

Cyclone Sidr in Bangladesh

Damage, Loss, and Needs Assessment for Disaster Recovery and Reconstruction

Draft Executive Summary

A Report Prepared by the Government of Bangladesh Assisted by the International Development Community with Financial Support from the European Commission

March 2008

Foreword

On 15 November 2007, Cyclone Sidr, a category 4 storm¹ struck the coast of Bangladesh and moved inland, destroying infrastructure, causing numerous deaths, disrupting economic activities, and affecting social conditions, especially in the poorer areas of the country. This report describes the assessment of damage to physical assets, the subsequent losses sustained across all economic activities, and the impact of the disaster on both the national economy and household-level activities and well-being.

On 12 December 2007, members of a Local Consultative Group agreed to conduct a Joint Damage, Loss, and Needs Assessment (JDNLA) on the impact of Cyclone Sidr. The aim of the assessment is to identify priority areas to support the Government of Bangladesh in cyclone recovery efforts as well as to design a disaster management strategy.

A comprehensive methodology was used to estimate damage to assets, changes in economic flows, and impacts on social and economic conditions. The estimates were based on quantitative information collected by the Government of Bangladesh and the Development Partners during field surveys in the aftermath of the disaster. This information was supplemented by completed and ongoing assessments of United Nations (UN) agencies and community-based analysis conducted by the national and international Non-Governmental Organizations (NGOs) that participated in the joint effort.

The recent disaster is one of several extreme natural phenomena—especially hydro-meteorological—that occur frequently in Bangladesh, with devastating effects on the social and economic development efforts. The analysis undertaken reveals that considerable progress has been made in recent years to reduce the impacts of disasters, but more must be done to further reduce vulnerability and risk, especially in light of ongoing climate change.

The analysis of the damage and loss assessment has identified the needs and quantified financial requirements that will facilitate formulating comprehensive early recovery actions, medium-term recovery and reconstruction plans, and a long-term risk management and reduction strategy. These should be adopted and implemented to reduce the impact of future disasters which are likely to be more intense due to climate change. International support will be essential as domestic resources and capacities are limited.

The report has been jointly prepared by the Government of Bangladesh through its Ministries of Planning, Food and Disaster Management, and other line Ministries/Agencies. The Economic Relations Division of the Ministry of Finance helped in coordinating the discussions with various Ministries and Agencies. Strong support was provided by the World Bank, the United Nations Agencies, and other Development Partners. European Commission contributed financially to this assessment. The resulting report, initiated by the Government of Bangladesh and Development Partners could well serve as an example for the ongoing global discussion in developing generic protocols for donor response to disasters at the request of the Government.

The country must enter into the post-disaster phase of socio-economic recovery and reconstruction and face the longer-term issue of disaster reduction through risk management. This report is intended to provide the inputs to define the international support that the Government of Bangladesh will require in future years to achieve this objective.

¹ On the Saffir-Simpson Hurricane Scale, ranging from category 1 to 5

Minister of Planning

Minister of Food and Disaster Management

World Bank Director

Representing the Joint Partners

Acknowledgements

This report was prepared by a joint team comprising the Government of Bangladesh and members of the International Community, including The World Bank, European Commission (EC), International Labour Organization (ILO), International Federation of Red Cross and Red Crescent Societies (IFRC), Asian Development Bank (ADB), United Nations Development Program (UNDP), Japan Bank for International Cooperation (JBIC), Japan International Cooperation Agency (JICA), Islamic Development Bank (IDB), Food and Agriculture Organization (FAO), World Food Program (WFP), World Health Organization (WHO), UK Department for International Development (DFID), United States Agency for International Development (USAID), and United Nations Children's Fund (UNICEF).

In the weeks following Cyclone Sidr, initial damage assessments were conducted by the Government of Bangladesh, UN agencies, and NGOs as a basis for the immediate response and short-term recovery. The JDNLA authors of this report worked closely with the involved actors. This report builds on their figures and documents of Cyclone Sidr's impacts. The JDNLA greatly benefited from the initial evaluations and the team would like to express their thanks and appreciation.

