactly how cyclone patterns will change as a result of climate change. Generally recent trends and climate models point towards an increase in both the frequency and the intensity of cyclones as a result of increased sea-surface temperatures and sea level rise caused by climate change. The IPCC stated it is *more likely than not* that the frequency of the most intense storms will increase substantially under projected 21st century warming. Whilst the frequency of cyclones overall may decrease slightly or largely remain the same, it is likely that continued sea-surface warming will lead to tropical cyclones that are more intense, with higher peak wind speeds and heavier precipitation.<sup>35</sup>

### **Cyclone Sidr, November 2007<sup>36</sup>**

On the evening of 15 November 2007, Cyclone Sidr (category four) hit the low-lying and densely-populated coast of Bangladesh. The cyclone ravaged 30 southern districts across Barisal and Khulna divisions. Hundreds of people lost their lives from buildings which collapsed in the 240 km per hour winds, and thousands more people drowned in tidal surges that were over 15 feet high in many villages.

#### **The cyclone caused**

➤ 3,363 deaths ➤ 55,282 injured people ➤ 1.5 million damaged or destroyed homes ➤ 2.5 million acres of damaged cropland

Through loss of life, home and livelihood, the 8.9 million people affected by the cyclone continue to face lives of increased poverty.

### **Cyclone Aila, May 2009<sup>37</sup>**

Cyclone Aila hit 14 districts on the south-west coast of Bangladesh on the 25th May 2009. It was the second major blow for the region in less than two years: many of these areas were still recovering from the effects of 2007's Cyclone Sidr when Aila struck.

#### **The cyclone caused**

➤ 190 immediate deaths ➤ injuries to 7,103 people ➤ damage to 6,000km of roads  
➤ more than 1,700km of embankments to collapse ➤ more than 500,000 people to become homeless ➤ complete destruction of 275 primary schools and damage to 1,942 schools

## 2.4 RIVER EROSION



River erosion is a major issue affecting millions of people every year living along Bangladesh's vast river network. There are 310 rivers in Bangladesh, including 57 trans-boundary rivers and Ganges, Brahmaputra and Meghna are the three major rivers. During the monsoon period, an inundation of about 20 to 25 per cent of the country is considered as normal flood, which is beneficial for crops, ecology, and environment.<sup>38</sup> Floods and riverbank erosion are related events, with floods leading to erosion, or floods occurring as a result of erosion. Disastrous erosions are mainly associated with the major river systems of the country and seen along the banks of the Brahmaputra-Jamuna, Ganges-Padmaband Meghna River system. Lands are lost and people are displaced to new places, mostly in urban or peri-urban areas due to river erosion.<sup>39</sup>

Whilst river erosion is not new, there is growing evidence that climate change could be exacerbating this problem in Bangladesh. Heavier rainfall events are causing increased flooding that erodes natural defences, washes away soil, and damages embankments. One study suggests that sea level rise (as a result of climate change) has lead to widespread erosion of Bhola Island, implying that 50 percent of the island has been eroded over a 40 year period.<sup>40</sup> However, other studies caution against such claims, indicating that the coastal areas of Bangladesh have always been dynamic and that both losses and gains have been made to land areas, with others suggesting instead that increase in population density may be the greatest threat to adapting to these dynamic processes.<sup>41</sup>

Whilst it may be unclear the exact role that climate change plays in river erosion in Bangladesh, what is clear is its devastating impact on the families affected. Estimates suggest that between 50,000 and 200,000 people are displaced each year due to river erosion.<sup>42</sup> It is poor communities who usually live in the most risk-prone areas such as on river embankments or flood plains. When floods hit, embankments erode or land is lost to the rivers, and people are faced with the task of starting over again. Whether or not there are net gains in land surface area elsewhere (as suggested by some studies), whether the poor and marginalised can maximise this opportunity, and whether local planning is responsive enough to the needs of a moving and movable population is questionable. It is estimated that since 1973 the Jamuna, the Ganges and the Padma have eroded around 1,590 km<sup>2</sup> of floodplains and made 1.6 million people homeless, both those living along the riverbanks and the char land dwellers who are also affected by land loss due to river erosion. It is thought that most victims become slum dwellers in large urban and metropolitan cities and towns, exchanging one type of vulnerability for another.<sup>43</sup>

## 2.5 SALINITY AND SEA LEVEL RISE



The south-western coastal belt of Bangladesh has long suffered from saline intrusion and water logging,<sup>44</sup> which is now being exacerbated by sea level rise. Core samples, tide gauge readings, and satellite measurements have shown that over the past century global sea levels have risen by 10-20cm, with the rate of rise increasing dramatically in recent years to 3.2mm per year over the last 20 years (roughly twice the average speed of the previous 80 years).<sup>45</sup>

As the Earth's surface temperature has increased caused by the increase volume of heat-trapping GHGs in the atmosphere, the oceans have absorbed approximately 80 percent of this additional heat. As a result thermal expansion and melting of glaciers, polar ice caps, and ice sheets in Greenland and West Antarctica have occurred, all of which have contributed to increased volumes of water and sea level rise.<sup>46</sup>

Even small increases in sea level rise can have devastating effects on coastal habitats, and this is becoming clear in Bangladesh. As seawater reaches further inland, it can exacerbate erosion, flood low lying areas, contaminate water supplies and agricultural soils, and fatally degrade the habitat for fish, birds, plants, trees, and crops. It also means that when large storms hit land – as is common in Bangladesh – the higher sea levels mean bigger, more powerful storm surges that can strip away everything in their path.

As there are currently insufficient actions being taken to limit climate change in the near term, warming will continue and with it sea level rise and its devastating impacts for coastal Bangladesh. Estimates of global sea level rise by 2100 range from 0.8 meters to 7.0 meters,<sup>47</sup> and the reality will be dependent on how quickly all countries of the world can significantly curb GHG emissions.

It is worth noting that increased salinity of freshwater sources and land is not only the result of sea level rise, it is also exacerbated by other climatic changes such as increased temperatures increasing evaporation thus leaving concentrated saline deposits, and reduced rainfall outside of the monsoons leaving those deposits for longer instead of rinsing them away.



Droughts can be caused both by prolonged periods without rain, or by a deficit in moisture between rainfall amount and evaporation rates. Bangladesh is affected by major country-wide droughts approximately every five years. However, local droughts occur frequently and affect crop life cycles. Monsoon failure also can often bring yield reduction and food insecurity to the affected regions.<sup>48</sup>

The two critical dry periods in Bangladesh are *kharif*, and *rabi* and *pre-kharif*:

***Kharif*:** Droughts during June/July to October can result from the dry conditions in the highland areas especially in the *Barind*. Shortage of rainfall affects the critical reproductive stages of rice, reducing its yield, particularly in those areas with low soil moisture-holding capacity. This drought also affects fisheries and other household-level activities.

***Rabi* and *pre-kharif*:** Droughts during January to May can be due to the cumulative effect of dry days, higher temperatures during *pre-kharif* (in excess of 40°C in March-May), or low soil moisture. This drought affects all the *rabi* crops, such as *boro*, wheat, pulses and potatoes, as well as *pre-kharif* rice crops.<sup>49</sup>

The north western region of Bangladesh is particularly vulnerable to droughts.<sup>50</sup> A severe drought can cause more than 40 percent damage to the late dry and early monsoon season rice crop. Apart from loss to agriculture, droughts have significant effect on land degradation, livestock population, employment and health.<sup>51</sup>

In addition to drought, climate change is also expected to increase both the frequency and intensity of extreme heat. In Bangladesh over the last few decades there has been an increasing trend in the annual number of hot days and warm nights, and a decreasing trend in the annual number of cool days and cold nights. Across the Ganges-Brahmaputra-Megna Basin, modelling indicates a warming trend across all the seasons of the year, but more pronounced from December to May, and overall increase in extreme high temperatures. Whilst temperatures are likely to warm more slowly in Bangladesh compared with the average across the Ganges-Brahmaputra-Megna basin, the models indicate average warming of between 0.9°C to 1.0°C by the 2020s, and between 1.6°C and 2.0°C by the 2050s.<sup>52</sup>

Extremes of temperature – both heat and cold – are not only damaging climate-sensitive livelihoods such as agriculture, but can be dangerous to human health and cause death. Across the region both heatwaves and coldwaves are responsible for high numbers of deaths, such as the 2003 heatwave in Andhra Pradesh, India responsible for more than 3,000 deaths.<sup>53</sup> Anecdotally people are reporting severe coldwaves have become common in Bangladesh over the last two decades,<sup>54</sup> and the Government of Bangladesh's Disaster Report recorded a coldwave in January 2013 which affected more than 20 districts mainly in the north and east, and a few districts in the south, killing 80 people, many of them children.<sup>55</sup>

## 2.7 NON-CLIMATE RELATED HAZARDS



**Building Collapse:** According to government sources incidents of building collapse have increased significantly throughout the country in recent years. In 2013 a total of 7 buildings collapsed, most notably the collapse of Rana Plaza on 24th April 2013 which was the most tragic industrial accident in the history of Bangladesh, killing 1,135 people, and injuring 2,500 people



**Fire:** Every year hundreds of people die and many are injured in fire accidents. In 2013, 8,868 fire incidents occurred nationwide, with the majority in Dhaka and Chittagong.



**Earthquake:** Due to its close proximity to active tectonic plate boundaries, Bangladesh is prone to earthquakes. The country has experienced numerous large earthquakes in the past 200 years.



**Other:** Other significant hazard risks in Bangladesh include arsenic contamination and landslides. Arsenic contamination of ground water is widespread throughout Bangladesh.





# 3

## IMPACTS OF CLIMATE CHANGE ON CHILDREN

## 3.1 EDUCATION

A 2010 UNESCO report highlighted climate change as an increasing challenge to education, with girls often being the first to suffer the impacts. The report cites examples from Pakistan and Uganda, where climate-related shocks have resulted in more girls being taken out of school than boys.<sup>60</sup> With the increasing impacts of climate change, such consequences are likely to become more widespread, particularly in developing countries. Bangladesh's high prevalence of disasters – worsening as a result of climate change – has a significant impact both on school infrastructure and on children's short-term and long-term attendance. In areas prone to floods, tidal surges, and cyclones, children's education is frequently interrupted by school closures with school buildings damaged or destroyed, used as shelters instead of schools, or due to restricted access from prolonged flooding of the surrounding area. Fieldwork conducted for this report in Khulna and Barisal Divisions revealed that in those locations schools were closed multiple times every year due to hydro-meteorological events. In locations heavily impacted by river erosion it was found that this was not just the case for cyclone events, in fact the schools were used as shelters more often for flood and river erosion impacts than for cyclones, with considerable disruption to normal school functioning with consequences for girls and boys educational development.

Livelihood decline also makes it more likely for parents to remove their children from school, whether the decline is due to a specific disaster event or from more gradual erosion of income generating opportunities or seasonal variability reducing productivity. Following disasters children are required to help at home on recovery, reconstruction, and income generating activities, and the longer that children do not attend school the less likely they are to return.<sup>61</sup> A World Bank review found that household income typically falls after a disaster, especially for already poor households, and investments in children's education declines with it.<sup>62</sup> Both heavy rain and drought events leading to a decline in agricultural income have been shown to be linked to school absenteeism in studies from India and Ethiopia.<sup>63</sup> Where household livelihoods are in decline – either long term through changing average conditions – or through specific or cumulative losses from disaster events, without assistance children will be less likely to attend school, with boys more at risk of child labour and girls of child marriage.

Climate change impacts are also increasing migration within Bangladesh, especially among people whose livelihoods are no longer viable or who have lost vital assets. This can impact on children's education when the whole family is moved, and thus continuity of education is in question, or when the father migrates in search of work, with children often required to engage in household and/or income generating activities to contribute to the household left behind. Even when children are able to remain in school, climate change can affect their educational attainment through its impacts on their health and nutritional status (outlined in the next section), and through direct impacts such as extreme heat which is not conducive to a learning environment.

While climate change will cause serious disruptions to children's schooling, equally

education is a vital capacity needed to adapt to climate change. Climate change education is an important adaptation measure, particularly in vulnerable developing countries such as Bangladesh. Today's children will be facing climate change impacts for the rest of their lives, and teaching children the skills they need to understand and adapt to a changing climate is of vital importance for securing a safe, productive, and prosperous future.

## Implications for education and climate change in Bangladesh



- Schooling is disrupted when disasters damage and destroy educational infrastructure and equipment.
- Schooling is disrupted when school buildings are used for shelters, in many locations in Bangladesh these disruptions are frequent, happening multiple times in every school year.
- Declining livelihoods – often an impact of shifting seasonal patterns on agricultural-based livelihoods – impacts on families ability to keep children in school.
- Disaster events and declining rural livelihoods can increase risk of child labour for boys and child marriage for girls.
- Girls are more likely to be taken out of school than boys when families experience a shock or decline in income.
- The longer a child is out of school the less likely they are to return to education at all.
- Studies demonstrate the link between drought and intense rainfall (through decline in agricultural income) to increased school absenteeism.
- Climate change is implicated in increasing levels of migration in Bangladesh, with impacts on children's schooling.
- An educated population is vital for adapting to climate change now and into the future. Today's children in Bangladesh will need the skills and knowledge to adapt to the unfolding impacts of climate change for the rest of their lives. Investing in girls and boys' education is vital for Bangladesh to thrive in a changing climate.

## 3.2 HEALTH

Sickness and disease affects childhood development as well as children's ability to lead full and healthy lives, and climate change has widespread and diverse impacts on children's health. Directly it impacts through the increased prevalence of diseases such as malaria and waterborne diseases, and indirectly by increasing rates of child malnutrition as rainfall and temperature changes impact on agricultural production. It is estimated that globally 25 million more children will be malnourished by 2050 due to climate change,<sup>64</sup> with devastating consequences for those children from stunted growth and weakened immune systems, through to impaired mental development undermining educational attainment and restricting life-long job prospects.

In Bangladesh changing climate conditions are leading to increased rates of communicable and non-communicable diseases in children, including waterborne diseases, vector borne diseases, and diarrhoea. More frequent and intense heat waves will increase mortality and morbidity in vulnerable groups in urban areas.<sup>65</sup> The transmission of infectious diseases, such as cholera epidemics in coastal Bangladesh and diarrheal outbreaks in rural children, will be affected as a result of warmer air, water temperatures, and altered rain patterns and water flows.<sup>66</sup> Temperature changes are also changing the distribution and prevalence of vector-borne diseases. Studies from India show that the distribution of the *Aedes aegypti* mosquito (carrier for dengue, yellow fever, and Chikungunya) has moved from a normal height of 500 metres above sea level to altitudes as high as 2,200 metres, such as in Darjeeling, India.<sup>67</sup>

Floods have a particularly large effect on the incidence of waterborne diseases,<sup>68</sup> but both ends of the extremes – floods and droughts – can lead to increased deaths in children under five from diarrhoeal diseases, dysentery, and salmonella.<sup>69</sup> There is evidence of large outbreaks of waterborne diseases such as leptospirosis (a bacterial infection spread through animal-human contact) following severe storms and flooding.<sup>70</sup>

Acute water shortages from droughts and contamination of freshwater supplies from flooding may increase the number of children using untreated water for drinking, increasing the risk of infectious waterborne diseases, such as diarrhoea, hepatitis A, cholera, dysentery, and typhoid.<sup>71</sup> The increased salinity of water supplies for many children in Bangladesh puts them at risk of health problems including acute dehydration from consumption of unsafe levels of saline, and from skin diseases from washing with saline water.<sup>72</sup>

Heatwaves and coldwaves are also causing death and health problems, and children are particularly vulnerable to the effects of extreme heat and cold.<sup>73</sup> Heat related illness is a particular concern in the hotter western districts in Khulna and Rajshahi Divisions.<sup>74</sup> Studies show an association between the number of hot days and children's hospital admissions, mostly for fever from heat stress.<sup>75</sup>

*Based on the trends predicted by the IPCC, therefore, we should expect the already significant levels of child morbidity and mortality due to natural disasters, malnutrition, heat stress, respiratory illness, diarrhoeal and vector-borne diseases to be further exacerbated by climate change.<sup>76</sup>*

In addition, just as schools are facing infrastructure damage and service disruption due to climate change impacts and disaster events, the same is true for health facilities such as hospitals and clinics, and access issues are compounded for the most marginalised when roads are destroyed or flooded and healthcare workers are unable to reach children and pregnant mothers who need their services.

## Health and climate change in Bangladesh



- Children are most at risk of health impacts of climate change.
- Climatic changes are disrupting disease patterns.
- Waterborne diseases are more prevalent after floods, cyclones, and droughts.
- Temperature changes are changing the distribution and prevalence of vector-borne diseases.
- It is estimated that globally 25 million more children will be malnourished by 2050 due to climate change.
- The availability of safe drinking water is undermined by climate change and weather-related disasters, leading to health problems for those with no choice but to use contaminated water.
- Increased deaths and hospital admissions of children during extreme heat and extreme cold.
- Ill-health and malnutrition in childhood undermines development and lifelong prospects.
- Healthcare services are disrupted when disasters or extreme weather events damage and destroy healthcare infrastructure and equipment.
- A healthy population is vital for adapting to climate change now and into the future.
- Healthcare infrastructure built today must be resilient to disasters and services invested in to deliver effective healthcare that meets the needs of girls, boys, women, and men in Bangladesh in a changing climate.



