

# MYANMAR

## POST-DISASTER NEEDS ASSESSMENT OF FLOODS AND LANDSLIDES

JULY–SEPTEMBER 2015



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## Government of the Union of Myanmar

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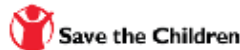
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# ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank
ASEAN	Association of Southeast Asian Nations
BBB	build back better
BTS	base transceiver station
CBM	Central Bank of Myanmar
CDD	community-driven development
CSO	civil society organization
DBE	Department of Basic Education
DFID	Department for International Development (UK)
DHP	Department Public Health
DMA	District Municipal Authority
DMH	Department of Meteorology and Hydrology
DRD	Department of Rural Development
DRM	disaster risk management
DRR	disaster risk reduction
DSW	Department of Social Welfare
ECD	Environmental Conservation Department
EIA	Environmental and Social Impact Assessments
EOC	Emergency Operation Center
ESE	Electricity Supply Enterprise
EU	European Union
EWARS	Early Warning Alert and Response System
FAO	Food and Agriculture Organization
FD	Forest Department
GAD	General Administration Department
GDP	gross domestic product
GFDRR	Global Facility for Disaster Reduction and Recovery
ha	hectare
HFA	Hyogo Framework for Action
HMIS	Health Management Information System
HPGE	Hydropower Generation Enterprise
ICT	information and communication technology
IDP	internally displaced person
IFC	International Finance Corporation
IHLCA	Integrated Households Living Condition Assessment
ILO	International Labour Organization
IMF	International Monetary Fund
IOM	International Organization for Migration
JICA	Japan International Cooperation Agency
JMP	Joint Monitoring Programme
kV	kilovolt
kW	kilowatt
kWh	kilowatt-hour
LIFT	Livelihoods and Food Security Trust Fund
MADB	Myanmar Agricultural Development Bank
MAPDRR	Myanmar Action Plan for Disaster Risk Reduction
MBA	Ministry of Border Affairs
MCIT	Ministry of Communications and Information Technology

MDRI	Myanmar Development Resource Institute–Centre for Economic and Social Development
MEPE	Myanmar Electric Power Enterprise
MESC	Mandalay Electricity Supply Corporation
MIMU	Myanmar Information Management Unit
MIP	Ministry of Immigration and Population
MIRA	Multi-Cluster/Sector Initial Rapid Assessment
MLFRD	Ministry of Livestock, Fisheries and Rural Development
MNPED	Ministry of National Planning and Economic Development
MOAI	Ministry of Agriculture and Irrigation
MOC	Ministry of Construction
MOCC	Ministry of Commerce
MOCO	Ministry of Co-operatives
MOE	Ministry of Education
MOECAF	Ministry of Environmental Conservation and Forestry
MOEP	Ministry of Electric Power
MOF	Ministry of Finance
MOFA	Ministry of Foreign Affairs
MOH	Ministry of Health
MOHA	Ministry of Home Affairs
MOI	Ministry of Information
MOLES	Ministry of Labour, Employment and Social Security
MORA	Ministry of Religious Affairs
MORT	Ministry of Rail Transportation
MOT	Ministry of Transport
MOU	Memorandum of Understanding
MNBC	Myanmar National Building Code
MPT	Myanma Posts and Telecommunications
MR	Myanmar Railways
MRCS	Myanmar Red Cross Society
MRTV	Myanma Radio and Television
MSME	micro, small, and medium enterprises
MSWRR	Ministry of Social Welfare, Relief and Resettlement
MVA	mega-volt-ampere
MW	megawatt
NAPA	National Adaptation Program for Action
NCD	noncommunicable disease
NESP	National Education Sector Plan
NGO	nongovernmental organization
NNDMC	National Natural Disaster Management Committee
NWRC	National Water Resources Committee
OPGW	optical-fiber ground wire
PDNA	Post-Disaster Needs Assessment
PFE	Permanent Forest Estate
PFLNA	Post-Flood and -Landslide Needs Assessment
PTD	Post and Telecommunications Department
RCC	Recovery Coordination Committee
RDSF	Rural Development Strategic Framework