The international community team for the JDNLA was led by Masood Ahmad (World Bank) and included the following sector coordinators: Roberto Jovel (GFDRR) for methodology, Ambar Narayan for macroeconomic analysis, Mohinder S. Mudahar for agriculture and livelihood, Shakil Ahmed Ferdausi for environment and forest, Christoph Pusch and Ayaz Parvez for disaster risk management, Mohi Uz Zaman Quazi and Charles Scawthorn for infrastructure, Dinesh Nair for the social sector, and Zafrul Islam for fiduciary and safeguards aspects. The core team also included S.A.M. Rafiquzzaman as the Dhaka anchor, Doekle Wielinga, Winston Yu, Henrike Brecht, Zahed H. Khan, Zahid Hussain, Arif Ahamed, Balakrishna Menon Parameswaran, Saroj Kumar Jha, Reefat Sultana, Shakila P. Khan Tandra, Toufiq Ahmed, Burhanuddin Ahmed, Fabio Pittaluga, Sanjana Zaman, Glen Pearce-Oroz, A.K.M. Abdullh, Sabah Moyeen, Helen J. Craig, Iffat Mahmud, Ceren Ozer, M. Iqbal, Pema Lhazom, Qaiser Khan, Raihan Elahi, Andy Kotikula, Sandeep Mahajan (World Bank), Hector Maletta, Antonio Cruciani, Mukul Bhola (ILO), Stefan Ekelund, Zahir Uddin Ahmad, Arun Kumar Saha, Brajesh Panth, Faruque Ahmed, Firoz Ahmed, Jamal Mahmood, Rafiqul Islam, Zahid Hossain, M. M. Zillur Rahman (ADB), Arham Siddique, Andrea Gerhardinger, Elodie Pagot (EC), Sayef Uddin (IDB), and Cynthia Burton (IFRC).

The team from the Government of Bangladesh was led by M. Ayub Miah (Ministry of Food and Disaster Management) and Jafar Ahmed Chowdhury (Ministry of Planning) and coordinated by Aminul Islam Bhuiyan, Shaheedul Haque (Economic Relations Division). Staff from line ministries provided valuable input and direction for the report, for which the core team is grateful: Mohsena Ferdausi (Ministry of Food and Disaster Management), Mohammad Abu Sadeque, Probir Kr. Das (Disaster Management Bureau), Mokammel Hossain, Matiur Rahman, Khawza Nazimuddin, Abul Khair (Ministry of Fisheries and Livestock), A.R.M. Nazmus Saqib (Ministry of Finance), Fazlul Karim (Ministry of Agriculture), M. Khurshid Alam (Bangladesh Bank), Siddiqur Rahman (Ministry of Commerce), Mohammad Qamar Munir, Dilruba Yasmin (Ministry of Environment and Forests), Zahir Iqbal (Forest Department), Mohammed Solaiman Haider (Department of Environment), Jinnahatul Islam (SPARSO), Abul Kashim Bhuiyan (Ministry of Education), Anowar Hossain (Ministry of Housing and Public Works), Akhteruzzaman, Moazzem Hossain (Ministry of Health and Family Welfare), Mohammad Arifur Rahman Sheikh

(Ministry of Posts and Telecommunications), Qamrul Huda, Ali Akbar, Humayun Kabir (Water Development Board), A.K.M. Ibrahim, Mustafizur Rahman, Amanullah Al Mahmood (Department of Public Health Engineering), M. Fouzul Kabir Khan (Ministry of Power, Energy and Mineral Resources), Iftekhar Ahmed, Wahadir Rahman, Shahidul Hassan, A.F.M. Munibur Rahman (Local Government Engineering Department), Arjumand Habib, Abdul Mannan (Bangladesh Meteorological Department), Abdus Sobhan Sikdar (Bangladesh Rural Development Board), Sunil Chandra Ghosh (Department of Livestock Services), Munshi Mustafizur Rahman (Road and Highways Department), and Shamsul Alam (Department of Agricultural Extension).