### 3.3 NUTRITION

*200,000 people will die and 200 million people will suffer from food insecurity as a result of climate change in lower income countries – half of these deaths are projected to be children from lower income countries.<sup>77</sup>*

Every child has the right to enough nutritious food. One of the most significant effects of climate change is the impact on the food system, both globally and locally. Agricultural yields and food security is being affected by climate change impacts in Bangladesh through the changing rainfall patterns, increasing temperatures, unreliability of seasonal patterns, and extreme weather events.

Agriculture provides around 84 percent of the livelihood base in Bangladesh and 16 percent of GDP. Agriculture is particularly sensitive to any changes in average and seasonal conditions, including changes in temperature, precipitation, seasonal timing and duration, as well as impacts of repeated flooding such as increased salinity of soil and water. Not only can these changes lead to long term productivity declines and poor-season losses, they can also impact on the nutritional content of crops, meaning that even when food is successfully grown, it may be less nutritious than it was previously, putting at risk children's nutritional status and health.<sup>78</sup> Whilst some climatic changes could be beneficial for crop productivity, these benefits are rarely available to the poorest who cannot afford the opportunity costs of trying something new, or who may not be able to maximise these benefits through lack of access to water for productive uses, or to weather forecasts to help them successfully adapt to changing and changeable conditions.

Climate change impacts leading to an overall decline in agricultural production across Bangladesh will mean that many families who are poor will also suffer as a result of price increases. The poor already spend a disproportionate amount of household income on food. An increase in the price of staple foods translates to a decrease in household spending on other things such as healthcare or investing in education.<sup>79</sup> As a result of climate change, Bangladesh could experience an increase in poverty of approximately 15 per cent by 2030.<sup>80</sup>

The effects of climate change on livelihoods can be sudden, such as droughts and floods, or slower and cumulative, such as changing long-term rainfall patterns. This cumulative effect is particularly notable in the case of food security and nutrition.<sup>81</sup> There will be direct effects such as increasing malnutrition and hunger, the IPCC states that "malnutrition linked to extreme-climatic events may be one of the most important consequences of climate change."<sup>82</sup> There will also be indirect effects of changes in food security. For example, loss of family income in agricultural areas could lead to children being taken out of school and increased migration, putting children at greater risk of exploitation and placing barriers to their development.<sup>83</sup>

Under nutrition, which includes stunting, poor foetal development and micronutrient deficiencies, is already the underlying cause of 3.5 million child deaths and 35 per cent of the disease burden in children younger than 5 years of age globally.<sup>84</sup> Children who are

undernourished are more susceptible to a range of risks related to weather and climate, including pneumonia, diarrhoeal disease and infections.<sup>85</sup>

Salinity is a particular problem for Bangladesh's rural livelihoods, with participants in this study reporting loss of agricultural production for up to three years following a cyclone due to residual salinity, and fruit trees dying off in saline affected areas. With the current trend for more severe cyclones, in some locations there will be more years where traditional agricultural practices are not viable than years when they are, with serious consequences for local livelihoods and for food security and childhood nutrition.

## Nutrition and climate change in Bangladesh



- Malnutrition linked to extreme weather events may be one of the most challenging consequences of climate change.
- Half the projected deaths from climate change induced food insecurity are expected to be children in lower income countries, such as Bangladesh.
- Agricultural yields and food security are being undermined by climate change in Bangladesh through changing rainfall patterns, increasing temperatures, unreliability of seasonal patterns, and extreme weather events.
- Climate change not only affects agricultural productivity, but also the nutritional content of the crops that grow.
- Efforts to adapt the Bangladesh agriculture sector to climate change will have implications for what is produced and how it is produced, with implications for children's nutrition.
- Increases in the price of food, caused by extreme weather events, climate variability or change, will disproportionately affect the poorest girls and boys in Bangladesh, with implications for other family expenditure on education, health, and other wellbeing factors.

## 3.4 WATER SANITATION AND HYGIENE

*Every child has the right to clean water. One of the most significant current and future impacts of climate change is the effect on the availability and supply of fresh water at a local, national and international level. Changing rainfall patterns and the increasing severity and frequency of natural disasters all threaten the availability of clean and safe water that in turn could lead to an increase in food shortages, diarrhoea and waterborne diseases as well as compromise water and sanitation systems and increase the likelihood of conflict over scarce water resources.<sup>86</sup>*

Climate change in Bangladesh is very often described through water issues and its associated health, safety, and hygiene challenges. Whilst it is wrong to characterise climate change in Bangladesh only as a water issue, this is an area that will be heavily impacted and will be enormously challenging to manage. With climate change the threat multiplier, the water impacts will be most pronounced where there are already significant challenges relating to water: where there is limited water there will likely become even less, where there is flooding it will likely become more severe, and where there is salinity this will become harder to combat and more widespread.

The complex interaction of changes to amounts of rainfall, distribution of rainfall, evaporation rates, and storm events, further interact with non-climatic influences such as population size, water management measures, and changing resource use, to make the design and delivery of effective climate change adaptation measures extremely challenging. Whilst the development challenge has previously been to ensure access to safe drinking water for all – and Bangladesh has made significant advances in this – the challenge now presented by climate change is to shore-up that coverage against climate change impacts, which may well prove to be an even more difficult outcome to achieve.

Globally diarrhoea is the second biggest killer of children, after pneumonia.<sup>87</sup> As outlined in the section on health, vector-borne diseases such as dengue, malaria, and diseases are associated with poor water quality, inadequate sanitation, and poor hygiene practices are on the rise as a result of climate change, and children are far more vulnerable to these diseases than adults.<sup>88</sup>

As with the other sectors, infrastructural damages will increase with climate change, and latrines, hand washing equipment, and irrigation infrastructure are all vulnerable to disasters.



### WASH and climate change in Bangladesh

- Bangladesh suffers negative consequences of both too much water and too little water.
- Globally diarrhoea is the second biggest killer of children.
- Climate change is exacerbating existing water challenges, through changing rainfall patterns, increased temperatures and evaporation, and increased flooding.
- Salinity of surface water and groundwater supplies are being exacerbated by climate change.
- WASH infrastructure is at risk from disasters and extreme weather events.

## 3.5 CHILD PROTECTION

*Loss of livelihoods and migration resulting from climate disasters and changing weather patterns leave children increasingly exposed to the dangers of child trafficking and slavery, or other forms of exploitation, violence and abuse. In Bangladesh, climate change has been linked to an increase in the number of girls forced into child marriage or prostitution in cities, often by desperate parents that have no other means to provide for their families.<sup>89</sup>*

Climate change exacerbates existing vulnerabilities and inequalities. This is particularly true for children in Bangladesh who are at increased risk of exploitation and violence due to the increased stresses climate change is placing on their families and communities. Children will be at risk both from disaster events and from the longer term climatic changes that are eroding rural livelihoods. The greater frequency and severity of climate-related disasters increases the protection risks to children before, during, and after disasters, leaving them more exposed to violence, abuse, child labour, child marriage, and trafficking. The impacts on livelihood productivity can also expose children to increased violence and stress from parents unable to cope, and even where child labour and child marriage is less common than it once was, left with few alternatives, their prevalence are likely to increase with climatic changes. Migration to escape the impacts of climate change also has the potential to put children at risk (see section below).

### Child Protection and climate change in Bangladesh



- Children are at risk of violence, exploitation, and abuse during and after disasters.
- Disasters are increasing in frequency and severity in Bangladesh due to climate change.
- Climate change is also eroding rural livelihoods, placing children at increased risk of child labour, child marriage, and trafficking as families struggle to cope with less predictable seasons and more frequent harvest failures.
- Migration is a common strategy for families in Bangladesh to cope with climate change and disaster impacts, which can increase the vulnerability of children.

## 3.6 CROSS-CUTTING: MIGRATION AND URBAN SLUMS

The very first IPCC assessment report in 1990 stated *“the gravest effects of climate change may be those on human migration.”*

Migration in Bangladesh is common, primarily within the country’s own borders, and mostly rural to urban. It is most frequently temporary and voluntary in nature, mainly to seek income earning opportunities. However in areas affected by environmental and climatic shocks such as floods, river erosion, and cyclones; or chronic stress such as salinization; migration is often used to escape increased environmental stress and reduced viability of livelihoods or as a last resort if all is lost.<sup>90</sup>

There are broadly four main types of migration in Bangladesh: internal displacement in the aftermath of environmental shocks; internal rural-to-urban migration for short or long periods in search of work; cross-border migration to India; and international migration to the Gulf countries, Malaysia, European countries, and elsewhere. Whilst internal displacement is most directly linked to environmental shocks and stressors, the gradual erosion of livelihoods in many locations due to climate change will be impacting in some ways on migration across the board.

According to the IOM, short term and short distance movement of populations is often an immediate response after disasters, with implications both for those displaced and host communities.<sup>91</sup> In Bangladesh on average over 50 million people are affected by environmental shocks every five years. Particularly affected are coastal areas where severe cyclones occur approximately every three years, as well as monsoon inundation of a quarter of the country on an annual basis. Major disasters can trigger high levels of internal displacement, such as 650,000 people displaced by Cyclone Sidr in 2007. People who lose their homes in disasters often move to slums in cities like Rajshahi, Khulna, Chittagong and Dhaka.<sup>92</sup>

However it is not just disasters that cause people to move in Bangladesh, it has been estimated that river erosion displaces 50,000 to 200,000 people in Bangladesh every year.<sup>93</sup> Changes to river flow, sediment build up, and patterns of flooding are causing riverbanks to shift meters or kilometres, and create or destroy chars. People are moving as the land moves; some as a result of their land and homes disappearing, or others to take up new opportunities on chars as they emerge.<sup>94</sup> A study in Kazipur sub-district in the 1980s found that two-thirds of the inhabitants of the Jamuna-Brahmaputra floodplain experienced displacement at least once, about 17 per cent three times, and 15 per cent 10 times,<sup>95</sup> and a survey in Hatia showed 16 per cent of households moved to cities to cope with the impacts of riverbank erosion and 22 per cent migrated after tidal surges.<sup>96</sup>

Climate change and migration are linked in complex ways that are only beginning to be investigated and understood by the research community.<sup>97</sup> Migration is influenced by a variety of factors in combination, of which the environment has long been recognised as

one contributing factor. Climate change is now driving increased environmental change, and as a result exerting an influence on who is migrating, when, and why. It is clear that in Bangladesh migration is being used by some people as a strategy to adapt to environmental stress and climate change, and migration could offer an effective adaptation strategy for at-risk populations where adaptation *in situ* would be virtually impossible. However migration and relocation present enormous challenges for both the communities being moved and host communities, and as such any migration plans undertaken in Bangladesh for climate change adaptation purposes cannot be led purely from an environmental perspective, rather it would require a rights-based approach drawing leadership and expertise across social, culture, and economic spheres. Policy in this area would need to be shaped by civil society groups with expertise in working with and understanding the needs of people who move, and the nuances and controversies of migration and displacement.<sup>98</sup> Securing the rights of children in any such policies that may be developed in Bangladesh, may be an important role for UNICEF.

Understanding the roles of the interconnected drivers of migration and their sensitivity to climate change is complex. A recent study found that crop failure is a significant factor in influencing migration trends in Bangladesh, more so than any particular hazard such as floods. Crop failure is being caused by a wide variety of climate change and environmental factors, including floods, but also due to late onset of rains, too little rain, and salinity; all of which will continue to worsen as the climate continues to change.<sup>99</sup> Therefore the consequences of impacts, as well as the impacts themselves, must be monitored and form the basis of analysis for adaptation strategies.

Amid such climatic and environmental changes – and their influences on crop production and water availability - it is likely that more people will migrate, or people will migrate for longer, in order to seek viable livelihood options for their families. Where people do not have adaptation options to respond to impacts of climate change on their lives and livelihoods, then migration is often seen as the only option left.

Between 2008 and 2014 it is estimated that 4.7 million people were displaced due to disasters in Bangladesh.<sup>100</sup> Estimates of between 500,000 to 730,000 people a year are moving to Dhaka, and whilst there is no way to determine how many are as a direct result of climate change, it is clear this is a growing factor contributing to rapid growth in urban populations in Bangladesh.<sup>101</sup> The IOM estimates that 70 per cent of Dhaka's slum-dwellers moved there fleeing some sort of environmental shock.<sup>102</sup>

In this study personal testimony was gathered from a man who lost his land to river erosion in the southwest near Bhola. With no land for the family's livelihood (he had been a farmer with significant crop and fruit tree holdings, and had employed many local people) and no land for the family to rebuild their home on, he felt the only option available to him was to move his family to the city so that he could find a job and they could rent a place to live. He struggled to find work, and whilst he now works part-time in a shop, the family has had to live in separate locations to manage the costs of rent as they cannot all afford to live together near to where he works. He stated that his situation will never recover to what it was when he had land and a thriving livelihood, and as a result he worries about what he can provide for his daughter. He is sad that their life in the city is so much less than the life they had before, but at least it is some small improvement on the "inhuman conditions" that was life directly



after their land disappeared into the river. At least in the city he has better access to water than when they were living temporarily on someone else's land near home, but still this life is a struggle and he sees little in the future to be optimistic about.

Variables that influence the impact of migration on children include whether they migrate with parents; whether the mother, father or both parents migrate; and whether the migration is seasonal or temporary.<sup>103</sup> Parental absence has an impact on income levels, caring capacity, and status of households, which can lead to problems for the children left behind, including disrupting school attendance and healthcare, and exposing them to risks. Children who migrate from rural to urban areas may encounter difficulties in continuing their education; they may be forced to work to help their family recover the costs of moving, there may be new costs for local services that cannot be afforded, or schools that are overcrowded may refuse migrant children due to lack of capacity.<sup>104</sup> If the migration has been a result of a disaster event, children may suffer with emotional impacts, both of the event itself and of the moving away from what is familiar to them. For some people migrating can improve circumstances; in many locations it may increase access to services such as education, health, water, and sanitation that were previously lacking in more rural areas. However in many cases vulnerability is likely to increase, such as through limited income generating options for the family requiring children to work, or inhabiting unsafe locations such as slums or living on the streets.

## Dhaka urban challenges



Unfortunately Dhaka and other cities in Bangladesh are not well prepared for this influx of environmental and climate change migrants and the reality for many children is simply replacing one set of problems for another. People coming to Dhaka after environmental disasters struggle even in the city to get enough safe water to drink or adequate sanitation facilities.

Dhaka simultaneously has a flooding problem and a lack of water problem. About 90 per cent of the city's water supplies come from ground reserves, which are depleted by approximately three metres a year. According to a 2014 report, there is a current supply-demand gap of 500m litres a day, which has led to chronic shortages and at times protests in the summer months.

Climate change is not the only problem urban slum dwellers face, they are also highly vulnerable to earthquake risks due to the lack of planning and poor construction, lacking infrastructure, and high population density of urban slums.

A twin-track approach is required in Bangladesh – adaptation efforts to enable more people to stay in viable rural livelihoods and locations – and at the same time robust urban development plans that are responsive to the trend of migration to urban centres and are climate change and disaster sensitive, so as not to expose people fleeing one unsustainable environment to simply another set of chronic vulnerabilities.