RIMES	Regional Integrated Multi-Hazard Early Warning System for Africa and Asia
RRD	Relief and Resettlement Department
SC-SWG	School Construction Sub-Working Group
SDC	Swiss Agency for Development and Cooperation
SMIDB	Small and Medium Industrial Development Bank
SPPRG	Social Policy And Poverty Research Group
SPSP	Social Protection Strategic Plan
TLM	teaching and learning material
TWh	terawatt-hour
UNCDF	United Nations Capital Development Fund
UNDP	United Nations Development Programme
UNFPA	United Nations Population Fund
UN-Habitat	United Nations Human Settlements Programme
UNHCR	United Nations Refugee Agency
UNICEF	United Nations Children's Fund
UNOCHA	United Nations Office for the Coordination of Humanitarian Affairs
WASH	water, sanitation, and hygiene
WFP	World Food Programme
WHO	World Health Organization
WMO	World Meteorological Organization
WSP	Water Sanitation Programme
YESC	Yangon Electricity Supply Corporation

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**Nay Pyi Taw  
Myanmar**



**The Vice President**

## **FOREWORD**

This Post-Flood and -Landslides Needs Assessment (PFLNA) is dedicated to the millions of our fellow Myanmar citizens who, despite devastating floods and landslides, continue to demonstrate the most cherished value in our society, Para-Hita, the spirit of helping others and sharing their own resources in times of suffering. We acknowledge the selfless efforts and sacrifices of the affected communities, civil society organizations and national defense forces, and their rapid action in initial relief and early recovery efforts.

Since July 2015, extensive floods and landslides have had a direct impact on nearly two million women, men and children, while millions more have suffered from livelihood losses and economic disruptions. The impact of these disasters continues to affect many communities and regions, even as this assessment is going to press. Striking Myanmar at a time when we are trying to keep the country on a path of high and sustained economic growth and insulate it from external shocks, the floods and landslides have dealt our economy an excruciating blow.

The National Natural Disaster Management Committee (NNDMC) is truly privileged to have received outstanding support from our Advisory Group, other national institutions, neighboring governments and our international development partners. All these partners have a wealth of experience and best practices, which have now been employed to estimate the damages, losses and recovery needs of the affected populations. The NNDMC, on its part, has organized several public forums to enable it to improve and help ongoing relief and recovery efforts and community-driven initiatives. With all these inputs from key stakeholders, we believe that this assessment will form sound basis for evidence-based planning, implementation and management of the government's recovery programs.

The assessment and recovery planning process is paying special attention to reinforcing ongoing reforms and laying the foundation for resilient recovery. Given the uncertainties of global climate change and the increasing frequency of extreme weather events, we must expect more disasters in future. We must ensure that we increase our capacity for recovery, resilience, disaster preparedness and risk management. In the wake of this tragedy comes an opportunity for us to work with regional partners in producing the new ASEAN Disaster Recovery Reference Guide. Myanmar now co-chairs the ASEAN Committee on Disaster Management Working Group on Recovery, the goal being to “establish a common vision of good recovery” and a commitment to “continuous improvement of ASEAN Member States’ recovery practices.”

This disaster transcends the boundaries of state and society, and spans the entire spectrum of ethnic and political diversity in the country. We must continue to uphold a spirit of national unity to build a better future together. The report makes key recommendations, including but not limited to improving coordination and governance, developing early warning and management information systems, strengthening emergency operations, prioritizing more immediate measures, ensuring transparent and accountable resource management, and building regulatory institutional frameworks. To implement these ambitious but necessary programs, we seek to enhance national and international partnerships for our resilient recovery program in Myanmar, which will pave the way for national renewal.

**Nyan Tun**  
**Vice President of the Republic of the Union of Myanmar**  
**Chairman, National Natural Disaster Management Committee**





**Nay Pyi Taw  
Myanmar**

**Advisory Group**

## **PREFACE**

The floods and landslides this year devastated many parts of Myanmar. Given the magnitude of these disaster events, the task of identifying and responding to the needs of the affected populations lie well beyond the national capacity to cope. We would therefore like to acknowledge the prompt and early assistance from our immediate neighbors and from the development partners. We also value the opportunity of collaborating, learning and sharing experience with colleagues from the World Bank, the United Nations, the European Union, the Japan International Cooperation Agency and other experts.