A larger international multi-agency group contributed to the report, including: Ian Rector, Mahmudul Islam, Bidyuth K. Mahalder, Aslam Alam, Shahidul Islam, Tasdiq Ahmed (CDMP/UNDP), Mamunul Haque Khan, Rune Dige Bandrup, Puji Pujiano, Scott Cunliffe (UNDP), Alessandro Villa, Koen Duchateau (EC), Ad Spijkers, Marc Bellemans, Alfred Osunanya (FAO), Jonathan C. Dunn (IMF), Sumar Das Gupta, Kunio Noda (JBIC), Sayedul Arefin, Kayo Torii, Kurio Noda (JICA), Paul Sabatine and Sue McIntyre (USAID), Momoe Takeuchi, Kazi Akram, Zahid Rahim (WHO), Nusha Yamina Choudhury (WFP), Simon de Haan (Danida/Ministry of Local Government Rural Development and Cooperatives), Abdul Motaleb (Water and Sanitation Program), Emaduddin Ahmad, Nasreen Mohal (Institute of Water Modelling), Giasuddin Ahmed Choudhury, Ahmadul Hassan (CEGIS), Mozaharul Alam (Bangladesh Centre for Advanced Studies), Yolande Wright, Faisal Islam (DFID), Arif Ainun Nishat, Mohammad Faisal (IUCN), Zahidul Hassan (Data Analysis and Technical Assistance Ltd.), Hasan Mansur (TOAB), Mosharraf Hossain Khan (PKSF), and Ms. Shawkat (CARE).

Photographs used in this publication are taken by the JDNLA Team and Government staff.

Special appreciation goes out to the EC for its financial support to the JDLNA.

Table of Contents

Acknowledgements.....	5
Table of Contents	7
Acronyms	11
Executive Summary.....	14
PART A: DAMAGE AND LOSS ASSESSMENT	20
Section I: The Disaster.....	21
Living with Natural Disasters.....	22
Super Cyclone Sidr	22
The Human Toll	23
The Immediate Response.....	24
Social and Economic Background of the Affected Area.....	27
Section II: Estimation of Damage and Losses	31
Methodology.....	32
Summary of Damage and Losses	33
Housing	37
Infrastructure	41
Transport.....	41
Power	43
Telecommunications.....	45
Water Supply and Sanitation	46
Urban and Municipal Infrastructure	48
Embankments and Water Control Structures.....	49
Social Sectors	52
Education	52
Health and Nutrition	55
Productive Sectors	61
Agriculture (Crops, Livestock, and Fisheries)	61
Industry, Commerce, and Tourism.....	64
Tourism	67
Crosscutting Issues.....	69
Environment	69
Introduction	74
Macroeconomic Impact	74
Impact on Livelihoods and Income	80
PART B: FACING THE FUTURE: RECOVERY AND RECONSTRUCTION REQUIREMENTS	84
Section IV: Early Recovery Requirements	85
Introduction	86
Early Recovery Strategy	86
Component 1: Protection	87
Component 2: Community Infrastructure Repair	90
Component 3: Economic Recovery	91

Summary	91
Section V: Medium- and Long-Term Recovery and Reconstruction Requirements	92
Recovery and Reconstruction Strategy	93
Component 1: Social and Economic Infrastructure Reconstruction	93
Component 2: Livelihood Recovery	93
Summary of Medium- and Long-Term Recovery and Reconstruction Requirements	95
Section VI: Disaster Risk Management Requirements Country Risk Profile	96
Country Risk Profile	97
Country Strategic Approach and Institutional Arrangements for Disaster Management	97
Needs Assessment for Disaster Response Management in the Light of Recent Lessons	98
Proposed Risk Mitigation Strategic Framework and Action Plan - Moving from Risk to Resilience	99
Pillar 1: Risk Identification and Assessment	99
Pillar 2: Strengthening and Enhancing Emergency Preparedness	101
Pillar 3: Institutional Capacity Building	102
Pillar 4: Risk Mitigation Investments for Reducing Exposure to Natural Hazards	103
Pillar 5: Catastrophe Risk Financing and Transfer	105
Climate Change Multi-Donor Trust Fund	106
Summary of Risk Management Requirements	107
ANNEXES	108
Annex 1 - Housing	109
Annex 2 - Transport	115
Annex 3 - Power and Telecommunications	121
Annex 4 - Water Supply and Sanitation	123
Annex 5- Urban and Municipal Infrastructure	129
Annex 6- Education	132
Annex 7- Agriculture (Crops, Livestock, and Fisheries)	139
Annex 8- Livelihoods	154