# 4

## COMMUNITY EXPERIENCES OF HAZARDS AND CLIMATE CHANGE IN SOUTHERN BANGLADESH

## 4.1 FIELD WORK METHODOLOGY



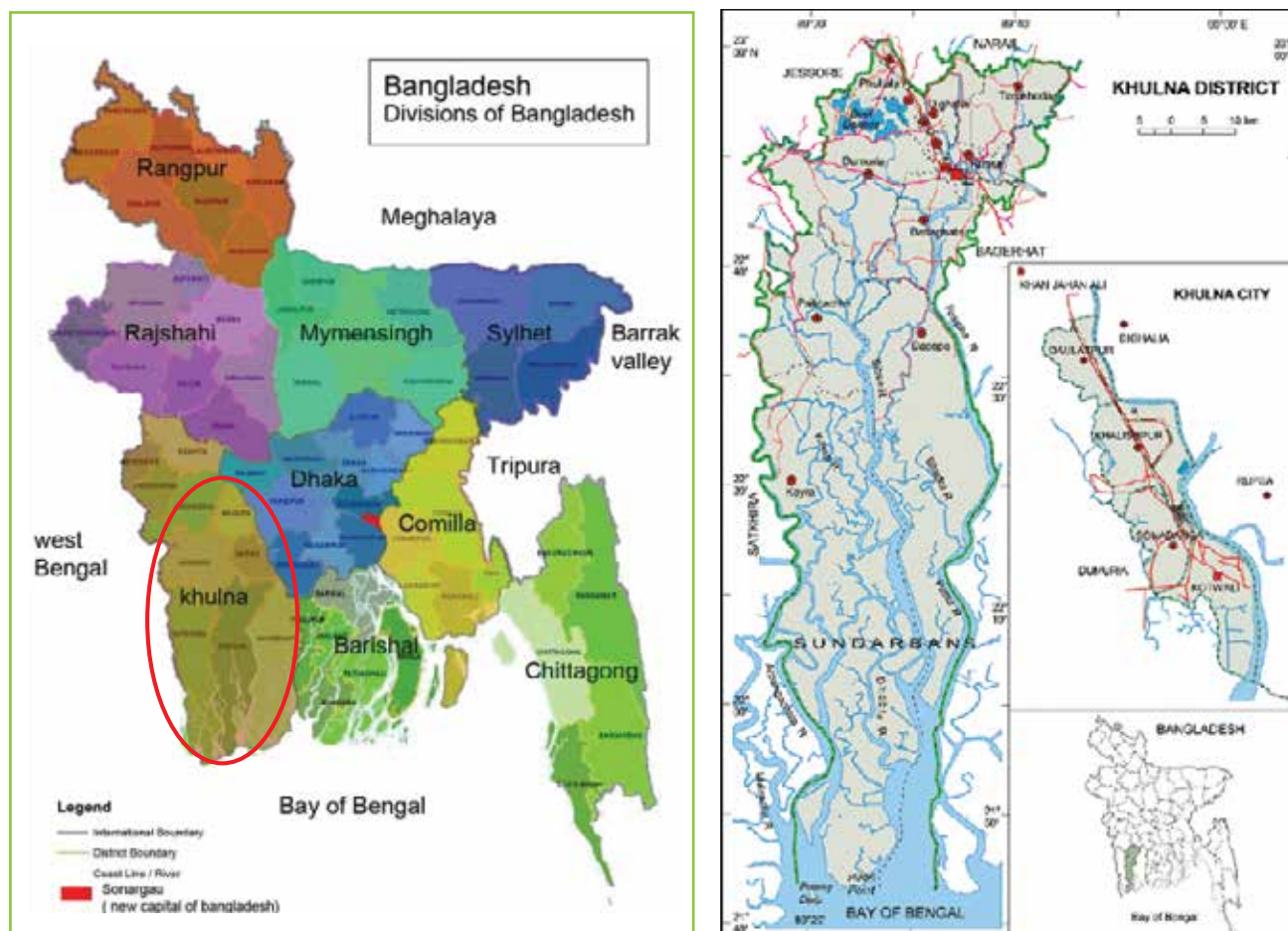
Participatory research was undertaken in Khulna and Satkhira districts in Khulna Division, and Bhola District in Barisal Division during November 2015. Key informant interviews and focus group discussions were undertaken with local government officials, partner staff, women and men project participants (in mixed or women only discussion groups), and with school children (aged 7 to 16) and adolescents (aged 12 to 27) in mixed discussion groups.

Climate change impacts were not singled out in the focus group discussions, instead participants were asked to consider all the hazards and environmental changes that impacted on their lives, and prioritise which were important to them. Climate change was mentioned with some groups and not with others, but overall the facilitators refrained as much as possible from using the term 'climate change' in order for the research to capture a picture of all the risks and changes people faced, and to facilitate a non-technical discussion with full participation, regardless of the level of pre-existing knowledge about climate change people had. This is also a useful approach in such disaster prone contexts where it is often difficult to separate out climate change impacts from pre-existing hazards.

UNICEF staff facilitated and documented the participatory research using standardised tools developed for this study based on VCA tools and methodologies. There was a high degree of variation between how the tools were used due to limited time available to train staff as well as different staff being available on different days. All field research was overseen by the lead researcher with daily field debriefs to capture learning throughout the process and identify gaps to focus on for enhancing the research as it progressed.

It is worth noting that participants in the study were encouraged to describe hazards and environmental changes *in their own words*, and translation was undertaken by UNICEF staff familiar with the context. Therefore in the findings that follow terms have been used that provide English translations of the Bengali words used by participants from the perspective of UNICEF staff engaged in the research, and not necessarily the technical definitions of such hydro-meteorological phenomena as tidal surge and drought. As a result, colloquial and everyday use of terms, rather than scientific accuracy, is reflected in this research.

## 4.2 KHULNA AND SATKHIRA DISTRICTS, KHULNA DIVISION



[Map sources<sup>106</sup>]

Khulna Division is in the south-west of Bangladesh, and reaches south to the Bay of Bengal. The area is part of the largest delta in the world, and Khulna is regarded as the gateway to the Sundarbans, the world's largest mangrove tidal forest and the environmental break for cyclones hitting landfall, originating in the Bay of Bengal. The district has a network of rivers which play a vital role in the local economy. The main rivers flowing through the district are the Koputaksha, the Rupsha, the Pasur, the Kazibacha, the Sibsha, the Bhadra, and the Sutarkali. All the rivers are connected with streams and canals and flow into the Bay of Bengal. These waterways are tidal and navigable throughout the year, and comprise approximately 14 per cent of the total area of the district.<sup>107</sup> The district has a hot and humid summer (mid-April to mid-June) and a mild winter (November to February). Rainfall is generally heavy in the months from June to September during the monsoon.<sup>108</sup>



*Photo details: Srinagar village (Kamarkhola Union, Dacope Upazila, Khulna district), 15<sup>th</sup> November 2015.*



*Photo details: Burigoalini UP, Shyamnagar Upazila, Satkhira District, Khulna, 16<sup>th</sup> November 2015.*



### 4.2.1 Summary of Khulna and Satkhira District Findings

Across all the key informant interviews and focus group discussions, the highest rated impacts and observed changes were found to be:

- Increased frequency of disasters, especially cyclones.
- Increased salinity, both in drinking water and impacts on agriculture.
- Increased frequency of flooding and inundation from high tide, tidal surges, river erosion, and embankment erosion.

The profile emerging from the study is of a complex tidal riverine risk context, where very high impact but low frequency disaster events sit side-by-side with chronic flooding and water salinity issues, with the former worsening the latter year-by-year.

Whilst adults and children reported the same risks and changes, adults consistently placed cyclones as the most significant hazard, and the increasing frequency of cyclones and storms as an important changing feature of that challenge. However whilst children and adolescents reported that the impacts of cyclones were the most devastating across all aspects of their wellbeing (defined as school, food, water, health, and safety), it was consistently ranked lower than other more chronic/every day or every year hazards and changes that they felt undermined their overall wellbeing more. When child and adolescent participants were asked why they did not rank cyclones as the most significant hazard after they had scored it the highest for negative impacts, they consistently responded that compared to other hazards they were infrequent, and they felt that more chronic and everyday problems had overall a more detrimental impact on their lives than the isolated events of cyclones. One adolescent group even failed to agree on prioritisation of the hazards and changes for this very issue of whether *infrequent severity* was worse than *frequent, cumulative* impacts.

Overall it was hazards and disaster risks that dominated discussions in Khulna and Satkhira districts, with the notable exception of challenges from salinity and seasonal change. Salinity was frequently ranked highly, and therefore included in more detailed discussions and the findings below. However whilst the changing of the seasons (from six seasons to four) was mentioned across all discussion groups and interviews in both Khulna and Barisal Divisions, it was never ranked highly enough for further detailed discussions, therefore this study has not been able to collect detailed information on the impacts of this change. However this perceived change – and consistent reporting of this change across two separate study sites – is a notable climatic change that will surely over time lead to some significant changes for lives and livelihoods in Khulna and Barisal, and further research is recommended for the implications of this seasonal change on local communities to become fully apparent.

Due to the time and capacity limitations on the field research a full VCA in each location was not feasible, instead this research carried out an initial assessment, primarily capturing and ranking hazards and environmental changes as perceived by communities themselves. This research therefore was unable to go into detail with regard to the implications of coping and adaptation strategies that people employ in response to a changing climate, but some interesting findings did emerge. It is worth noting that this is an important area to consider with regard to adapting to climate change, as girls and boys will not just be impacted by climate change impacts directly, but will also be impacted indirectly through the strategies that their families, communities, and government employ to both proactively and reactively deal with climate change impacts.

One such example that emerged in the research in Khulna Division was that increasing numbers of people are turning to shrimp farming (often incorporating other saline-aquaculture and agriculture) as a way to manage the increased salinity of land that had undermined the viability of their previous agricultural activities. Given that the local agricultural land has become more saline and more frequently submerged or waterlogged, crops and fruit tree



cultivation had become more difficult, and virtually impossible for the two or three years after a cyclone or severe flooding. Switching to shrimp farming therefore *seems* to offer an appropriate way to adapt to the changed situation that local people find themselves in. However with all adaptation there are trade-offs to be considered, and for effective adaptation to climate change an activity must be sustainable and not lead to maladaptation.<sup>109</sup>

Whilst switching to shrimp farming seems to be a reasonable response to the situation, it remains to be seen how sustainable it is; whether it is a feasible income generating strategy long-term for people living in poverty; and whether it will actually exacerbate vulnerability (be maladaptive) overall.<sup>110</sup> When actions to try to limit flooding and saline intrusion are stopped in favour of actions to actually encourage it for the expansion of shrimp farming, there are serious detrimental impacts for local communities, the primary one being deterioration of drinking water supplies, often requiring all local residents to purchase water transported in from outside the area, whether or not they financially benefit from the shrimp farming.<sup>111</sup> Secondly, without high levels of investments and training, shrimp farming can be very profitable for a few years, and then drop off very quickly due to diseases and other factors, leaving contaminated land unsuitable for both shrimp farming and other forms of agriculture.<sup>112</sup> It is this sort of forward looking analysis and effective management of trade-offs that is vital for effective adaptation to climate change, rather than short term 'solutions' that ultimately exacerbate poverty, vulnerability, and environmental degradation.

## 4.2.2 Flood

Flooding was reported to be caused by a variety of factors, sometimes together and sometimes separately, including **heavy rain** (more frequent heavy rain events), **high tides** (the nature of tides were described as having changed, and that now during high tide times the sea water is raised even higher, flooding houses, fields, and roads), **tidal surge**<sup>113</sup> (sometimes discussed as linked to storms and sometimes discussed more like very high tides and not part of storm events), **river erosion** (collapse of land and/or embankments leading to inundation from the river), and as a result of **cyclones** and **storms**. Flooding also ranged from localised flash flooding (such as from high tide) through to prolonged periods when whole areas were underwater for many weeks and months (such as from tidal surges or destruction of embankments).

Key consequences cited across these different varieties of flood events were:

- Damage to buildings and infrastructure – including houses, schools, roads, and fields – sometimes leaving people homeless.
- Buildings and fields flooded for considerable periods of time – sometimes leaving people homeless.
- Children unable to go to school.
- Drinking water crisis – fresh water ponds flooded, Pond Sand Filters and other water sources contaminated also.
- Crop losses and livestock deaths.
- Danger of drowning for children.
- Many people dying as a result of tidal surge.
- Child marriage increases for poor families trying to recover from impacts of flood events.
- Disruption to all types of services, especially education, health treatment, businesses, communications, and physical access to markets/meeting travel needs.
- Financial crisis, especially for poor families.
- Increased water-borne and skin diseases.

### 4.2.3 Salinity

Participants felt that increased salinity after cyclones had always been a problem, but one that they previously eventually recovered from. However, they felt that increased salinity was now a daily problem because of the increased impacts of tidal surge. It was not just water surface water supplies that were suffering salinity; both groundwater and cropland were also described as saline, with the result that they felt they were suffering a constant crisis of saline water and infertile land.

The consequence of the salinity was perceived as a big crisis for drinkable water, not just after disasters but all the time. Water had to be collected from further away, and less was available even there. Children and adolescents felt that there was more malnutrition and diseases because of this water crisis. They also felt that the land wasn't producing as much crop because of the salinity of the soil and water. They reported that it affected the availability of food and the overall economic wellbeing of their family.

Vegetable, rice, and fruit production were reported to be declining every day, blamed on decreasing fertility of soil due to not enough rain to wash away the salinity of the soil, and to replenish the ground water and surface water used in crop production. The trees were also reported to be dying, particularly coconut trees and some local varieties of fruit, which were now no longer available for the children to eat.

Quotes from adolescents participating in UNICEF's Child Friendly Space Project in Khulna District:

*Water is salty, it is not drinkable. It causes skin diseases. It reduces the fertility of land. There are less crops. Now day-by-day salinity is increasing because of tidal surge.*

### 4.2.4 Cyclones

Cyclones were of highest concern to all the adult groups, not just for the severity of their impacts, but because it was felt that they have become more frequent, therefore it is no longer just a case of the severity of the impacts, but the cumulative impacts as there is less time to recover before the next one. They said that every year now a cyclone is formed in the bay, and whilst the cyclone does not always reach land and impact on them, there are more warnings and more worry for 6-10 days that a cyclone may come.

When cyclones do come there are multiple impacts including tidal surge, river erosion, and embankment erosion/destruction. Houses, schools, school materials, crops, trees, roads, sanitation systems, and fish farms are damaged or destroyed. Human lives are lost, as are cattle and other animals. Assets are lost, both through the disaster itself, and through theft if people have gone to cyclone shelters or other places. Tube wells, ponds, and rivers are filled with saline water. There are diseases, especially diarrhoea diseases. Children can't go to school, in some cases schools were closed for about 2 months, and their education is hampered.






All adult groups reported that it took three to four years to recover, with one group specifying that recovering household food consumption to three meals a day took three to four years, for crops to grow again in the fields took three years<sup>14</sup>, recovery to normal education took four to five years, and that they were still struggling economically following Aila, now six and a half years ago.






**Table 3 : Summary of common preparedness and coping strategies in Khulna and Satkhira Districts**

Common preparedness strategies	Common coping strategies
Store dry foods (if it can be afforded).	Use storage dry foods if you have it.
Construct houses on slightly raised land where able to.	Some people sell their assets to survive: cattle, poultry and sometimes even land.
Use concrete pillars for home construction rather than wooden pillars, if you can afford to.	Richer families support the poor families with food immediately after the event.
Save money if you can afford it.	Take a loan from others.
Become familiar with the warning information.	Use savings to start up livelihood again.
Women and children go to the shelter when there is a warning.	People had to survive on their own for 3-4 days, but after that Government and NGOs would provide relief.
	Take a loan from an NGO.
	Send children to work. <sup>115</sup>
	Migrate to other places looking for work.

## 4.2.5 Other Hazards and Changes

**Table 4 : Summary of other hazards and changes in Khulna and Satkhira Districts**

	<b>Drought: less rain than there should be</b> There isn't enough rain in the rainy season. Trees, cattle, and crops die, and there aren't enough crabs and fish in the rivers. Ponds are dried up, and people can't grow crops and vegetables. Poverty increases.
	<b>Drought: too much heat with less rain</b> Salinity increases, heat increases, crops and fishes are not produced. Creates poverty.
	<b>River Erosion</b> Water levels rise in the sea and the rivers, and wind brings that water onto the land. Crops are damaged. Children and women are affected. Children cannot continue their education. Child labour increases because of financial crisis in the family.
	<b>Diarrhoea</b> Diarrhoea was often listed as a hazard in its own right, not a consequence of other hazards. Drinking unsafe water causes diarrhoea in children and they may die. Many can't get treatment because they are too poor.
	<b>Siltation of the river</b> The siltation decreases the depth of the river and increases the risk of flooding. This exacerbates the impacts of higher tides, more tidal surges, heavy rain, and cyclones.

	<b>Seasonal change</b> There used to be six seasons, now there is only four. There is no rain when it is supposed to rain. There is no longer any Autumn.
	<b>Erratic rainfall</b> Described as “too much and too little rain”. Rain was too heavy at times and not enough at other times. Rainfall was less predictable than it used to be, as well as less helpful.
	<b>Rain outside of rainy season</b> There is now frequently up to three months of rain outside of the rainy season. The perception is that this didn’t use to happen 10 years ago.
	<b>Heat / increased temperatures</b> It is hotter than it should be. There are too many hot days that are more intense and difficult to withstand and to work. The winter months are also warmer too. The warmer weather has a negative impact on fish production and availability.
	<b>Inward migration</b> More people are migrating here from other places to try to get work, but there are less and less employment opportunities, and poverty has increased.
	<b>Outward migration</b> Many people migrate to try to find work to recover from cyclones when they have lost what they have, but the whole area is affected and so many people looking for work drives down wages. They can’t earn enough to come back to the family and end up living away in slums.

Quote from a male member of the Union Convergence Coordination Committee, Burigoalini Union Parishad, 16<sup>th</sup> November 2015:



“ *The seasons have changed. The right weather changes are not happening at the right times. Now it is winter, but we are not feeling cold. Rain doesn’t happen during the raining season. Now it is very hot, but 10 years ago it was cold at this time... We are suffering as there is both too much and too little rain now.* ”



Photo details: Participants of children’s focus group discussion from Kolbari ABAL School, Burigoalini, Shyamnagar, Satkhira District, Khulna, 16<sup>th</sup> November 2015.