This Post-Flood and -Landslides Needs Assessment (PFLNA) uses a methodology agreed upon and standardized by the international community. Under the mandate given by the National Natural Disaster Management Committee (NNDMC), more than 50 national and foreign experts worked round the clock to produce this assessment, covering 15 sectors in less than a month. The Advisory Group with support from development partners took on the challenging task of analyzing, validating and interpreting vast amount of data on damage, loss and needs within a short time. We also organized several rounds of consultations and discussions with diverse stakeholders to bring collective understanding of disaster risks and to better operationalize the concept of “building back better” in recovery. This participatory process was further strengthened by the guidance from the NNDMC on the ongoing efforts of communities and on collaboration with the private sector and civil society, with a view to developing a realistic and credible recovery plan. Using all these inputs and the comprehensive PFLNA, we will be able to develop a long-term plan for resilient recovery, a plan that takes fully into consideration the aspirations of the people, as well as the constraints and limits set by institutions and resources.

We see the PFLNA as a starting point for forging public policies to plan and prepare for post-disaster recovery and reconstruction. We hope the PFLNA and our recovery plan will be able to provide reference points for essential national dialogue on the resilience, recovery and long-term economic renewal of the country. We recognize that the recovery strategies outlined in the PFLNA stand to improve in the light of new insights, better data and fresh vision.

Myanmar has always attempted to regain her strength after natural disasters, and we have faith in the unity of our people to build back better. We also believe in strong commitment from the leadership and in the perseverance of our communities. We hope that all these will provide an opportunity for national unity in our recovery efforts. We hope that this comprehensive assessment will receive the immediate attention it deserves from within and outside the country, together with support for making the recovery successful.

Our sincere thanks are due to the officials of the Emergency Operations Center, the Recovery Coordination Center, line ministries, national institutions and to the members of our own Advisory Group to the NNDMC. We could not have conducted the entire PFLNA exercise successfully were it not for the hard work and professionalism of these colleagues. We look forward to working with all stakeholders in the implementation of the recovery initiatives identified in this PFLNA report.

**Yin Yin Nwe**  
Chairperson, Advisory Group

**Zaw Oo**  
Special Coordinator for Recovery Planning

# EXECUTIVE SUMMARY





# EXECUTIVE SUMMARY

## Torrential rains and the onset of Cyclone Komen triggered severe and widespread floods and landslides in July and August 2015 across 12 out of 14 states and regions in Myanmar.

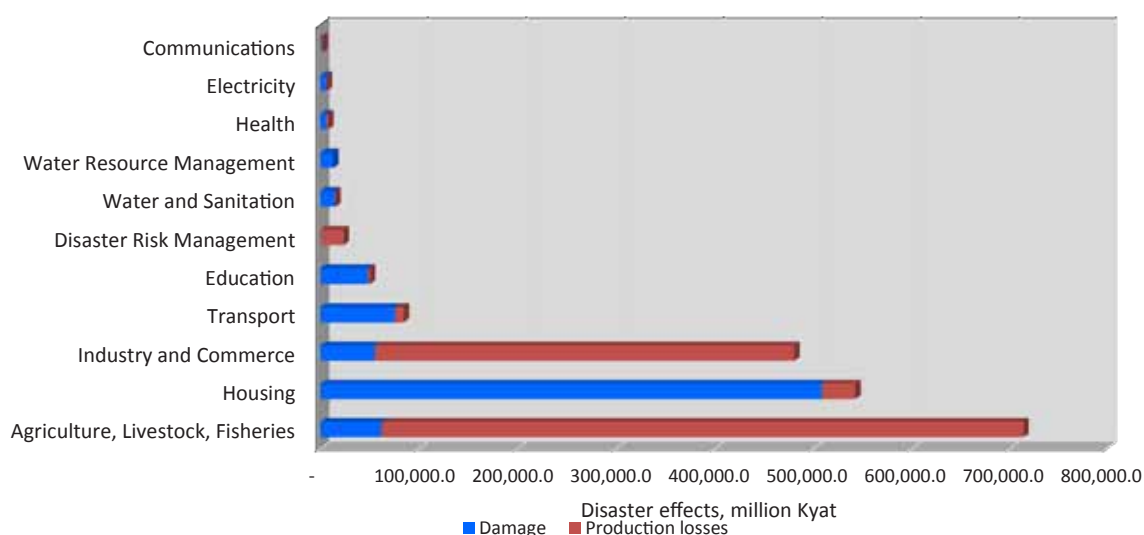
An estimated 1.6 million individuals were recorded as having been temporarily displaced from their homes by the disaster, and 132 lost their lives.<sup>1</sup> Up to 5.2 million people were exposed to the floods and landslides in the 40 most heavily affected townships.<sup>2</sup> Within the 40 most-affected townships, 775,810 individuals have been displaced, or approximately half of the total displaced population.