List of Tables

Table 1: Overall Summary of Damage and Losses.....	15
Table 2: Comparison of Recent International Disasters.....	17
Table 3: Summary of Early Recovery Interventions.....	18
Table 4: Summary of Medium-Term Recovery and Reconstruction Interventions.....	19
Table 5: Investment Program for Long-Term Disaster Risk Management (US\$ million)	20
Table 6: Deaths Associated with Noteworthy Tropical Cyclones in the World.....	24
Table 7: Cyclone Sidr Death Toll, People Missing and Number of Injured People.....	25
Table 8: Distribution of Food by Different Agencies	27
Table 9: Donor Commitment.....	28
Table 10: Demographic Summary for Worst Affected Districts	29
Table 11: Percentage of Households Receiving Domestic Remittances by Division	32
Table 12: Poverty Rates by Division	33
Table 13: Overall Summary of Damage and Losses	37
Table 14: Housing Type Characteristics.....	42
Table 15: Housing Damage in the Twelve Worst Affected Districts.....	43
Table 16: Damage in the Housing Sector	43
Table 17: Damage and Losses in the Power Sector.....	51
Table 18: Damage and Losses in the Water Supply and Sanitation Sector.....	54
Table 19: Damage Assessment for Coastal Polders by Type of Works.....	59
Table 20: Short-Term Needs Assessment for Coastal Polders by Type of Works	60
Table 21: Number of Affected Educational Institutions.....	64
Table 22: Summary of Reconstruction Cost of Educational Institutions.....	65
Table 23: Health Indicators in the Two Cyclone-Affected Divisions	67
Table 24: Damage to Health Facilities.....	68
Table 25: Losses in the Health Sector	70
Table 26: Recorded Disease Burden between 27 December 2007 and 15 January 2008.....	71
Table 27: Estimated Damage and Loss for Agriculture: Crops, Livestock and Fisheries	74
Table 28: Estimated Program Needs to Promote Food Security, Recovery and Reconstruction.....	78
Table 29: Manufacturing Establishments in the Cyclone-Affected Area	80
Table 30: Affected Areas of Major Plant Species	85
Table 31: Damage of Cyclone Sidr in the Environment Sector.....	86
Table 32: Loss in Value Added by Sector.....	91
Table 33: Immediate Needs of Communities.....	102
Table 34: Summary of Early Recovery Interventions.....	109
Table 35: Summary of Medium-Term Recovery and Reconstruction Interventions	114
Table 36: Investment Program for Disaster Risk Reduction (US\$ million)	129

List of Figures

Figure 1: Destroyed Houses at the Coast of Bangladesh	14
Figure 2: Search for Salvageable Materials	23
Figure 3: Number of Fatalities by District.....	24
Figure 4: Land Cover in Bangladesh	28
Figure 5: Poverty Rates by Division	29
Figure 6: Destruction along the Coast	30
Figure 7: Distribution of Disaster Effects.....	33
Figure 8: Damage and Losses Caused by Cyclone Sidr in Most Affected Sectors	34
Figure 9: Most Affected Districts in Damage and Loss Terms	36
Figure 10: Semi-Pucca and Kutcha Housing	37
Figure 11: Fully Destroyed Houses By District.....	39
Figure 12: Destroyed Houses.....	40
Figure 13: Road Damage by District	41
Figure 14: Ferry as an Important Mode of Transportation	41
Figure 15: Ferry Pontoon with Stranded Ferry.....	42
Figure 16: Damaged Power Pole	43
Figure 17: Typical Mobile Telecommunications Tower.....	45
Figure 18: Embankment Damage by District.....	49
Figure 19: Embankments Washed Away By Sidr’s Storm Surge	50
Figure 20: School Girls	52
Figure 21: Number of Affected Schools By District	53
Figure 22: Damaged Crops by District	61
Figure 23: Cattle Shed	63
Figure 24: Bagerhat Beach.....	67
Figure 25: Satellite Image of the Sunderbans	69
Figure 26: Tree Damage due to Cyclone Sidr	70
Figure 27: Share of GDP by Sector, Fiscal Year 2007	74
Figure 28: Tents as Temporary Housing.....	80
Figure 29: Cyclone Shelter.....	99
Figure 30: Disaster Risk Management Framework	100
Figure 31: Embankments at the Coast	105