## 4.2.6 Children's Perceptions of Impacts of Highest Ranked Hazards and Changes on their wellbeing

Table 5 : Summary of impacts on children and adolescent's wellbeing in Khulna and Satkhira Districts

	FLOODING / TIDAL SURGE	CYCLONE / STORM	SALINITY
 <b>SCHOOL</b>	<p>Children stated that flooding has a high impact on school attendance. They reported school closures due to damage to school infrastructure as well as to roads and access to the school, including localised waterlogging in school fields and the surrounding areas. In addition they reported that their learning materials, such as books and pencils, are damaged or destroyed. Flooding was considered to be a relatively frequent occurrence that resulted in frequent and prolonged school closure. They said that when schools remained closed for long periods of time some parents would send their children to work and they would never go back to school. One group reported school being closed for two months this year due to flooding.</p> <p>Even when the schools weren't closed, some of them had missed school because of diarrhoea or other health issues they associated with the floods, particularly in relation to available water.</p>	<p>Impacts on school were described as much the same as for flooding and tidal surge, but much more severe. Considerable damage to school buildings and materials were reported. School closure was always reported as an impact, with durations of between two days and two months in various cases.</p>	<p>Salinity was not felt to directly have impacts on school or schooling, rather indirect impacts through food, water, and health impacts described below.</p>
 <b>FOOD</b>	<p>Children linked impacts of flooding on crop production losses directly to limited availability of food in their own homes. They mentioned crops being destroyed in the field, as well as salvaged food rotting as a result of floods. But they also linked floods to longer term detrimental impacts on food production; some groups described it as saline water coming in and the land becoming infertile.</p> <p>They also linked the flooding to less food available in shops. They shared that they would often feel hungry during periods of flooding.</p>	<p>The impacts on food availability were seen as less significant. Problems related to cooking - such as damage to kitchens, equipment, and access to water for cooking were mentioned - as was short term scarcity of food.</p>	<p>The most significant impacts of salinity were felt through food and water. Children reported that food didn't grow anymore as a result of frequent or severe flooding. They felt that the salinity left behind from tidal surge and flooding meant that the land was not fertile anymore, and trees and crops had died.</p>



	FLOODING / TIDAL SURGE	CYCLONE / STORM	SALINITY
 <b>WATER</b>	<p>Children reported very significant impacts of flooding on water sources and the implications on them. Tidal surge was reported to spoil all drinking water sources. They said they had less water to drink and had more work to do to collect and prepare the water to make it safe. It wasn't just drinking water that impacted on them, washing with saline or polluted water hurt their skin and eyes.</p>	<p>The impact of cyclones on water supplies and safe water availability was seen as less significant than with tidal surge and flooding as they felt the impacts were more short-lived by comparison. Whereas flooding was felt to have long term impacts on salinity of water supplies, it was generally felt that cyclones had a shorter impact on water supplies. The impacts were described as fresh water ponds, tube wells, and rivers polluted with salinity, dead animals, and other debris, and damage to infrastructure including Pond Sand Filters.</p>	<p>The consequences of salinity were felt most acutely through water. All water sources were reported to be more saline than previously, and they reported getting sick from drinking saline water, and suffering skin irritations and diseases from washing with it. The high salinity of the water also meant they had to spend more time on water collection and water preparation, which took time away from playing and other activities.</p>
 <b>HEALTH</b>	<p>The water impacts continued into the discussions around health implications, children said they got sick from drinking unsafe water, but also suffered other health impacts from the flooding. Between the groups the following were listed: diarrhoea, jaundice, malaria, typhoid (fever), skin diseases, pox, and more mosquitoes. Diarrhoea was the most significant health factor discussed – and indeed some groups ranked diarrhoea highly as a specific hazard in its own right. They reported it causing them to feel weak and lose weight, and it taking one or two weeks to recover; impacting on their ability to go to school, their ability to eat, and overall their level of health. They also linked this to safety concerns, as sometimes their parents would look after them when they were sick, but that often that wasn't possible and they would be left alone at home. They also felt that the impacts on availability of food also made them sick.</p>	<p>Health services and clinics were reported to be disrupted by cyclones, and were often closed. Health impacts were not reported to be as significant as with flooding and tidal surge. Injuries and deaths were discussed more so than disease outbreaks. But the overall perception of health impacts was lower.</p>	<p>Diarrhoea was spoken about frequently in relation to salinity of water supplies and not having enough fresh water. Skin irritations and diseases were also expressed as a consequence of this issue.</p>



	FLOODING / TIDAL SURGE	CYCLONE / STORM	SALINITY
 <b>SAFETY</b>	<p>The children felt that their safety was less impacted by flooding than other hazards, but they reported being scared of the flooding, particularly of it occurring at night when they felt they might be more likely to drown. They also feared drowning in the river. Other safety considerations included injury from infrastructural damage such as broken bones, and snakes coming into their houses after the flooding. The impacts on people's homes were considered to be very significant, with homes damaged or destroyed, and families being homeless as a result.</p>	<p>Safety was reported to be highly impacted by cyclones – as mentioned above high levels of injury and deaths were discussed. Broken infrastructure and falling trees and electrical wires following the cyclone were also cited as safety concerns. Groups reported being scared by cyclones, and often not having enough time after warnings to get to shelters. They also discussed the lack of space in cyclone shelters as an issue, as well as the insecurity of their homes and assets whilst they are in the shelters, with the potential that people would go to their houses and steal from them. Again the direct impacts on homes were mentioned, and that cyclones can lead to homelessness.</p>	<p>The children did not feel that salinity caused any notable direct impacts on their safety.</p>
 <b>RECREATION/PLAY</b>	<p>One school group placed a high importance on having spaces to play as another category needed for their wellbeing; and stated the impacts of flooding on this was very significant. They reported that the fields and play grounds get flooded and waterlogged, and then there is nowhere for them to play. They also mentioned health issues again in relation to play, and in particular that they are too weak to play after diarrhoea.</p>	<p>Safety issues impacted on recreation and play also, especially in terms of dead animals and damaged trees in playgrounds. The most significant impact was the time for play was lost to activities at home to help recover from the cyclone.</p>	<p>Being unable to play due to ill health and due to increased work to get water was discussed in relation to impacts on recreation and play.</p>



*Photo details: Adolescent focus group discussion with participants of the Child Friendly Space Project, Kalinagar village (Kamarkhola Union, Dacope Upazila, Khulna district), 15<sup>th</sup> November 2015.*







*Photo details:  
Participants in the  
adolescent focus  
group discussion  
with the radio  
listeners groups,  
Burigoalini UP,  
Shyamnagar  
Upazila, Satkhira  
District, 16th  
November 2015.*

## 4.2.7 Implications for Children and their Communities

The study found that both specific challenges presented by specific hazards, and also the cumulative consequences of the local climate change and disaster context, is having a detrimental impact on children's wellbeing. In this context it is increasingly difficult to separate out stand alone 'disaster' events from a chronic crisis of repeated flooding and increased salinity of water and land. Climate change is exacerbating seasonal flooding and previously 'normal' storm events, and as a result average conditions are becoming much more like crisis conditions, and 'recovery' in the traditional sense is becoming almost impossible. Adult FGDs expressed a sense of frustration at the increasing hopelessness of the situation, from community members experiencing erosion of their livelihoods and inability to manage the salinity issues, to union officials reporting that there simply isn't anything anyone can do to stop the salinity.

**Table 6 :** Summary of implications of these findings on children, across UNICEF's priority sectors

	<p><b>EDUCATION</b></p> <p>Use of schools as cyclone shelters means they are not being used as schools. Many schools destroyed and damaged from flooding and cyclones. Schools can be used as shelters for as much as four months of the year, with considerable consequences on education. Drop out from school increases as a result of disasters.</p>
	<p><b>NUTRITION</b></p> <p>Malnutrition in children was felt to be increasing, especially as a result of agricultural losses from salinity as well as erratic and unseasonal weather.</p>
	<p><b>HEALTH</b></p> <p>Increases in skin diseases, diarrhoea, and other diseases as a result of saline water, flooding, and waterlogging (prevalence of standing water). Complicated by poor nutrition undermining overall health.</p>
	<p><b>WASH</b></p> <p>Salinity of all water sources, including ground water. Latrines destroyed in cyclones, and often takes months to rebuild as they are considered a low priority post-disaster.</p>





### CHILD PROTECTION

After a disaster or when the schools are closed, the children of poor families often start working in shrimp ponds (gher). Many families used child labour and child marriage as coping strategies after disasters, even though there was a strong articulation of attitudes generally moving away from child marriage. It was reported that there are incidences of adolescent abuse including rape in the shelters during crisis situations. Children are also walking longer distances to collect water to try to get water that is less saline. More migration for work, sometimes leaving children behind and sometimes taking them to urban slums.

The perception from adults was that there had been some positive improvements that would reduce the impacts of cyclone in the future. These included:

- People are more aware and prepared. Signals are disseminated widely; and people would help to take the pregnant women, children, and people with disabilities to safe shelters.
- Cyclone Preparedness Programme Volunteers have been trained and equipped.
- There is a community, Union and sub-District level Disaster Preparedness and Response Plan prepared and exercised.
- More cyclone shelters – particularly school buildings – had been constructed.
- UP has a Disaster Management and Contingency Plan.
- Schools and houses that had been constructed on raised lands were thought to withstand cyclones better.
- Where there had been tree planting activities they felt this would offer protection.

Whilst people felt that actions could be taken to prepare for and lessen the impacts of cyclones, people felt less optimistic – and even angry – about their inability to manage the consequences of salinity and increased heat after cyclones. For the issue of heat they said *“we can’t do anything, we can’t harvest kochu vegetable this season – it rotted. We are only suffering.”* Asked if there was anything positive about the heat or anything that they would like to plan for if they had the resources, and they replied that there was nothing they could do.

Coping mechanisms were discussed by the adult groups, and they felt that many people are now adopting more saline-based approaches to agriculture and aquaculture, and some are getting support from government and NGOs to assist with this. However, they also felt that this actually contributed to future worsening of the salinity problems.

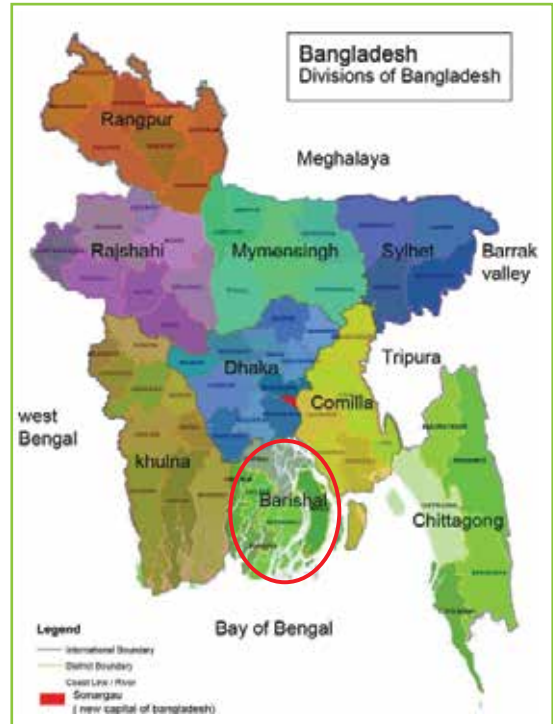
One noticeable difference between groups was between MAR and non-MAR project participants. Whilst the MAR Project Participants still reported that increased salinity of land and water was a change or hazard they were facing, their discussion of the consequences of this was not dominated by water shortage concerns or helplessness about the situation as it was with other groups. The success of this project for the provision of water in the community was clear, as was the faith the community members and project staff had in the reliability of the MAR system to withstand cyclone impacts, even though the system had not been in place prior to the last cyclone and therefore this remains untested at present. When asked to think about future cyclone events and the impacts and losses of that, they felt that MAR made them more resilient when it came to ensuring a safe water supply, and that there would be benefit of constructing more MAR systems, particularly on raised lands.



*Photo details: MAR project in Srinagar village (Kamarkhola Union, Dacope Upazila, Khulna district), 15th November 2015.*



## 4.3 BHOLA DISTRICT, BARISAL DIVISION



*Photo details: Bhola Sadar, 23<sup>rd</sup> November 2015. Visiting an area where 2km of road had recently been lost to river erosion. Map reference.<sup>116</sup>*

Bhola District is located in south-western Bangladesh. Bhola Island is the largest island of Bangladesh, and is home to 1.6 million people. It is sandwiched between the Meghna river on one side and the Tetulia river on the other. According to a 2007 report the island of Bhola has halved in size in just 40 years from 1965 to 2005. River erosion is a perennial problem in Bangladesh, home to a complex network of 230 rivers. But the report found that rising sea levels, caused by climate change, may be responsible for the erosion of coastal islands such as Bhola that were not previously vulnerable to the problem. The report suggests that widespread erosion of Bhola Island only started in the 1960s, and prior to that the size was reasonably stable with some erosion on just one side of the island. The report also found that the rate of the erosion has accelerated over the years. The report concludes that rising sea levels has created stronger currents in the rivers that surround Bhola which has led to the erosion of the island.

### 4.3.1 Summary of findings

The overwhelming focus of the discussions and interviews in Bhola district was related to chronic river erosion that according to the aforementioned report is caused by, or at least exacerbated by, sea level rise as a result of climate change. The challenges communities described were a combination of high tides, heavy rains, and tidal surges, leading to flooding and ultimately riverbank erosion and land loss. This was reported to be most problematic from April to October, with impacts taking a further two or three month's recovery, thus describing a chronic and perpetual problem, rather than distinct separate disaster events.

Cyclones were found to be another notable hazard with very significant negative impacts on children's wellbeing in Bhola; however cyclones were consistently ranked lower than river erosion in every FGD and interview. As was the case in Khulna, adults ranked cyclones as more significant than children. Children instead placed greater emphasis on more chronic and annual hazards, stating that cyclones occurred only every three or four years and whilst their individual impacts were considerable, the continuous and cumulative impacts from other hazards they felt most undermined their overall wellbeing. Whilst cyclones were ranked lower by children for their significance compared with other hazards, their impacts on each element of wellbeing (school, food, water, health, and safety) when cyclones did occur, was recorded as 'high' by children and adolescents.

As in Khulna another change that was noted by all, but discussed little in terms of significant direct impacts, was the loss of two distinct seasons. Again it was consistently reported by adult participants that six seasons have reduced to four. Also as with in Khulna coping strategies was not the priority focus of the discussions, but one issue which emerged repeatedly was that of migration as a result of land lost to river erosion. This was spoken about very much as a strategy of last resort, rather than a proactive and planned adaptation strategy.

For children and adolescents disruptions to education delivery as a result of river erosion, flooding, high tide, and tidal surge were high. This negatively impacted on school infrastructure, school services, and access to schools. In some cases schools had been damaged or destroyed, and in other cases loss of roads and flooded fields meant they were inaccessible. However it emerged that the most significant disruption was from schools being used frequently as temporary shelters and therefore closed for educational purposes. The research found that schools, particularly those designed for dual purpose as cyclone shelters, were used far more frequently as shelters than the frequency of cyclones. It was reported that schools were often closed at least three times every year for their use as a shelter in response to non-cyclone events, thereby leading to significant disruptions of the children's education.

For adults the greatest impacts by far were from loss of land and loss of investments.



In particular, the Union Committee and the local government officials reported that each year's budget was spent on rebuilding what had been lost rather than on new investments, thereby barely keeping up with facilities the communities had, and not being able to take any meaningful development steps forward.

This sense of losses, hand-to-mouth existence, and never getting a solid foothold to build out from, was evident across all age groups. Adolescents reported knowing preparedness measures for cyclones, such as storing dry food, but not actually doing this because there was never enough spare food to store. Adult groups talked about the importance of sanitation and hand washing practices, but then reported having to rebuild latrines every single year, and it not always being possible or the immediate priority.

Likewise, whilst it came across strongly that culturally attitudes were changing towards child marriage and child labour, and that there was a move towards this not being normal practice, it was reported by adults, adolescents, and children that this increased after disaster events and when people had lost land, homes, assets, and the means for their livelihoods from river erosion. It was spoken about almost inevitably in that context.

### 4.3.2 River Erosion

River erosion was identified as by far the most significant hazard or change undermining people's wellbeing by all FGDs and interviews across all age groups. The impacts of river erosion are significant in Bhola and descriptions included:

- Rich people become poor overnight.
- Everything is lost.
- Loss of both land and household items.
- People become street people.
- People have to migrate – the poor go to town or Dhaka, the rich try to buy a piece of land nearby and rebuild minimum housing.
- Children don't attend their school as they are submerged and the roads blocked.
- Health and other services are disrupted.
- People get sick from the water.



*Photo credit<sup>118</sup>*

In addition to river erosion being ranked highest in all focus group discussions across all age groups, the research collected a personal testimony from a man who had been displaced by river erosion, and an area was visited where 2km of road had been lost earlier in the year. The evidence of river erosion was visibly clear, but the consequences, such as in the case of Iqbal Hossain are perhaps not as well understood by policy makers and NGOs. There is limited evidence of the severity of this problem in Bhola and beyond, but the case of Iqbal Hossain illustrates a stark reality, combined with pessimistic almost despairing situation described by all participants in the research.