## Summary of Damages and Losses<sup>3</sup>

The total economic value of the effects of the floods and landslides was estimated to be approximately K 1.942 trillion (US\$1.51 billion).<sup>4</sup> Of this, K 792,493 million (US\$615.58 million) was attributed to damages and K 1,149,522 million (US\$892.90 million) to losses. The total effects would be the equivalent of 3.1 percent of Myanmar's gross domestic product (GDP) in 2014/2015.

Productive sectors and housing have been the hardest hit sectors accounting for about 90 percent of the total disaster effects. Table 1 summarizes the disaster effects within the different sectors. Figure 1 shows the disaster effects by sectors; the agriculture, livestock and fisheries sector was the most severely affected, followed by housing and then commerce and industry amounting to 37, 28 and 25 percent of the total damage and loss, respectively. All other sectors combined account for about 11 percent of the total damage and loss. In the agriculture sector, the disaster has damaged 20.4 percent of the cultivated area— 2,952,753 hectares—in the impacted regions. The social sectors of education and health have sustained lower amounts in damage and losses, but the harm to these sectors significantly harms the population's quality of life and living conditions. Across the sectors, the value of production losses is much higher (59 percent of the total effects) than that of damages to physical assets (41 percent of the total effects), which is typical of a disaster caused by a hydrometeorological event. Landslides had a major impact on road connectivity and communications.

**Figure 1.** Most-affected sectors of social and economic activity in terms of damage and production losses



Source: Assessment team.

<sup>1</sup> GOM 2015c. This figure reflects those who were displaced on a temporary or permanent basis to shelters such as camps, schools, religious buildings, or the houses of relatives/friends.

<sup>2</sup> This figure for the number of people in townships exposed to floods, landslides, and wind damage reflects the enumerated population in the 40 most-affected and 178 moderately affected townships as given in the 2014 Population and Housing Census (GOM 2015d).

<sup>3</sup> The assessment of the disaster effects is based on the quantification of damage and losses following the internationally-recognized post-disaster needs assessment methodology, as outlined in the next section of the report.

<sup>4</sup> Exchange rate of as 11 November 2015; 1USD = K 1,287.40.

**Table 1.**

Summary of estimated disaster effects by sector (million K)

State/Region	Damage			Losses			Disaster Effects		
	Total	Public	Private	Total	Public	Private	Total	Public	Private
<b>PRODUCTIVE SECTORS<sup>a</sup></b>	<b>130,760.0</b>	<b>13,346.1</b>	<b>117,414.0</b>	<b>1,076,536.8</b>	--	<b>1,076,536.8</b>	<b>1,207,296.9</b>	<b>13,346.1</b>	<b>1,193,950.8</b>
Agriculture crops	54,252.6	--	54,252.6	335,210.1	--	335,210.1	389,462.7	-	389,462.7
Livestock	7,627.4	--	7,627.4	10,150.5	--	10,150.5	17,777.9	-	17,777.9
Fisheries	299.4	75.0	224.4	305,677.4		305,677.4	305,976.8	75.0	305,901.8
Water Resource Management (Irrigation and Flood control) <sup>b</sup>	13,271.1	13,271.1	--	n.a.	n.a.	n.a.	13,271.1	13,271.1	--
Industry	27,585.7	--	27,585.7	300,191.1	--	300,191.1	327,776.8	-	327,776.8
Commerce	27,723.9	--	27,723.9	125,307.8	--	125,307.8	153,031.7	-	153,031.7
<b>SOCIAL SECTORS</b>	<b>55,116.8</b>	<b>54,975.4</b>	<b>141.4</b>	<b>3,839.9</b>	<b>3,839.9</b>	--	<b>58,956.8</b>	<b>58,815.4</b>	<b>141.4</b>
Health	6,647.9	6,506.5	141.4	1,537.3	1,537.3	--	8,185.2	8,043.8	141.4
Education	48,468.9	48,468.9	--	2,302.6	2,302.6	--	50,771.6	50,771.6	--
<b>INFRASTRUCTURE</b>	<b>606,589.0</b>	<b>97,321.1</b>	<b>509,267.9</b>	<b>45,470.5</b>	<b>1,753.6</b>	<b>43,717.0</b>	<b>652,059.5</b>	<b>99,074.6</b>	<b>552,984.8</b>
Housing	508,079.3		508,079.3	34,153.5	200.0	33,953.5	542,232.8	200.0	542,032.8
Electricity	6,282.3	5,719.8	562.5	623.7	250.8	372.9	6,906.0	5,970.5	935.4
Water and Sanitation <sup>c</sup>	14,805.5	14,805.5	n.a.	936.7	936.7	n.a.	15,742.2	15,742.2	n.a.
Transport	76,175.1	76,042.9	132.1	8,512.6	80.0	8,432.6	84,687.7	76,122.9	8,564.8
Communications	1,246.9	752.9	493.9	1,244.0	286.1	957.9	2,490.8	1,039.0	1,451.8
<b>CROSS-CUTTING<sup>d</sup></b>	<b>27.2</b>	<b>27.2</b>	<b>n.a.</b>	<b>23,674.4</b>	<b>23,674.4</b>	<b>n.a.</b>	<b>23,701.6</b>	<b>23,701.6</b>	<b>n.a.</b>
Disaster Risk Management	27.2	27.2	n.a.	23,674.4	23,674.4	n.a.	23,701.6	23,701.6	--
<b>Total</b>	<b>792,493.0</b>	<b>165,669.8</b>	<b>626,823.2</b>	<b>1,149,521.7</b>	<b>29,267.9</b>	<b>1,120,253.8</b>	<b>1,942,014.8</b>	<b>194,937.7</b>	<b>1,747,077.0</b>