Acronyms

ARI	Acute Respiratory Infections
ADB	Asian Development Bank
ADRA	Adventist Development and Relief Agency International
BIDMTR	Bangladesh Institute for Disaster Management Training
BBS	Bangladesh Bureau of Statistics
BDT	Bangladesh Taka
BMD	Bangladesh Meteorological Department
BoP	Balance of Payment
BRAC	Building Resources Across Communities (formerly known as Bangladesh Rural Advancement Committee)
BRE	Brahmaputra Right Bank Embankment
BWDB	Bangladesh Water Development Board
CDMP	Comprehensive Disaster Management Programme
CEGIS	Center for Environmental & Geographic Information Services
CERF	Central Emergency Relief Funds
CFW	Cash-for-Work
CEIP	Coastal Embankment Improvement Program
CGI	Corrugated Galvanized Iron
CPP	Cyclone Preparedness Program
CRA	Community Risk Assessment
DAE	Department of Agricultural Extension
DER	Disaster and Emergency Response
DFID	Department for International Development (UK)
DLS	Department of Livestock Services
DMB	Disaster Management Bureau
DMC	Disaster Management Committee
DoE	Department of Environment
DoF	Department of Fisheries
DPP	Development Project Proposal
DRF	Disaster Response Fund
DRR	Disaster Risk Reduction
EC	European Commission
ECLAC	United Nations Economic Commission for Latin America and the Caribbean
EM-DAT	Emergency Events Database
ERR	Economic Rate of Return
EWS	Early Warning Systems
FAO	Food and Agriculture Organization of the United Nations
FAP	Flood Action Program
FD	Forest Department
FFWC	Flood Forecasting Warning Centre
FHH	Female Headed Households
FY	Fiscal Year
GDP	Gross Domestic Product
GFDRR	Global Facility for Disaster Reduction and Recovery
GoB	Government of Bangladesh

GPS	Government Primary School
HIES	Household Income and Expenditure Survey
HFA	Hyogo Framework for Action
HNPSP	Health, Nutrition, and Population Sector Program
IDA	International Development Association (The World Bank Group)
IDB	Inter-American Development Bank
IFRC	International Federation of Red Cross and Red Crescent Societies
IIRS	Indian Institute of Remote Sensing
ILO	International Labour Organization
IMDMCC	Inter-Ministerial Disaster Management Coordination Committee
IMF	International Monetary Fund
IUCN	World Conservation Union
IWM	Institute of Water Modelling
IWTA	Inland Water Transport Authority
JBIC	Japan Bank for International Cooperation
JDNLA	Joint Damage Loss and Needs Assessment
JICA	Japan International Cooperation Agency
JRC	Joint Research Centre of the EU Commission
LCG	Local Consultative Group
LDRRF	Local Disaster Reduction Fund
LGED	Local Government Engineering Department
LGI	Local Government Institutions
MoE	Ministry of Education
MoFDM	Ministry of Food and Disaster Management
MoPME	Ministry of Primary and Mass Education
MoWR	Ministry of Water Resources
NDMC	National Disaster Management Council
NDMAC	National Disaster Management Advisory Committee
NGO	Non-Governmental Organization
PGCB	Power Grid Company of Bangladesh
PKSF	Palli Karma-Sahayak Foundation
PO	Partner Organization
R&HD	Roads and Highways Department
RBIP	River Embankment Improvement Program
REB	Rural Electrification Board
RNGPS	Requisite Non-Governmental Primary School
RRAP	Risk Reduction Action Plan
SCF	Save the Children Fund
SMEs	Small and Medium Enterprises
SPARRSO	Space Research and Remote Sensing Organization
TOAB	Tour Operators Association Bangladesh
UN	United Nations
UNDP	United Nations Development Fund
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
VGD	Vulnerable Group Development

VGf	Vulnerable Group Feeding
WB	World Bank
WCS	Water Control Structures
WFP	World Food Programme
WHO	World Health Organizations
WZPDCL	West Zone Power Distribution Company Limited