## Personal Testimony: Displacement by River Erosion.



*Interview with Iqbal Hossain, aged 48, from Ramdaspur village, Razapur Union, Bhola District, Barisal Division.*

Iqbal Hossain has a seven-year-old daughter, and he used to own much land for crop cultivation – 3,500-4,000 decimals of land, mostly for paddy and other vegetables, but also 1,500 decimals for fruit trees. He employed people to work for him on his land, where he lived with this family – his daughter, wife, brother, sister-in-law, and mother.

Within just one week in 2012 his house and land were washed away by river erosion along 2km. It was not the result of a violent storm, rather the slow changing flow of the mighty Meghna river. A char had started to appear in the middle of the river, and over 1.5-2 years built up until the current change to go around it was so severe that the waves took away the land. The water had simply changed course.

He quickly shifted his family to another piece of land that he owned 1 km away, but they were only able to take their most essential belongings and everything else was washed away. Even in the new temporary home they felt threatened from the river erosion, and about a month later that land disappeared too. They were forced to make a small house on someone else's land and managed to salvage and sell some of the trees they had been cultivating to make some money.

But they hardly managed in what he described sadly as *"inhuman conditions"*, but also noting that many, many people were living in this way too. They had lost everything and were struggling for survival. They hardly managed at all. They bought the minimum food they could with what money they had left, collected water from the river, and travelled 0.5km to the tube well for drinking water.

He is sad that he knows he can never recover to his past life when he was an employer and an influential person in the local community. Now he has had to move his family to the city (Bhola) to get work. He works part-time in a shop; lives in rented accommodation on the periphery of the city, with his family living even further out (4km) as it is too expensive to rent a place they can all live in together within the city. They hardly manage and he is sad. *"Previously I employed people, and now I am barely employed"*.

There is no scope for income in his previous livelihood without land, and whilst things are a bit better now he has a job in the city, he still describes their conditions as inhuman, but says at least in the city they have safe water and civic amenities.

His daughter is now seven years old and in grade 3 at the local school. He dreams of sending her to a better school, but now he has no money for this. He is afraid. His mother died last year. He is worried about the studies and future for his daughter. His income is not increasing, but education costs are increasing.

Is there anything he is optimistic about? He says sadly 'no'. Maybe this land might return in 100 years, even 50 years, but that will be too late. He is frustrated and has no ideas what to do.

He says many people suffered the same fate as they have. So many people were impacted, both in big and small ways.

Does he think anything could have been done to prevent this from happening? He says there was nothing *he* could do. The only thing that would make a difference is a huge project to keep the mighty Magna river moving. Chars building up in the river causes the water to force through changes of directions, and that washes away land and homes.

He says it is painful. He has lost everything except his family. They are in such marginalised conditions. He can't think about present life – it is just too painful.

### 4.3.3 Tidal Surge



Tidal surges occur between April and October. The water can rise between three and six feet, and flood houses, ponds, land, schools, and roads. Crop fields are inundated, seeds washed away, and fish escape from ponds. The water logging usually stays for 10-15 days. Rice, vegetables, and fish are lost, and people say they become poorer as a result. Those who have the resources to try to replant, but as it is much later in the season the yield is poor.

Schools are also affected, and close while the area is flooded. Children have less food to eat because of the crop and income losses suffered by their parents. Often people have to find shelter elsewhere as their homes are flooded, and roads and embankments are broken and flooded. Various diseases are reported to break out, with children suffering the most. Due to the severity of the tidal surges, people also drown, especially children.

### 4.3.4 High Tide



In the months of July to October high and low tides occur frequently in the river Meghna. During this period the farmers often can't plough their land because they are inundated. Salt water overflows onto the land, and into ponds and sources of safe drinking water, polluting them. Crops are damaged and lost, with direct impacts on people's incomes. The high tide occurs every 15 days, and is highest at new moons and full-moons. In addition to damage to cultivated land and infrastructure, people suffer from waterborne disease breakouts and snakes entering their homes.


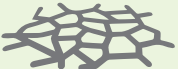



### 4.3.5 Flood







At times of flooding, educational services, infrastructure, and equipment are impacted. Safe water sources are contaminated, and people face challenges accessing safe water for drinking. Crops are damaged in the field and incomes drop. Many families have to move from their homes. Diseases such as diarrhoea and fever are common. The flooding is caused by excessive rain, these floods last one or two weeks, and can occur as frequently as once every month.<sup>119</sup>

### 4.3.6 Other Hazards and Changes

**Table 7 : Summary of other hazards and changes identified by focus groups in Bhola District**

	<p><b>Excessive Rain</b></p> <p>Excessive rain starts in April and May, and can occur until October. Excessive rain affects whether we can go to school, and ruins our booklets. Crops are damaged by the heavy rain, fish escape ponds, and livelihoods are disrupted. The excessive rainfall causes flooding, including in our homes. Diseases like diarrhoea and fever break out. Last year from March to June the rains were longer, heavier, and more frequent.</p>
	<p><b>Drought</b></p> <p>When there is a drought there is not enough rain, and so there is not enough water in the river, ponds, and tube well. Our fathers can't plough the land easily, the soil is too hard. Crops don't grow and are damaged due to the hot, dry weather. Fish also die. Temperatures are very high.</p>
	<p><b>Cyclone</b></p> <p>During cyclones trees and mud houses are damaged or destroyed, and people die. Everything is flooded from overflow of the river water afterwards. Others often go to the cyclone shelter. Safe water sources are inundated and people get sick from drinking the water, suffering with diarrhoea and fever. Crops are destroyed, and agriculture is affected for a long time after the cyclone. People can't work their fields, and no one can afford to buy their labour. Schools are broken, and can be closed for anything from a couple of days to many weeks. Many children drop out of school.</p>
	<p><b>Child Labour</b></p> <p>Child labour is our social curse. Most of our families struggle to have enough to provide for the family. We do not have the opportunity to study for a degree from college or university, so we have to stop our studies within school level. Therefore we are likely to start working in the field with our parents or go to the town or outside to sell our labour.</p>
	<p><b>Population Increase</b></p> <p>Most of our families are prepared to marry their girls below 18 years of age because they are seen as a burden. These girls do not complete school, and then they have children who also cannot afford to complete school.</p>






	<p><b>Child Marriage</b></p> <p>Girl students are dropping out from the school due to child marriage, and due to child marriage our population is increasing. Teenage woman give birth to malnourished children because she is poor, and they often die.</p>
	<p><b>Earthquake</b></p> <p>During earthquakes houses are damaged and destroyed. There is nowhere safe to go, and children and the elderly are at high risk. The seasons do not come as expected anymore. Sometimes the rainy season lasts for four or five months, which is too much rain and causes damage to crops as well as flooding. As a result we suffer waterborne diseases and other health problems.</p>
	<p><b>Seasonal Changes</b></p> <p>Six seasons have now turned to only four - winter, summer, rainy, late autumn –there is no spring or autumn. The summer is hotter and longer – it causes a lot of suffering. The winter time is colder and poor people can't get enough warm clothes. The seasons are getting harder.</p>
	<p><b>Tornado</b></p> <p>During tornados many people die, and infrastructure and equipment are damaged. Tornados occur during May and June. Houses are swept away and we don't go to school.</p>





*Photo details: Discussion with women from Engaging Community for Social Behaviour Change (C4D) project, Kalupur village (East Elisha Union, Bhila sadar, Bhola), 23rd November 2015.*

### 4.3.7 Children's Perceptions of Impacts of Highest Ranked Hazards and Changes on their Wellbeing

Table 8 : Summary of impacts on children and adolescent's wellbeing in Bhola District

	RIVER EROSION	FLOOD	CYCLONE
 <b>SCHOOL</b>	<p>Many schools are broken down by the river erosion or inundated by the water. We don't go to school. Our school is used as a shelter (two or three times a year) so there are no classes. When the school is used as a shelter (not cyclone) the school can be closed for 1 to 15 days.</p> <p>Even cattle come to the shelter – it is not a good environment everyone together with their animals. These are the same impacts for flooding.</p>	<p>Sometimes our school is flooded. We don't go to school and at that time the school remains closed. So our studies also stop for a couple of weeks or months.</p>	<p>When cyclones occur school buildings are destroyed or damaged. We can't go to school. The affected people are staying in the school as a shelter.</p>
 <b>FOOD</b>	<p>Food is our essential element to survive. Our cultivated land is disappearing and crops are submerged by the water due to river erosion. We are facing a shortage of food. When crops are destroyed, we have no food.</p> <p>Fish escape from the ponds.</p>	<p>Our crops and fish ponds are inundated and fishes are swept away from the pond. We are becoming poor. We don't read easily at this time, when we are hungry.</p>	<p>Our crops are damaged by the cyclone. So hunger breaks out. Cattle die also.</p>
 <b>WATER</b>	<p>After river erosion the safe drinking water is polluted by the waste and salty water. So we are suffering from various types of water borne diseases like fever, diarrhoea, and skin diseases. We spend a lot of extra time collecting water from further away – and boiling and filtering water – all the children have to do this work.</p>	<p>During flood our houses and safe water sources are inundated, so there is no safe water due to overflow by the flood water. We have to take unsafe water from the river or pond. We suffer from various diseases like diarrhoea and fever.</p>	<p>After cyclone safe drinking water is polluted by the worse water. Sanitary latrines are broken down. As a result water borne diseases break out and we all are affected by the serious diseases.</p>

	RIVER EROSION	FLOOD	CYCLONE
 <b>HEALTH</b>	<p>We don't get safe drinking water and people get sick. River erosion is the main cause of it. When river erosion takes place the roads are broken down and the medical centre is also inundated, so we don't receive proper treatment from health facilities. Living with the cattle in the shelter isn't healthy.</p>	<p>After flooding many diseases break out. Children, women and old men are suffering from diarrhoea and fever.</p>	<p>After cyclone we are suffering from fever, diarrhoea, and other water borne diseases. Children and pregnant women are seriously affected by this.</p>
 <b>SAFETY</b>	<p>After river erosion the houses and all other materials are washed away. Children, old men, and pregnant women are suffering from not having a safe place to stay. We are totally insecure under the open sky. We don't feel so safe walking further – maybe two hours - to get water.</p>	<p>When flood occurs our houses are flooded and the surrounding area, it is hard to move from the houses. Many families shelter in the cyclone centre/ school all together, and with their animals too.</p>	<p>Our muddy houses are broken down. Crops are damaged. Our parents can't go to work in their field or sell their labour. People stay in the cyclone centre. There is no safety for adolescent girl and pregnant women.</p>






*Photo details: Focus group discussion with adolescents from Engaging Community for Social Behaviour Change (C4D) project, Sundarkhali village (Bapta Union, Bhola District, Barisal Division), 23<sup>rd</sup> November 2015*





### 4.3.8 Implications for children and their communities

The research found a chronic situation in Bhola with widespread river erosion and frequent flooding dramatically undermining local livelihoods and causing many people to lose everything they have, with enormous consequences for the wellbeing of children. River erosion was such a constant and devastating hazard that it was talked about by everyone, and cyclone risks paled into insignificance. However from the discussions, cyclones seem to be the primary focus of all DRR activities in the area. The picture from the research is of a rapidly deteriorating situation in Bhola, increased unplanned migration, and union budgets spent every year on rebuilding what has been lost, there is a feeling amongst people that they are running just to stand still. The cost of repeated losses and the continuous maintenance of roads and schools are high. Union officials felt that this hindered their ability to allocate any resources for child-focused centric activities.

The perception from communities was that largescale infrastructure projects is the only possible solution, that embankments are needed and siltation managed. The perception from partners was that project disruptions are the norm, that every year activities have to stop due to hazard impacts.

**Table 9 : Summary of implications of this context on children, collected through this study**

	<p><b>EDUCATION</b></p> <p>Education is frequently disrupted by river erosion and flooding, due to use of the school as a shelter for affected families or by damage to school buildings and roads. In some cases as much as three months of schooling every year are lost. Schools are not just used as shelters for cyclones, but much more frequently for people affected by river erosion and flooding.</p> <p>Families often have to resort to sending boys to work or marrying girls to manage the chronic crisis, meaning that these children do not complete their education as well as suffer considerable harm. Drop out from school increases as a result of chronic crisis and disaster events.</p>
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	<p><b>NUTRITION</b></p> <p>Agriculture and aquaculture is being negatively impacted in the area by climate change, with families often unable to produce enough food or generate enough income to buy food. Vegetables and fruit trees are negatively impacted by salinity, which impacts both on the types of food, and nutritional content of the food available. Even fish availability is affected, which is an important source of protein in the area.</p>
	<p><b>HEALTH</b></p> <p>After flooding (caused by river erosion, high tide, tidal surge, or cyclone) various diseases break out including diarrhoea, pneumonia, and fever.</p> <p>Children and pregnant women don't get enough food due to impacts on local food production and household income generation.</p> <p>Health services are disrupted, and children and pregnant mothers can't get to the health centre due to flooding, damaged roads, and/or centres being closed.</p>
	<p><b>WASH</b></p> <p>Repeated river erosion and flood events makes access to and availability of water and sanitation facilities a significant challenge.</p> <p>Most sanitation facilities are underwater due to heavy rainfall or high tidal surge during June to October.</p> <p>Water sources become unsafe due to flooding and waterlogging.</p>
	<p><b>CHILD PROTECTION</b></p> <p>Increased risk of drowning for children in times of high tide or storms.</p> <p>Children are exposed to greater risks by travelling further to get water.</p> <p>Loss of homes and livelihoods leave boys more vulnerable to child labour and girls more vulnerable to child marriage as families struggle to cope.</p> <p>River erosion is leading to increased migration which can expose children to greater risks.</p>



*Photo details: Material used in the focus group discussion with adolescents from Engaging Community for Social Behaviour Change (C4D) project, Sundarkhali village (Bapta Union, Bhola District, Barisal Division), 23<sup>rd</sup> November 2015*



# 5

## CONCLUSIONS AND RECOMMENDATIONS

## 5.1 KEY CONSIDERATIONS FOR UNICEF BANGLADESH

Climate change is a threat multiplier, therefore it is important for UNICEF to understand the ways in which climate change may undermine efforts towards achieving the goals set out in the 2017-2020 Bangladesh Country Programme. Adjustments to current programming approaches may be necessary, as well as developing new areas of work where UNICEF may be able to offer a comparative advantage. Through conceptualising vulnerability to climate change as a product of sensitivity, exposure, and adaptive capacity, UNICEF can prioritise actions to target the most vulnerable children and adolescents in Bangladesh in order to meet their mandate to address inequality. Without a specific focus on the most vulnerable children and adolescents, climate change will increase inequality in Bangladesh.

### Climate change makes all UNICEF priority areas more vital

Achieving UNICEF's mandate in Bangladesh has become both more important to achieve in the face of climate change, and more difficult to achieve because of climate change. Therefore climate change is an important contextual challenge, and advocacy is needed to secure the necessary resourcing, focus, and forward-looking planning to ensure the rights of children in a changing climate and across UNICEF priorities for Education, Health, Nutrition, WASH, and Child Protection.

Achieving Education, Health, Nutrition, WASH, and Child Protection outcomes are vital for reducing vulnerability and actively build the adaptive capacity of children and adolescents in Bangladesh.

### Who is vulnerable and what success looks like has changed

The vulnerability context for children in Bangladesh is dramatically changing, therefore the Country Programme 2017-2020 must be oriented towards meeting the needs of children and adolescents vulnerable to climate change impacts and its associated increased disaster risks. Both *who* is targeted and *what* success looks like in Bangladesh across Education, Health, Nutrition, WASH, and Child Protection outcomes have now changed in the face of climate change.

Climate change is undermining the sustainability of development progress already made, therefore within the next Country Programme there must be efforts to prevent backsliding of gains caused by climate change, as much as progress forward. New approaches might be needed to achieve the same things, or tried and tested approaches may no-longer work or not be the most appropriate.

### Predictable disruptions must be planned for

An equity focus in Bangladesh must now include addressing climate change because of how it is, and will, impact differently girls and boys in various locations and situations. Therefore

equal access to such things as education services, healthcare provision, and safe drinking water, will not be delivered similarly to all populations. This is especially important in areas suffering chronic crisis, where there is no longer a distinction between disaster periods and normal periods (such as evidenced in this study in Bhola). This is a fundamental challenge both to government service delivery and to UNICEF programming.

## **Projects and policies must be climate risk screened**

UNICEF and Government of Bangladesh investments must now be suitable and sustainable in the face of climate change. Therefore climate change and disaster risk analysis must be mainstreamed across the UNICEF portfolio to ensure investments are not undermined by climate change and disaster risks, or indeed inadvertently make people more vulnerable.

## **New investments are needed to adapt to climate change**

New policies and initiatives are needed for Bangladesh to adapt to climate change, therefore there is a role for UNICEF to ensure that the voices, perspectives, and needs of children and adolescents are brought into these processes, and there may be new climate change adaptation initiatives that UNICEF has a comparative advantage to lead on.

## 5.2 IMPLEMENTATION RECOMMENDATIONS

### 5.2.1 Capacity Development

- Climate information services are an area of increasing importance given the increased need to understand and manage climate change impacts. This study found little evidence of community-level use of seasonal forecasts and generally inadequate early warning systems in terms of how community members are able to access and interpret information in order to make decisions. Increased investment is needed in this area, especially directly working with communities to understand how different information can be used, and rolling out information systems. UNICEF could develop niche work around child-focused climate information services building on existing approaches such as CARE's Participatory Scenario Planning<sup>120</sup> and IFRC's Climate Change games.<sup>121</sup>
- Climate information services are not just important at the community level, but increasingly forecasts are being used to trigger specific preparedness and response actions.<sup>122</sup> UNICEF would benefit from this in its own work and as well as working with Government to build capacity to gather and interpret information for decision-making and supporting communities in deteriorating situations.
- Local government are key to delivering climate change adaptation and DRR investments for vulnerable communities, yet have low capacity and few resources to do so. UNICEF could support the capacity building of local government institutions through the leveraging of local government grants for climate resilient activities in UNICEF related sectors.

### 5.2.2 Evidence Generation

- Incorporate climate change vulnerability and disaster risk indicators into the UNICEF Multiple Indicator Cluster Survey in Bangladesh in order to increase awareness and knowledge of climate change and disaster impacts on children.
- Develop and pilot child-focused Climate Vulnerability and Capacity Analysis (CVCA) with communities targeted with multi-sector programme interventions, in order to:
  - strengthen ability of the project to reduce vulnerability,
  - develop specific DRR and climate change adaptation components where appropriate,
  - and increase knowledge of climate change impacts on girls and boys across different locations in Bangladesh.
- Invest in a real-time evaluation of MAR during disaster conditions, documenting functionality during and immediately post-disaster to generate learning on any improvements needed to the system, and to provide evidence to advocate for greater investment in the approach.



### 5.2.3 Policy Dialogue and Advocacy

- Increase understanding across staff, partners, and government of how urgent and important Education, Health, Nutrition, WASH, and Child Protection outcomes are to reduce underlying causes of vulnerability that would otherwise leave girls and boys more negatively impacted by climate change.
- Advocate for a redoubling of efforts for inclusive Education, Health, Nutrition, WASH, and Child Protection service delivery and outcomes as a baseline requirement for Bangladesh to be able to rise to the challenges presented by climate change: a generation of better educated and more healthy citizens is a stronger starting point for meeting the challenges of climate change. Inclusivity and equity in a changing climate require specific attention to disaster and climate change vulnerable communities.
- Advocate for climate change and disaster risk screening of all Government of Bangladesh investments, particularly those child-focused, such as school building standards in earthquake and cyclone affected areas.
- Advocate for all Ministries to allocate a proportion of their budget to climate change within their own area, as well as engage with cross-ministry climate change initiatives.
- Advocate for government to be sufficiently forward looking in sectoral investments and planning to ensure climate change impacts are anticipated and planned for, such as prevention and treatment measures in place in areas becoming newly affected by particular diseases, or review and update existing DRR and response measures to anticipate changing disaster profile in some locations.
- Advocate for, and engage on content, to ensure that nutritional requirements are incorporated in adaptation plans for the agricultural sector, ensuring that criteria for strategies promoted include nutritional considerations of the population alongside considerations such as productivity in changing conditions and cost effectiveness.
- Advocate for children's voices and perspectives in policy making around climate change adaptation and mitigation, both in terms of how children are affected now, and in terms of how the decisions being taken now creates their future.

### 5.2.4 Partnerships

- Work with partners, donors, and government to scale up UNICEF's MAR approach to adequate levels of coverage in all viable locations. The approach has been proven from a water access and safety perspective, and has enormous potential to be disaster and climate change resilient.
- Work with government to ensure that any policies developed relating to planned migration as a climate change adaptation strategy upholds children's rights.
- Map stakeholders and climate change initiatives in Bangladesh to identify opportunities for collaborations building on UNICEF's comparative advantage.

## 5.2.5 Identification and Promotion of Innovation

- Incorporate forward looking contextual analysis and anticipatory planning into the UNICEF long term processes to identify where future programming shifts are needed to anticipate and respond to shifting context and disaster profiles. For example, where health programming will be needed to raise awareness of changing disease patterns, and establishing new immunisation or treatment projects in areas where they were not previously needed.
- Develop and pilot new integrated programming for chronic crisis areas, working collaboratively across humanitarian and sector expertise (and with Clusters if appropriate). This could be expanded to include use of project monitoring processes for monitoring deteriorating situations, and/or the development of crisis modifiers that could be piloted to intervene before humanitarian responses are required.

## 5.2.6 Support to Integration and Cross-sectoral Linkages

- Use the opportunity presented by UNICEF's leadership and participation in sectoral Clusters (particularly leadership of Education Cluster) to link up across development and humanitarian investments, knowledge, and programming divides to develop new initiatives that concretely contribute to resilience building. Key priority areas to pursue include:
  - (i) Incorporating DRR and climate change knowledge into the education curriculum.
  - (ii) Continuity of key services for children during predictable, seasonal disruptions.
  - (iii) Resilience of resources and infrastructure to climate and non-climate disasters.
  - (iv) Prevention of post-disaster/ disruption reversal of programme gains (building on such things as the success of UNICEF's conditional cash transfers for getting children back into school post-disaster).
- Mainstream climate change adaptation and disaster risk reduction across UNICEF's work to ensure that projects, investments, as well as policies advocated for, are not undermined by climate change impacts and disasters. Mainstreaming should also involve incorporation of actions that actively reduce vulnerability and build adaptive capacity of girls and boys across Bangladesh (see box below for specific steps that could be taken to mainstream).
- Climate change makes effective natural resource management more important than ever, both because of how climate sensitive natural resources are, and also because of the important role natural resources play in buffering communities from the worst impacts of climate change and disasters. Protecting and effectively managing natural resources will increasingly become important with regard to climate change and equity issues. In addition, the impact of strategies that people employ to adapt to climate change can also enhance or undermine natural resources, such as the conflict between shrimp farming and the impacts of increased salinity on other crops and drinking water (as raised in this study). UNICEF Bangladesh does not directly work on NRM issues, but it is increasingly important as an inter-generational justice issue and as the building blocks of agriculture, food security, nutrition, water access, and DRR.

## Actions to mainstream climate change adaptation and disaster risk reduction



- Use local level child-focused VCAs to inform targeting and programming decisions.
- Use climate change and disaster risk screening tools in the design of all projects.
- Incorporate disaster risk management processes into all projects.
- Train all staff on climate change adaptation and disaster risk reduction.
- Use IFCR's Minimum Standards for Local Climate Smart DRR or similar tool/approach with communities, partners, staff, and the Government of Bangladesh, incorporating a focus on children and adolescents.
- Use local level seasonal calendars for project planning cycle.
- Develop and use general and sector-specific indicators for climate change and DRR in project performance evaluation and learning.
- Advocate for sector service delivery to plan for seasonal and predictable disruptions as the 'normal' conditions under which they deliver their services.
- Ensure the specific needs of climate change vulnerable children are factored into all policies and sector service delivery.
- Target particularly climate change vulnerable children as part of UNICEF's commitment to equality

### 5.2.7 Service Delivery

- In view of the 2017-2020 Country Programme, review the focus on, and the definitions of, 'vulnerable', 'equity', and 'hard-to-reach areas' in light of Bangladesh's disaster context and climate change impacts. Key considerations should be how to target the most vulnerable to climate change, and how to achieve ***equity in a changing climate and disaster prone context***. Chronic climate change affected areas, disaster prone areas, and urban-based climate change migrated populations should be key focuses moving forward.
- Climate change and disaster impacts increase disruptions to vital services, therefore more investment and planning are needed to deliver the same level of services in a changing climate across Education, Health, Nutrition, WASH, and Child Protection services and outcomes.
- Include measures of success in service delivery related to reaching the most vulnerable, alongside traditional measures for increased national coverage more generally.

## 5.3 SECTORAL RECOMMENDATIONS

Mainstreaming climate change adaptation and disaster risk reduction is vital in a context such as Bangladesh. In addition to mainstreaming however, there may be sector-specific challenges from climate change and disasters, some of which are outlined below.

### 5.3.1 Education and Climate Change

A well educated population is vital to manage the challenges Bangladesh faces from climate change. Ensuring that all children receive a quality education is more urgent than ever, and more difficult than ever. Research in this report found high levels of disruption to education not just caused by specific disaster events, but by chronic conditions and the cumulative impacts of repeated small-scale disasters. Whilst culturally communities seem to value children's education more than ever before, when people are faced with limited options because of eroding viability of livelihoods and increased disaster impacts, it is often children and their education that suffer the most.

The education sector faces the challenges of how to deliver quality education in a context of increasingly unstable conditions with many disruptions; how to enable children to access education when rural livelihoods are so under threat and with high levels of migration to urban areas ill-equipped to meet their educational needs; and how to educate the children about climate change in a way that equips them to make appropriate choices about their lives and livelihoods in anticipation and in response to the changes they will be exposed to throughout their lives. Adapting to climate change requires knowledge, requires being able to analyse information, and to be able to make forward-looking decisions.

#### Climate change initiatives that UNICEF Bangladesh Education Sector could consider



- Incorporate DRR, climate change, and environmental education into the curriculum.
- Youth-led community environment and climate change risk mapping.
- Work collaboratively with development and humanitarian actors (such as under the leadership of the Education Cluster) to introduce policies and practice to ensure continuity of education services for children during seasonal and other disruptions and chronic crisis.
- Advocate for policies and measures to ensure resilience of resources and infrastructure to climate and non-climate disasters, such as floods, cyclones, and earthquakes to ensure minimum disruption to education services.
- Measures to retrofit schools unsafe for predictable flood, cyclone, and earthquake risks in both urban and rural locations.
- Pilot projects to target prevention of post-disaster/ disruption school dropout.
- Research annual school days lost by disasters and through use of schools for other purposes (shelters) and advocate for solutions.

### 5.3.2 Nutrition and Climate Change

One of the areas where climate change will be most severely felt is in agricultural livelihoods, with direct implications for food and nutrition security. Climate change threatens to reverse improvements made in childhood nutrition in Bangladesh, whilst at the same time good nutrition and health is a vital component of a resilient population. Whilst UNICEF Bangladesh does not work directly on agriculture and livelihoods, this will increasingly become an important policy space with regard to climate change adaptation strategies and investments, and UNICEF could usefully contribute to ensure that the rights and perspectives of children are brought into that space. Mapping how climate change is and will change local food and nutrition insecurity is also an important element the Government of Bangladesh will need to get to grips with, and is another area where UNICEF has a comparative advantage and child-focus perspective that is important to anticipate and respond to changing patterns of food and nutrition security in Bangladesh.

#### Climate change initiatives that UNICEF Bangladesh Nutrition Sector could consider



- Advocate for adaptation policies in the agriculture sector to include nutritional analysis and to meet the nutritional needs of children.
- Develop 'crisis modifier' nutrition programming for use in chronic crisis or pre-crisis (deteriorating) situations, which use seasonal forecasts and project monitoring to trigger implementation in order to prevent the need for a later humanitarian response.
- Work with government and other stakeholders to map climate change and food insecurity trends and hotspots, and develop an early warning system for early action in the near-term, and information to inform policy makers about longer term anticipated trends.

### 5.3.3 Health and Climate Change

Health is vital to a resilient population but is undermined by climate change in a wide variety of ways, including nutrition and WASH issues, but also in Bangladesh new challenges of increased extreme heat, increase in diseases such as dengue; and increased prevalence of disasters and its resultant impacts on health and wellbeing.

## Climate change initiatives that UNICEF Bangladesh Health Sector could consider



- Advocate for forward looking planning by health services to anticipate and respond to changing healthcare needs as a result of climate change, such as impacts of heatwaves, diseases spreading to new areas, and increased disaster causalities.
- Advocate for increased resources from Government to meet these increased health challenges as a result of climate change.
- Work collaboratively with development and humanitarian actors to introduce policies and practices to ensure continuity of health services for children and pregnant mothers during seasonal and other disruptions and chronic crisis.
- Advocate for policies and measures to ensure resilience of resources and infrastructure to climate and non-climate disasters, such as floods, cyclones, and earthquakes to ensure minimum disruption to health services.
- Work with Government and other stakeholders to map climate change and health trends and changes, and develop a monitoring system to feed into Government planning cycles and enable anticipatory actions to longer term trends.

### 5.3.4 WASH and Climate Change

Many of the challenges relating to climate change in Bangladesh are linked to hydro-metrological hazards, as a result of too much and too little water. A recurrent finding of these research was that. However another clear finding of the research was that water issues - and therefore their solutions - are very location-specific and even in similar places such as in Khulna and Bhola districts the situation is different. Bangladesh has a complex landscape of coastal, riverine, swamp, and arid areas, and a range of climatic changes that will influence water availability and hazards including increased temperatures and extreme heat, less days of rain but more heavy rainfall events, and sea level rise. The challenge for the WASH sector is how these multiple impacts interact together in multiple contexts. On top of that is the interaction of policies and practices to manage water across different ministries responsible for different areas (drinking water, agriculture, industry for example) as well as with upstream in other countries.

The MAR initiative represents UNICEF Bangladesh's flagship work so far in relation to programming that has the potential to be disaster and climate change resilient, though it is vital that evidence is gathered to prove its theoretical effectiveness during and post disaster. Certainly in the current conditions it is working well and offers a specific response to the "too much and too little" challenge by 'banking' in times of too much, for withdrawal in times of too little. Simple and effective technology-based climate change adaptation solutions such as this, especially with so few negative trade-offs, are exceedingly rare, and this initiative deserves both high praise and high profile to ensure it is rolled out to all the identified viable locations. Future roll out, especially if financed through climate funds, should seek to find solar or other renewal energy sources to replace the diesel powered motors to make it truly climate smart and sustainable.



## Climate change initiatives that UNICEF Bangladesh WASH Sector could consider



- Advocate for forward-looking planning by water authorities to anticipate and respond to the changing climate and its consequences, including increased temperatures, reduced rainfall, increased migration to urban areas, and increased saline-based livelihoods.
- Advocate for policies and measures to ensure resilience of resources and infrastructure to climate and non-climate disasters, such as floods, cyclones, and earthquakes to ensure minimum disruption to safe water availability.
- Take MAR to scale in all suitable locations, include project to undertake real-time evaluation of MAR performance under disaster conditions.
- Pilot solar or other renewal energy sources to power MAR pumps to reduce cost – both financial and in terms of climate change and environmental impacts – of diesel.
- Research options for latrine design that would be more resilient to flood and tidal surge.
- Research impact of saline agriculture and aquaculture on local water supplies, and work with natural resource management stakeholders to seek equitable solutions for all.
- Advocate for closer collaboration between Ministries and departments responsible for water management among different user groups (drinking water, agriculture, industry). Climate change requires mapping and management of all water use to come together to ensure sustainability of policies, practices, and resources, and prevent escalating costs for those who can afford it least.
- Ensure that all project infrastructure is built above anticipatory future flood levels and that water sources are protected from contamination to those levels.

### 5.3.5 Child Protection and Climate Change

Climate change is increasing children's vulnerability in Bangladesh by eroding people's livelihoods and ability to provide for their family's needs, and by increasing the physical, emotional, and psychological risks of disasters. For families who have lost or are losing everything they have few options, and it is the children who suffer worst in such situations. Some families migrate exposing children to new challenges often in ill-equipped and unsafe urban slums, others send their children out to work, and others marry off their girls. The impacts of climate change through disasters and as well as slower erosion of people's assets and opportunities, has the potential to put back advances in child protection in Bangladesh. It also means that who is vulnerable and where they are located may well change.

## Climate change initiatives that UNICEF Bangladesh Child Protection Sector could consider include



- Pilot projects to target prevention of post-disaster/disruption child labour and child marriage.
- Initiatives to take cash transfers /social protection measures to keep climate change vulnerable children in school post climate disruption or disaster.
- Advocate for child-centred social protection measures to be implemented as a vital component of Bangladesh's climate change adaptation strategy funded through Climate Finance.
- Advocate for child and adolescent safe cyclone shelters.
- Educate and raise awareness of the role of climate change in increasing the vulnerability of children, and ways to identify and reduce vulnerability of at-risk children.
- Advocate for increased psychological and social support for disaster and climate change affected children.
- Increase programming focus on child protection in urban areas and work with others to monitor the increase in migration due to climate change impacts.