Executive Summary

On 15 November 2007, Cyclone Sidr struck the south-west coast of Bangladesh with winds up to 240 kilometers per hour. The category 4 storm² was accompanied by tidal waves up to five meters high and surges up to 10 meters in some areas, breaching coastal and river embankments, flooding low-lying areas and causing extensive physical destruction. High winds and floods also caused damage to housing, roads, bridges, and other infrastructure. Electricity and communication were knocked out, and roads and waterways became impassable. Drinking water was contaminated by debris and many sources were inundated with saline water from tidal surges, and sanitation infrastructure was destroyed.

Figure 1: Destroyed Houses at the Coast of Bangladesh



The cyclone was the second natural disaster to affect Bangladesh in twelve months. Monsoon floods had previously caused extensive agricultural production losses and destruction of physical assets, totaling near US\$ 1.1 billion³. The occurrence of these events in close succession is a reminder of the country's extreme vulnerability to frequent hydro-meteorological hazards, which stand to be further exacerbated because of climate change.

Damage and Losses

Damage and loss from Cyclone Sidr was concentrated on the southwest coast of Bangladesh. Four of Bangladesh's thirty districts were classified as "severely affected" and a further eight were classified as "moderately affected".⁴ Of the 2.3 million households affected to some degree by the effects of Cyclone Sidr, about one million were seriously affected.

The number of deaths caused by Sidr is estimated at 3,406, with 1,001 still missing, and over 55,000 people sustaining physical injuries. Improved disaster prevention measures, including an improved forecasting and warning system, coastal afforestation projects, cyclone shelters, and embankments are credited with lower casualty rates than what would have been expected, given the severity of the storm. Most of the destruction and related social and economic losses resulted from the harsh storm conditions and the subsequent failure of an extensive embankment system.

² On the Saffir-Simpson Hurricane Scale, ranging from category 1 to 5

³ According to World Bank Damage Assessment, 2007

⁴ The four worst affected were: Bagerhat, Barguna, Patuakhalki and Piroipur. The eight moderately affected districts were Khulna, Madaripur, Shariatpur, Barishal, Bhola, Satkhira, Jhalakthi, and Gopalgani.

In the wake of Cyclone Sidr, the Government of Bangladesh, together with international experts, undertook a comprehensive damage and loss, and needs assessments to ascertain the extent of the damage caused by the storm, and to define a comprehensive and feasible recovery plan. The Joint Damage, Loss, and Needs Assessment (JDNLA) estimated the total damage and losses caused by the cyclone to be Bangladesh Taka (BDT) 115.6 billion (US\$ 1.7 billion). Table 1 presents an overall summary of the damage and losses broken down by sectors.

Table 1: Overall Summary of Damage and Losses

Sector	Sub-Sector	Disaster Effects (BDT Million)			Disaster Effects (US\$ Million)		
		Damage	Losses	Total	Damage	Losses	Total
Social Sectors		4,482	1,453	5,934	65.0	21.1	86.0
	Health and Nutrition	169	1,038	1,206	2.4	15.0	17.5
	Education	4,313	415	4,728	62.5	6.0	68.5
Infrastructure		71,064	2,130	73,194	1,029.9	30.9	1,060.8
	Housing	57,915	—	57,915	839.3	—	839.3
	Transport	8,006	1,725	9,731	116.0	25.0	141.0
	Electricity	576	359	935	8.3	5.2	13.6
	Water and Sanitation	157	46	203	2.3	0.7	2.9
	Urban and Municipal	1,696	—	1,696	24.6	—	24.6
	Water Resource Control	4,918	—	4,918	71.3	—	71.3
Productive Sectors		1,734	32,083	33,817	25.1	465.0	490.1
	Agriculture	1,472	28,725	30,197	21.3	416.3	437.6
	Industry	262	2,035	2,297	3.8	29.5	33.3
	Commerce	—	1,258	1,258	—	18.2	18.2
	Tourism	—	65	65	—	0.9	0.9
Cross-Cutting Issues		420	0	420	6.1	0.0	6.1
	Environment	420	—	420	6.1	—	6.1
Total		79,904	35,665	115,569	1,158.0	516.9	1,674.9

Source: Estimates by JDNLA Team.