# 6

## ANNEXES

## ANNEX 1

# SUMMARY OF BANGLADESH CLIMATE CHANGE POLICY CONTEXT<sup>124</sup>

### **Name of law**      **Sustainable and Renewable Energy Development Authority Act**

**Date**                      10 December 2012

This act, predicated on the aim of increasing energy security, creates an independent authority, the Sustainable and Renewable Energy Development Authority, to promote the development and use of renewable energy. The act specifies 23 responsibilities of the authority, including to:

- Encourage the use of power and energy efficient equipment and take necessary steps for standardisation and labelling of power and energy using equipment and appliances
- Assist the government in making and implementation of energy efficient building code
- Provide technical and financial assistance in research, development, demonstration and training on renewable energy
- Encourage commercialisation of renewable energy and energy efficiency activities in private sector through implementation of pilot project

### **Name of law**      **Disaster Management Act**

**Date**                      19 September 2012

The objectives of the Act are substantial reduction of the overall risks of disasters to an acceptable level with appropriate risk reduction interventions; effective implementation of post disaster emergency response; rehabilitation and recovery measures; provision of emergency humanitarian assistance to the most vulnerable community people; strengthening of institutional capacity for effective co-ordination of disaster management involving government and non-government organisations, and establishing a disaster management system capable of dealing with all hazards for the country.

The Act is intended to help in promoting a comprehensive disaster management programme upholding the all-hazard, all-risk and all-sector approach where risk reduction as a core element of disaster management has equal emphasis with emergency response management with greater focus on equitable and sustainable development.

### **Name of law**      **The Climate Change Trust Fund Act**

**Date**                      2010

This is intended as the government's quick-start domestic response to climate change adaptation activities, which are planned through the BCCSAP. As such this Act is closely linked to the BCCSAP. It stipulates allocating an initial budget of USD100m per year for three years between 2009 and 2011. It stipulates that 66% of its budget will be spent on the implementation of projects/programmes prioritised in the BCCSAP. The remaining 34% will be maintained as a deposit for emergencies. Interest accrued on the deposit will be spent on project implementation. Funds from the BCCTF can be used to finance public sector and non-government projects. It is not mandatory to spend the total grant within a given financial year.

As of 2014, the Trust Fund is still operational, with US\$26m (approximately) allocated in the 2014/15 fiscal year.

<b>Name of law</b>	<b>The Bangladesh Energy Regulatory Commission (BERC) Act</b>
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<b>Date</b>	24 July 2003, most recently amended in 2010
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The Act makes provisions for the establishment of an independent and impartial regulatory commission for the energy sector. The commission is, *inter alia*, to determine the energy efficiency of institutions regulated under the Act, and to monitor and verify institutions' energy use through energy audits. It is also required to ensure the efficient use of energy at a generation, transmission and distribution level.

<b>Name of Policy</b>	<b>Climate Fiscal Framework</b>
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<b>Date</b>	June 2014
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The Climate Fiscal Framework (CFF), published by the Ministry of Finance, provides principles and tools for climate fiscal policy-making (CFP), helping to identify the demand and supply sides of climate fiscal funds (expenditures vis-à-vis revenue or finance, respectively), and to ensure that CFP is transparent and sustainable in the longer term.

The CFF determines:

- The equitable division of climate funds and their allocation to relevant sectors
- The division of services, identification of the demand for climate fund, and expenditure areas of financial authority for raising revenue, for national and international financing options, and for fiscal tools
- A governance framework for climate change funds under national fiscal policy

The CFF also recommends a set of climate codes designed to (i) track climate change expenditures for policy analysis and reporting, and (ii) estimate long-term climate finance needs by identifying potential climate-related public expenditures across government ministries.

<b>Name of policy</b>	<b>Action Plan for Energy Efficiency and Conservation</b>
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<b>Date</b>	September 2013
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Published by the Ministry of Power, Energy and Mineral Resources, the action plan aims to set a cohesive framework for energy efficiency and conservation activities under the guidance of the Sustainable and Renewable Energy Development Agency (SREDA). It notes that the government has set the following targets to ensure sustainable energy supply:

- 10% of primary and secondary energy saving by 2015
- 15% by 2021
- 20% by 2030

The plan provides an overview of Bangladesh's energy sector, its legal and institutional framework, how capacity will be managed in the energy sector, and a summary of ongoing energy efficiency activities. These include an energy star labelling programme, an improved cook stove programme, and installation of solar panels.

The ultimate aim is for a Master Plan on Energy Efficient Management to be developed.



<b>Name of policy</b>	<b>National Sustainable Development Strategy (2010-2021)</b>
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<b>Date</b>	<b>May 2013</b>
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The NSDS identifies five strategic priority areas and three cross-cutting areas that are critical to achieve sustainability in Bangladesh. The five strategic priority areas are:

- Sustained economic growth
- Development of priority sectors (including agriculture and energy)
- Urban environment
- Social security and protection
- Environment, natural resource and disaster management

Climate change is discussed under the environment priority area, with the strategy emphasising the need to scale up investments in disaster risk reduction so that a suitable environment for the economic and social development of the country can be created in the face of climate change. Specific areas include the rehabilitation and climate proofing of coastal polders with especial focus on removing water logging, disaster risk reduction, mainstreaming disaster risk reduction and climate change, coastal char land afforestation, development of climate stress tolerant crop varieties and utilisation of climate change funds.

<b>Name of policy</b>	<b>6<sup>th</sup> Five Year Plan (FY 2011-FY 2015)</b>
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<b>Date</b>	<b>2011</b>
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The current Five Year Plan, produced by the Ministry of Planning, and focusing on ‘accelerating growth and reducing poverty’ contains numerous policy initiatives that relate to climate change, including the following topics:

**Energy:**

- A target to increase energy efficiency by 10%
- Improve railways and waterways as energy efficient multi-modal transport system to reduce carbon emissions
- Optimising domestic production of primary energy resources including renewable energy

**Environmental sustainability:**

- Increase productive forest coverage by 2 percentage points
- 500 metre-wide permanent green belt established and protected along the coast
- Environmental, climate change and disaster risk reduction considerations are integrated into project design, budgetary allocations and implementation process

<b>Name of policy</b>	<b>Bangladesh Climate Change Strategy and Action Plan (BCCSAP)</b>
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<b>Date</b>	<b>2009</b>
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The BCCSAP, published by the Ministry of Environment and Forests, is a “knowledge strategy” built upon the National Adaptation Programme of Action (2005 and 2009). It sets out 44 programmes to be taken by Bangladesh over the short, medium and long term within six strategic areas:

- Food security, social protection and health
- Comprehensive disaster management
- Infrastructure
- Research and knowledge management
- Mitigation and low carbon development
- Capacity building and institutional strengthening

A common theme throughout of all of these strategic areas is the focus on the poor and vulnerable and in particular women and children. All programmes are expected to provide synergies with the government's Vision 2021. Examples of the programmes include:

- Infrastructure: programme T3P8 seeks to restore rivers and khals through dredging and de-siltation works
- Mitigation: programme T5P7 targets re/afforestation

<b>Name of policy</b>	<b>Renewable Energy Policy</b>
<b>Date</b>	<b>18 December 2008</b>

Published by the Power Division of the Ministry of Power, Energy and Mineral Resources, the Renewable Energy Policy (REP) has numerous objectives to promote renewable energy and includes the target of developing renewable energy resources to meet 5% of the total power demand by 2015 and 10% by 2020.

The REP notes that a Sustainable Energy Development Agency (SEDA) will be established under the 1994 Companies Act to act as a focal point for sustainable energy development and promotion. SEDA will 'create market opportunities and start-up business models for sustainable energy technologies, such as energy services companies and rural energy providers' and 'provide financial support in the research and development of renewable energy technology'.

The REP further outlines three core provisions:

- Renewable energy project(s): the sale of electricity from plants requires a power generation licence from The Energy and Mineral Resources Division (BERC) if the capacity is 5 MW or more.
- The government and the Sustainable Energy Development Agency (SEDA), in consultation with BERC, will create a regulatory framework encouraging generation of electricity from renewable energy sources.
- BERC shall approve the energy tariff in consultation with the government and SEDA as per the provision of the BERC Act 2003 if the capacity of renewable energy project(s) is 5MW or more. Electricity distributors may offer "green energy" tariffs, which provide consumers an opportunity to co-finance through their electricity bills the development of new renewable energy sources.

## ANNEX 2: CLIMATE CHANGE AND THE LIFE-CYCLE APPROACH

The considerations for climate change and disasters from sectoral, mainstreaming, and implementation strategies perspectives are outlined in the report. Here is a summary of some key considerations from a life-cycle approach perspective.

### Young children and their mothers

Adequate quantity and quality of nutritious food is vital during pregnancy and breast feeding to ensure healthy children that fulfil their developmental potential. Seasonal shifts and variability, as well as extreme weather events, are undermining the ability of many households and communities to produce enough food or to access enough affordable food at market. Further, climatic changes such as increased temperatures can reduce the nutritional content of some crops, and adaptation investments in the agricultural sector that do not adequately consider nutrition may put vulnerable communities at risk if nutritional requirement is not a criteria considered alongside feasibility and profitability of crops selected for cultivation in a changing climate.

Access to health services is vital during pregnancy, labour, and for new-borns. Health services and transport infrastructure must be resilient to predictable shocks and stressors, and must be designed or retrofitted to be resilient for future climate change and disaster conditions. In such a disaster prone context as Bangladesh, services must also be designed and delivered in such a way that young children and their mothers can access the services they require even during floods as well as in the aftermath of cyclones.

Young children and their mothers need access to clean and safe water to ensure healthy development. Climate change is impacting of the availability and quality of water, such as through increased frequency or severity of droughts; higher temperatures which cause increased evaporation of surface water sources; increased salinity of groundwater and surface water sources from saltwater intrusion and/or lack of rains to rinse away saltwater deposits; and contamination of water sources as a result of seasonal floods and storms.

### Girls and boys of primary school age

Schools must be safe places for girls and boys to learn. Therefore infrastructure and equipment must be resilient to predictable shocks and stressors, and must be designed or retrofitted to be resilient for future climate change and disaster conditions. Further where schools are used as shelters from cyclones and frequent flood events, provision must be made for continuity of education, so that many weeks of education are not lost every year, and so that temporary disruptions in schooling do not lead to girls and boys permanently dropping out of schooling.

Climate change is now unavoidable, and will affect today's girls and boys in many different ways for the rest of their lives. Therefore education is a crucial tool in building individual, community, and national capacity to adapt to climate change long into the future. Incorporating climate change and disaster risk reduction into the school curriculum in

Bangladesh would build the collective adaptive capacity of the nation, and enable children to learn ways in which they and their families can reduce risks from the hazards they face through their own choices and behaviours.

Migration is on the rise in Bangladesh often due to environmental shocks and climatic changes. Children can be taken out of school as whole families migrate or as those left behind are required to contribute to income generating or household activities. Migration is often to urban slums ill-equipped to provide education services to the growing numbers arriving there and where children are often more vulnerable and exposed to new risks.

## Adolescents

Climate change is undermining rural livelihoods and increasing the frequency and severity of disasters. As a result people are under increasing pressures and struggling to provide for their families. Children and adolescents are increasingly likely to be taken out of school as the result of disasters or poor harvests – both of which are becoming more frequent occurrences as a result of climate change. Boys in particular are at risk of child labour, and girls at risk of child marriage and human trafficking, as families seek to reduce the number of mouths to feed or to get some additional income. Social protection schemes are vital for protecting at risk children and adolescents as a consequence of disasters and/or failed harvests.

Education is vital for equipping today's adolescents with the knowledge and skills they need to develop livelihoods and build institutions that are suited to the changing climatic conditions that will unfold across Bangladesh over the coming decades. Incorporating climate change and disaster risk reduction into the curriculum at all levels will build adaptive capacity. As was the case for primary school aged girls and boys, infrastructure resilience and continuity of education in a disaster-prone and climate change context is vital for ensuring educational achievement and building this much needed adaptive capacity.

## ANNEX 3 SUMMARY OF RESEARCH KEY POINTS

### Impacts of climate change in Bangladesh will be felt:

- Through livelihoods
- changing/increasing disaster profile
- Migration and growth in urban slums
- Increasing vulnerability of those already vulnerable – increasing inequality
- Increasing disruption to basic services – costs of delivery increases
- Backsliding of development gains in education, health, nutrition, WASH, and Child Protection

### Challenges for integrating climate change into programming

Climate change does not occur in isolation, and particularly in situations of poverty it is often difficult to separate out what is specifically a result of climate change. This means that mainstreaming climate change and disaster risks throughout projects and policies is crucial in order to secure UNICEF's goals in a changing climate. However to access climate funding more specific climate change oriented programming is needed.

### Field research findings from Khulna and Barisal Divisions

- It is difficult to separate out climate change issues from non-climate change issues at local level. The challenges that children and communities face need addressing holistically through integrated programming.
- Children and adults largely report the same weather-related challenges, but children tend to perceive the cumulative risks of chronic conditions as more concerning compared with risks from specific high impact but less frequent disaster events.
- DRR and preparedness investments mainly focus on cyclones, and whilst cyclones are increasing in frequency and severity, they are increasingly being characterised as contributing factors in longer term chronic conditions rather than as individual disaster events. DRR and humanitarian investments must now build out from cyclone investments to build more holistic resilience.
- Large differences were found in the hazard profile and challenges faced by children and adults in Khulna and Barisal Divisions, in spite of perceived similarities between these contexts (facing coastal / water challenges. This demonstrates the need for specific local level analysis to inform investment and programming decisions.
- Recent changes to the seasonal patterns (from six seasons to four) came out strongly in the research, however the implications of this remain poorly understood as hazards related to coastal and riverine context are prioritised. Non-coastal locations should be studied to understand how these changes are undermining livelihoods and children's wellbeing in other parts of Bangladesh.



## Interviews findings

- Government and many actors (e.g. UNDP, Plan, Save the Children, BCAS) in Bangladesh have been active on climate change issues for many years and UNICEF should seek to partner with others.
- Disruptions and disasters are the norm in Bangladesh, but often overlooked by development planning – there is the opportunity to use mechanisms such as Education Cluster to address issues of continuity of education during disruptions and disasters and ensuring re-enrolment post-disaster.

## UNICEF portfolio considerations

- Disaster prone nature of Bangladesh is not currently reflected in programming; strategically or in practice. Instead ‘normal’ conditions are assumed, with disasters considered as separate and requiring ‘response’ activities rather than risk reduction and seasonal planning across all sectors.
- Climate change will start to reverse some of the progress made in key areas such as safe water access, education, and child marriage. Programming requirements to stop backsliding requires greater focus on at risk/highly vulnerable sub-populations rather than national approaches.
- Urbanisation is an important *symptom* of climate change impacts and is becoming an increasing driver of children’s vulnerability not just to climate change but to risk generally, including earthquake risk in urban slums.

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<sup>1</sup> Between 1.5°C and 2.0°C warming of global average temperatures compared to pre-industrial times, is generally considered to be the threshold at which climate change impacts will become unmanageable and catastrophic, with the Paris agreement committing to limit warming to "well below 2°C" and "to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change." Currently the world has already warmed by at least 1°C, and if not action is taken the world is on a path for warming of 4-5°C. Voluntary pledges of mitigation actions made by governments under the UNFCCC in Paris in December 2015 could limit warming to 3°C, so further commitments and turning commitments into reality, is still urgent business in order to meet the objectives of the Paris agreement to limit warming.

<sup>2</sup> Maplecroft identifies 32 'extreme risk' countries in its Climate Change Vulnerability Index (CCVI), which evaluates the sensitivity of populations, the physical exposure of countries, and governmental capacity to adapt to climate change over the next 30 years. Bangladesh was ranked as 1st and most at risk in 2015. <https://maplecroft.com/portfolio/new-analysis/2014/10/29/climate-change-and-lack-food-security-multiply-risks-conflict-and-civil-unrest-32-countries-maplecroft/> Whilst there is no universally agreed way of measuring climate change vulnerability for comparison between countries, across various approaches Bangladesh is consistently in the top 10, and often number one. From Maplecroft's 2011 Climate Change Vulnerability Index (where Bangladesh was also ranked 1<sup>st</sup>) "*rates Bangladesh as the country most at risk due to extreme levels of poverty and a high dependency on agriculture, whilst its government has the lowest capacity of all countries to adapt to predicted changes in the climate.*" See: <https://maplecroft.com/about/news/ccvi.html>

<sup>3</sup> UNICEF figures for 2007-2011, available [http://www.unicef.org/infobycountry/bangladesh\\_bangladesh\\_statistics.html](http://www.unicef.org/infobycountry/bangladesh_bangladesh_statistics.html)

<sup>4</sup> Bangladesh has per capital emissions of 1.02 tCO<sub>2</sub>e (excluding land-use change and forestry). Figures available from: <http://cait.wri.org/profile/Bangladesh> and <http://cait.wri.org/profile/United%20States>

<sup>5</sup> Pettengell (2010) *Climate Change Adaptation: Enabling People Living in Poverty to Adapt*, Oxfam Research Report.

<sup>6</sup> See <https://www.unisdr.org/we/inform/terminology>

<sup>7</sup> IPCC (2007) *Climate Change 2007: Impacts, Adaptation, and Vulnerability*.

<sup>8</sup> UNISDR (2009)

<sup>9</sup> UNISDR (2009) defines a hazard as "a dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage."

<sup>10</sup> Cited in UNICEF (2015) *Strategic Framework on Environmental Sustainability for Children 2016-2017*.

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- 12 UNICEF (2015) *Unless We Act Now*, pp6.
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- 27 IPCC (2013 see sections TS.5.8.1 Monsoon Systems and 14.8.11 South Asia.
- 28 Pender (2008), Alam (2004).
- 29 Pender (2008), Alam (2004).
- 30 "Only 7% of the catchment of the major rivers lies within Bangladesh, so the country is vulnerable to interventions further upstream. Barrages in India control all of the tributaries to the Ganges and divert approximately 60% of river flow to large scale irrigation. There are also 30 upstream water diversions controlling flow before it reaches Bangladesh. More projects are planned to divert water from the Ganges and Brahmaputra Rivers to India's drier southern states. Therefore climate change impacts must also be considered alongside human activities that will influence river flow, flood management, and overall water availability" (Pender,2008).
- 31 Source: [http://www.unicef.org/bangladesh/4926\\_4991.htm](http://www.unicef.org/bangladesh/4926_4991.htm)
- 32 Disaster Report 2013, Government of the People's Republic of Bangladesh.
- 33 Source: <http://www.worldbank.org/en/news/feature/2013/12/20/shelter-from-storms-in-bangladesh>
- 34 [http://www.unicef.org/bangladesh/4926\\_4993.htm](http://www.unicef.org/bangladesh/4926_4993.htm)
- 35 IPCC (2013) box TFE.9
- 36 Source: [http://www.unicef.org/bangladesh/4926\\_4990.htm](http://www.unicef.org/bangladesh/4926_4990.htm)
- 37 Source: [http://www.unicef.org/bangladesh/4926\\_6202.htm](http://www.unicef.org/bangladesh/4926_6202.htm)
- 38 Disaster Report 2013, page 13.
- 39 Disaster report 2013, page 11.
- 40 See <http://www.spacedaily.com/news/climate-05zzx.html>, and for more information COAST (2007) and Aktar (2013).
- 41 Brammer (2014)
- 42 Martin *et al.* (2013).
- 43 Aktar (2013)
- 44 Disaster Report 2013, Government of the People's Republic of Bangladesh.
- 45 This is the increase in the Global Mean Sea Level (GMSL), figures taken from: <http://ocean.nationalgeographic.com/ocean/critical-issues-sea-level-rise/>
- 46 Thermal expansion: When water heats up, it expands. About half of the past century's rise in sea level is attributable to warmer oceans simply occupying more space.  
Melting of glaciers and polar ice caps: Large ice formations, like glaciers and the polar ice caps, naturally melt back a bit each summer. But in the winter, snows, made primarily from evaporated seawater, are generally sufficient to balance out the melting. Recently, though, persistently higher temperatures caused by global warming have led to greater-than-average summer melting as well as diminished snowfall due to later winters and earlier springs. This imbalance results in a significant net gain in runoff versus evaporation for the ocean, causing sea levels to rise.  
Ice loss from Greenland and West Antarctica: As with glaciers and the ice caps, increased heat is causing the massive ice sheets that cover Greenland and Antarctica to melt at an accelerated pace. Scientists also believe meltwater from above and seawater from below is seeping beneath Greenland's and West Antarctica's ice sheets, effectively lubricating ice streams and causing them to move more quickly into the sea. Moreover, higher sea temperatures are causing the massive ice shelves that extend out from Antarctica to melt from below, weaken, and break off.  
Information from: <http://ocean.nationalgeographic.com/ocean/critical-issues-sea-level-rise/>
- 47 <http://ocean.nationalgeographic.com/ocean/critical-issues-sea-level-rise/>
- 48 FAO (2007), page 13.

- <sup>49</sup> FAO (2007), page 14.
- <sup>50</sup> Disaster Report 2013.
- <sup>51</sup> FAO (2007), page 14.
- <sup>52</sup> Using IPCC SRES emission scenarios A2 (high) and B1 (low) in Tanner *et al.* (2007)
- <sup>53</sup> IPCC (2007) Chapter 8
- <sup>54</sup> For example in interviews cited in Roach, R. (2005) and in field research undertaken for this study.
- <sup>55</sup> Disaster Report 2013
- <sup>56</sup> Disaster Report 2013
- <sup>57</sup> Disaster Report 2013
- <sup>58</sup> Disaster Report 2013
- <sup>59</sup> Disaster Report 2013
- <sup>60</sup> UNESCO (2010)
- <sup>61</sup> Baez *et al.* (2010)
- <sup>62</sup> Baez *et al.* (2010)
- <sup>63</sup> UNICEF (2011)
- <sup>64</sup> UNICEF UK (2013a)
- <sup>65</sup> IPCC (2014) page 1347
- <sup>66</sup> IPCC (2014) page 1347
- <sup>67</sup> UNICEF (2011)
- <sup>68</sup> Singh *et al.* (2001)
- <sup>69</sup> UNICEF UK (2013a)
- <sup>70</sup> UNICEF (2011) cites examples from September 2008 in northern Thailand where more than 200,000 people were diagnosed with waterborne diseases after 19 days of heavy flooding; and In Manila where a large outbreak of leptospirosis was reported after tropical storms and severe flooding in October 2009.
- <sup>71</sup> UNICEF (2011) and Tearfund (2005)
- <sup>72</sup> A finding from field research for this study as well as Tearfund (2005)
- <sup>73</sup> Tearfund (2005)
- <sup>74</sup> Pender (2008), page 50
- <sup>75</sup> UNICEF (2011)
- <sup>76</sup> UNICEF UK (2007), page 13
- <sup>77</sup> UNICEF UK (2013b)
- <sup>78</sup> Myers *et al.* (2014)
- <sup>79</sup> UNICEF (2011).
- <sup>80</sup> IPCC (2014) page 1349
- <sup>81</sup> UNICEF UK (2013b)
- <sup>82</sup> IPCC (2007), 8.4.2.2, cited in UNICEF UK 2013(a)
- <sup>83</sup> For more information see UNICEF UK's recent briefing on food and climate change <http://bit.ly/1dvQllc>
- <sup>84</sup> Black *et al.* (2008).
- <sup>85</sup> Mahrshahi *et al.* (2007)
- <sup>86</sup> UNICEF UK (2013a), page 15
- <sup>87</sup> UNICEF UK (2013a)
- <sup>88</sup> UNICEF (2015)
- <sup>89</sup> Quote from: <https://blogs.unicef.org.uk/2015/11/26/five-things-the-world-needs-to-know-about-children-and-climate-change/>
- <sup>90</sup> Kniveton *et al.* (2013)
- <sup>91</sup> IOM cited in Kniveton *et al.* (2013)
- <sup>92</sup> Kniveton *et al.* (2013)
- <sup>93</sup> Martin *et al.* (2013)
- <sup>94</sup> Kniveton *et al.* (2013)
- <sup>95</sup> Hutton and Haque (2003) cited in Kniveton *et al.* (2013)
- <sup>96</sup> Foresight (2011) cited in Kniveton *et al.* (2013)
- <sup>97</sup> COMPAS (2014)



- <sup>98</sup> COMPAS (2014)
- <sup>99</sup> Gray and Mueller (2012) cited in Kniveton *et al.* (2013)
- <sup>100</sup> Figure cited by Displacement Solutions at: <http://displacementsolutions.org/ds-initiatives/climate-change-and-displacement-initiative/bangladesh-climate-displacement/>
- <sup>101</sup> Estimates include 400,000 per year from the World Bank back in 2007 (World Bank, Dhaka: Improving Living Conditions for the Urban Poor, Bangladesh. Development Series, Paper No. 17); 500,000 per year cited in <http://www.citiesalliance.org/node/420>; and 2,000 per day (therefore 730,000 per year) cited in: <http://www.theguardian.com/cities/2015/dec/01/dhaka-city-climate-refugees-reality>
- <sup>102</sup> See <https://www.iom.int/newsdesk/20151202> and citations in the two articles above.
- <sup>103</sup> Urbano *et al.* (2011) cited in UNICEF (2011)
- <sup>104</sup> UNICEF (2011)
- <sup>105</sup> Sarder Shafiqul Alam, a senior researcher at the International Centre for Climate Change and Development and Bangladesh's representative at the Rockefeller Foundation's Asian Climate Change Resilience Network, cited in <http://www.theguardian.com/cities/2015/dec/01/dhaka-city-climate-refugees-reality>
- <sup>106</sup> <http://ruralbdblog.blogspot.co.uk/2012/12/divisions-of-bangladesh-with-comprising.html> and <http://mapofbangladesh.blogspot.co.uk/2011/09/khulna-district.html>
- <sup>107</sup> Bangladesh Bureau of Statistics (2013)
- <sup>108</sup> Bangladesh Bureau of Statistics (2013)
- <sup>109</sup> The International Initiative on Maladaptation to Climate Change (iMACC) defined Maladaptation as "an adaptation process that results in increased vulnerability to climate change and/or undermines capacity for future adaptation." See: <https://environmentalmigration.iom.int/blogs/avoiding-maladaptation-better-manage-climate-induced-migration-asia-pacific>
- Maladaptation has been defined by the IPCC as "Any changes in natural or human systems that inadvertently increase vulnerability to climatic stimuli" or as "an adaptation that does not succeed in reducing vulnerability but increases it instead". UNFCCC (2007)
- <sup>110</sup> "Although growth in shrimp farming in the Ganges–Brahmaputra–Meghna delta of Bangladesh might be viewed as a useful adaptation to increasing salinity intrusion in the region, there are no systematic studies to establish the associations between shrimp farming, salinity intrusion and poverty, particularly for the vulnerable and marginalised population of the delta. The high demand and perceived monetary benefits of shrimp has inspired many farmers to convert farmlands intruded by saline water into shrimp farms, whilst others have actively encouraged saline water from marine sources into their farmlands to produce shrimp. Cyclones and storm surges, particularly Cyclone Sidr in 2007 and Aila in 2009 have contributed to rapid salinization of the delta, including agricultural lands, freshwater ponds, canals and rivers. This has been compounded by deforestation, particularly for large-scale shrimp farming, which has led to loss of protection from cyclones and storm surges. In addition, dam construction upstream reduces freshwater flow and increases sea water intrusion."
- "The geospatial multivariate analysis revealed that after accounting for the significant controls, the levels and intensities of salinity intrusion in a union are significantly associated with an increased probability of a union being in the poorest quintile. However, saline and freshwater shrimp farming are not directly associated with poverty. These findings indicate that despite the asserted monetary benefits of shrimp, its impact on poverty amongst the local populations is trivial. This suggests that shrimp farming in its present structure may not be an effective adaptation to increasing salinity intrusion and poverty, at least not in its current form and not in deltas where shrimp farming might have been thought of as a compensatory livelihood for the loss of agriculture to salinization." Johnson *et al.* (2016)
- <sup>111</sup> Adaptation activities in one sector can affect other sectors or have unintended consequences... Trade-offs (negative or positive effects resulting from activities in the fisheries and aquaculture sector or other sectors) occur where there may be tight competition for resources. Common in climate change is competition between sectors for water resources, for example, between agriculture, domestic use and other sectors such as aquaculture. Certain groups may be more powerful in some contexts and able to divert water away from systems. This could cause further degradation in addition to climate change impacts.
- Maladaptations (where adaptation increases vulnerability within a sector or system rather than decreasing vulnerability) result from adaptation activities that are not planned or implemented properly. Effects to communities outside of the immediate community need to be considered as well as local impacts. For example, a community that decides to build a sea wall to prevent further erosion will alter the coastal dynamic of the area, affecting their coastline and also potentially causing more intense erosion or affected ecosystem functions farther down the coastline. Maladaptations may also be trade-offs. An activity that provides a benefit for one group (e.g. a dam for agriculture) may negatively affect another sector (e.g. aquatic systems and fisheries). Strong institutions, collaborative decision-making and holistic planning can prevent maladaptations or at least provide all sectors a voice when making decisions that may involve trade-offs. FAO (2014)
- <sup>112</sup> Rising temperatures will affect the metabolism, growth and seasonal reproduction of aquatic organisms and make them more vulnerable to diseases and toxins. Dissolved oxygen in water will drop rapidly at night, impeding the growth and killing fishes and shrimps. Floods and storms can destroy fish ponds, fish cages, and reduce estuarine water salinity, severely affecting aquacultural production. Increased temperatures and environmental stresses will encourage increased incidence and spread of pests and diseases in aquaculture farms and foster the growth and development of harmful micro-organisms at the expense of the fish stock.
- <sup>113</sup> Some of the hydro-meteorological events were very difficult to pin down exact definitions and descriptions of for the following factors: (1) so as not to disrupt effective facilitation of non-scientific discussions with community members, adolescents, and children; (2) difficulties of translating from Bengali to English by non-technical staff; and (3) different levels of existing knowledge about such phenomena by participants, facilitations, and translators. It is assumed that tidal surge mostly refers to wind-driven tidal events above normal astronomical tide and influenced by monsoon depressions, such as the one in June 2011 causing inundation by a wind driven surge of height ¾ feet above normal astronomical tide along with rainfall.

The situation for Khulna district was described as: *“Due to heavy rains and tidal surge since 16 June 2011, several areas of Dacope and Koira upazilas have been inundated. 300 Kaccha houses have been destroyed in Dhanisanta union of Dacope upazila. About 4000 dwelling houses including 2000 houses belonging to these families living in the embankments have been damaged in Koyra upazila. The upazila administration with the help of local people’s representatives and general public are engaged in repairing the breached embankments. No shelter center has been opened.”*[http://www.lcgbangladesh.org/derweb/doc/SitRep/Situation%20report%20%20on%20tidal%20surge%20received%20from%20NDRCC%20\(unofficial%20translation\).pdf](http://www.lcgbangladesh.org/derweb/doc/SitRep/Situation%20report%20%20on%20tidal%20surge%20received%20from%20NDRCC%20(unofficial%20translation).pdf)

<sup>114</sup> This point was also verified by a local project staff member in a key informant interview.

<sup>115</sup> This point was also verified by a local project staff member in a key informant interview, who stated that children from poorer families had to work in the shrimp ponds rather than go to school.

<sup>116</sup> <http://mapofbangladesh.blogspot.co.uk/2011/09/bhola-district.html>

<sup>117</sup> Insert reference: Report that analysed satellite images and archive maps dating back to the 1950s undertaken by the Dhaka-based NGO The Coast Trust. Check reference whether 2005 or 2007 first published.

<sup>118</sup> Photo from: <http://practicalaction.org/blog/wp-content/uploads/2012/12/Jamalpur-Nov-12-B.jpg>

<sup>119</sup> It is worth noting that the field research faced challenges in clearly defining differences between tidal surge, high tides, and other types of flooding. How community members reported this to us – through translation into English by UNICEF staff - is how it is presented here. Attempts were made to get greater clarity over the use of differing terms, however it is inevitable that a degree of overlap has occurred and terms have not necessarily been used consistently by different FGD or translated consistently by different staff.

<sup>120</sup> [http://www.care.org/sites/default/files/documents/CC-2011-ALP\\_PSP\\_Brief.pdf](http://www.care.org/sites/default/files/documents/CC-2011-ALP_PSP_Brief.pdf)

<sup>121</sup> <http://www.climatecentre.org/resources-games/games-overview>

<sup>122</sup> For example forecast-based financing, and forecast-based pre-positioning, such as <http://www.climatecentre.org/news/657/a-humanitarian-history-a-made-as-uganda-red-cross-launches-forecast-based-financing-for-real> and

<sup>123</sup> Available to download at: <http://www.climatecentre.org/downloads/files/Minimum%20Standards/Minimum%20Standards%20for%20climate-smart%20DRR%20%202.0%20NOV%202013.pdf>

<sup>124</sup> Recreated from Grantham Institute’s *Climate Change Legislation in Bangladesh* (2015) Available to download: [www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2015/05/BANGLADESH.pdf](http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2015/05/BANGLADESH.pdf)

<sup>125</sup> Available at: <http://ftp.iza.org/dp5164.pdf>

<sup>126</sup> Available to download at: <http://www.sciencedirect.com/science/article/pii/S221209631300003X>

<sup>127</sup> Available to download at: [www.unisdr.org/files/4032\\_DisasterBD.pdf](http://www.unisdr.org/files/4032_DisasterBD.pdf)

<sup>128</sup> Available to download at: <http://www.compas.ox.ac.uk/2014/climate-change-and-migration-how-are-they-linked/>

<sup>129</sup> Available to download at: <http://www.souken.kochi-tech.ac.jp/seido/wp/SDS-2014-11.pdf>

<sup>130</sup> Available to download at: <http://bit.ly/16v0H5c>

<sup>131</sup> Available to download at: <https://www.unicef.org.uk/Documents/Publication-pdfs/unicef-climate-change-report-2013.pdf>

<sup>132</sup> Available to download at: <http://bit.ly/1dvQllc>

<sup>133</sup> Available to download at: <http://www.unisdr.org/we/inform/terminology>





United Nations Children's Fund  
BSL Office Complex  
1, Minto Road, Dhaka-1000  
Bangladesh

Telephone: 0088 02 55668088  
Email: [dhaka@unicef.org](mailto:dhaka@unicef.org)  
Website: [www.unicef.org.bd](http://www.unicef.org.bd)

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