Damage and losses were concentrated in the housing sector (57.9 BDT billion, or 50 percent of the total), productive sectors (33.8 BDT billion or 30 percent), and on public sector infrastructure (15.7 BDT billion or 14 percent). More than two-thirds of the disaster effects were physical damages and one-third were economic losses, and most damages and losses were incurred in the private sector, rather than in the public sector. This has significant implications in the strategy that must be adopted for recovery and reconstruction.

The Impact

While other disasters in neighboring Asian countries have caused more costly damage and losses (Table 2), the effects of Cyclone Sidr are still estimated to be equivalent to 2.8 percent of Bangladesh's Gross Domestic Product (GDP).

Table 2: Comparison of Recent International Disasters

Country	Disaster Event	Year	Damage and Losses (US\$ Million)	
			Nominal Value	Constant 2007 Prices
Indonesia	Tsunami and earthquake	2004	4,450	4,856
Indonesia	Yogyakarta earthquake	2007	3,134	3,206
India	Gujarat earthquake	2001	2,600	3,026
Pakistan	Earthquake	2005	2,851	3,010
Thailand	Tsunami	2004	2,198	2,399
Bangladesh	Floods	2004	2,300	2,510
Bangladesh	Cyclone Sidr	2007	1,675	1,675
Bangladesh	Floods	2007	1,100	1,100

Source: Asian Disaster Preparedness Center Thailand, ECLAC, EM-DAT, World Bank

Preliminary estimates indicate that overall economic growth in the country will be affected by less than 0.5 percent in the current fiscal year, although significantly higher declines are expected to occur in the economies of the most affected districts (for which no detailed estimates of GDP are available). This decrease in growth is similar to that estimated for the 2007 floods and will detract from the pre-disaster estimated growth rate of 7.0 percent. The import bill is anticipated to increase due to the need for imported foodstuffs, mainly rice, fertilizers, and other agriculture inputs as well as some construction materials. Pressure will mount on the fiscal deficit in view of required outlays to meet emergency and rehabilitation needs after the disaster.

It is estimated that about 2 million people have lost income and employment in the more affected districts. These districts also have some of the highest poverty rates in the country; the disaster were highly concentrated in the Districts of Bagherat, Barguna, Patuakhali, Pirojpur, and Barisal where, according to data from the 2005 Household Survey, poverty levels range between 35 to more than 50 percent of the population. Thus, the brunt of the disaster was borne by some of the poorest population groups of the country and will significantly further degrade their living conditions. In addition, their income in this year is expected to be reduced to about a third of the average.

Recovery and Reconstruction Requirements

1. An integrated, multi-pronged approach for the economic recovery of the affected area, and for the reconstruction of destroyed physical assets, is required to ensure the protection of the most vulnerable members of society and to resume socio-economic development in the affected regions.

Given Bangladesh' vulnerability to natural disasters it is recommended that recovery and reconstruction is approached from a risk reducing "build back better" approach. An important consideration is the utilization of local resources in the forms of human resources and materials to maximize community involvement and minimize negative environmental impact.

Financial requirements to address the most immediate as well as the longer term recovery, reconstruction needs are assessed at BDT 91 Billion (US\$ 1.3 Billion). A total of BDT 24,840 Million (US\$ 360 million) is required for immediate recovery activities during 2008 while BDT 65,757 (US\$ 953 million) is needed in the medium-to-long term recovery and reconstruction phases.

Risk Management Requirements, estimated to be implemented over a period of 15 years are estimated to be BDT 276 Billion (US\$ 4 Billion).

Early Recovery Requirements

An early recovery stage would take care of the most immediate needs arising from the humanitarian assistance phase, and create a solid foundation for the medium- to long-term recovery and reconstruction stages. The early recovery stage includes interventions designed to provide social protection, infrastructure repairs and income recovery

Early Recovery cost estimations identified in the Recovery Action Plan, prepared by the Ministry of Food and Disaster Management⁵, are included in both the Early Recovery section as well as the Medium to Long term section of this report, based on immediate needs, nature of activities and funding and implementation feasibility in the next 4–8 months.

Table 3: Summary of Early Recovery Interventions

Early Recovery	(BDT Million)	(US\$ Million)
Protection		
Food Security	17,526	254.0
Shelter	3,105	45.0
Water and Sanitation	345	5.0
Education	393	5.7
Health and Nutrition	152	2.2
Environmental protection	221	3.2
Governance (improve disaster preparedness)	110	1.6
Community infrastructure Recovery		
Economic and social infrastructure repairs	1,953	28.3
Income Recovery		
Agriculture	690	10.0
Non-Farm	345	5.0
Total	24,840	360

Note: based on findings of MoFDM figures and the assessment team

⁵ "Cyclone SIDR, Early Recovery Action Plan, February 2009", prepared by the Ministry of Food and Disaster Management

Medium and Long Term Recovery and Reconstruction Requirements

Medium and long term recovery and reconstruction concentrates on the recovery of sustainable production in agriculture, industry, and commerce and on restoration of livelihoods, reconstruction of infrastructure (housing, embankments, roads, and shelters) with improved risk resistance. The aim would be to reduce risk exposure and enhance coping abilities.

Table 4: Summary of Medium-Term Recovery and Reconstruction Interventions

Medium/Long Term Recovery and Reconstruction	Medium (1st Priority)		Long (2nd Priority)	
	(BDT million)	(US\$ million)	(BDT million)	(US\$ million)
Infrastructure Reconstruction				
Housing	1,380	20	0	0
Transport Infrastructure	2,760	40	4,485	65
Power	2,926	42.4	0	0
Water and Sanitation	4,761	69	3,450	50
Urban road and drainage canals	1,007	14.6	690	10
Embankments and Water Control Structures	4,554	66	2,760	40
Education	3,588	52	3,450	50
Health Care	573	8.3	0	
Environmental protection	690	10	393	5.7
Sub Total Reconstruction	22,239	322	15,228	221
Livelihood Recovery				
Agriculture sector	9,660	140	6,900	100
Rural non-farm sector	3,450	50	2,415	35
Financial assistance to recover housing and goods	5,865	85	0	0
Sub Total Recovery	18,975	275	9,315	135
Total	41,214	597	24,543	356
Total (BDT Million)	65,757			
Total (US\$ Million)	953			

Note: estimates by the JDLNA Team

Disaster Risk Management Requirements

Effective disaster risk management is an essential requirement for the future, especially in the aftermath of two successive major disasters in the past year and with climate change being a likely factor. A long-term strategy and plan that effectively integrates structural and nonstructural, human-oriented interventions to reduce risk has been broadly outlined in light of lessons learned during Cyclone Sidr and previous work carried out under flood action plan studies over the last two decades.

A long-term disaster risk reduction framework has been defined and consists of the following five strategic pillars:

- (a) Risk identification and assessment,
- (b) Strengthening and enhancing emergency preparedness,
- (c) Institutional and community capacity building,
- (d) Risk mitigation investments, and
- (e) Introducing catastrophe risk financing in the longer term.

A 15-year long-term plan of action would be required to achieve disaster risk reduction and management. Investments required for its implementation are estimated at US\$ 4.0 billion spread over three 5-year stages, as indicated in Table 5.

In the fifth pillar, emphasis is placed on establishing a special disaster response fund, the establishment of a risk transfer mechanism for low-probability catastrophic events, and a climate change multi-donor trust fund.

Table 5: Investment Program for Long-Term Disaster Risk Management (US\$ million)

Program Component	Investment Required, US\$ million			Total
	5-Year Stages			
	2008-2012	2013-2017	2018-2022	
Risk identification and assessment	10	3	3	16
Strengthening emergency preparedness	240	215	245	700
Institutional capacity building	10	2	2	14
Risk mitigation works	860	1,160	830	2,850
Capacity building for implementation	20	10	10	40
Disaster Response Fund	300	—	—	300
Multi-donor Climate Change Fund	80			80
Total	1,520	1,390	1,090	4,000

Note: The cost estimates provided in the table are indicative, and are based on WB Staff estimates, derived through various sources, including GOB estimates, consultations with various Development Partners, and current costs of activities funded under various ongoing programs, such as the CDMP.