Source: Estimations by the assessment team using official information.

Note: -- not available; n.a. = not applicable. Please see individual sector chapters for details on damages and losses.

a. Damages from the banking and financial sector are negligible and losses are not listed here to avoid double counting as these are not additional to the production losses within the other productive sectors, in particular agriculture.

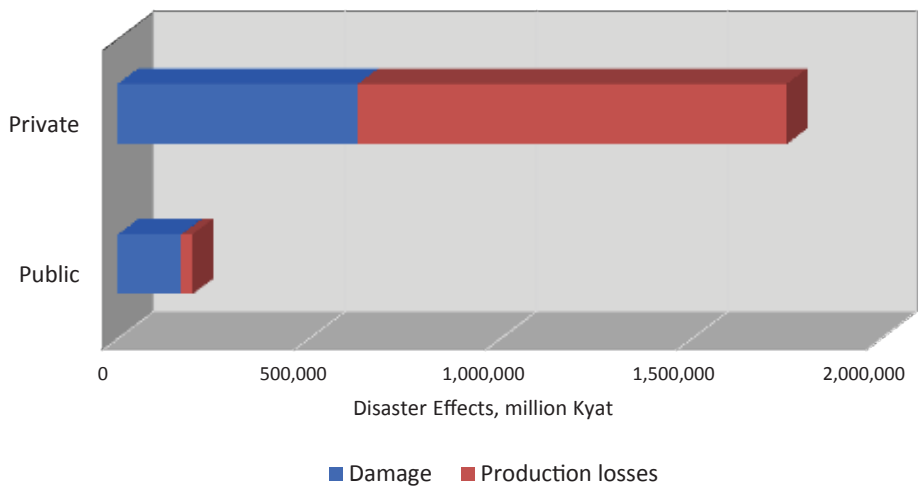
b. Production losses resulting from damages to water resources management assets are captured in the agriculture, water and sanitation, and electricity sectors.

c. Water and Sanitation damage and losses to schools, health facilities and private homes, are captured in the Education, Health and Housing sector, respectively.

d. Environment damages and losses were not assessed due to time constraints and lack of baseline data. The sections on gender, employment and livelihoods, and poverty, social impact and social protection only record needs, which are captured in Table 4.

**An examination of the ownership of disaster effects reveals an uneven distribution between the public and private sectors.** Analysis shows that disaster effects in the public sector are a small fraction of those in the private domain, including households and communities, which sustained most of the total effects (Figure 2). Private enterprises, individual homeowners and farmers bear a large part of the disaster effects, and this burden needs to be considered by the responsible authorities during recovery and reconstruction. Since small to medium-size enterprises, individual farmers, and smallholders with limited financial capacity and nearly no insurance coverage have been affected, the role of the government will have to be expanded in dealing with recovery and reconstruction, and the government will also have to play a catalytic role in mobilizing private banking resources to assist the poorer strata of the population.

**Figure 2.**  
 Ownership of disaster effects by public and private entities (million K)



Source: Assessment team.

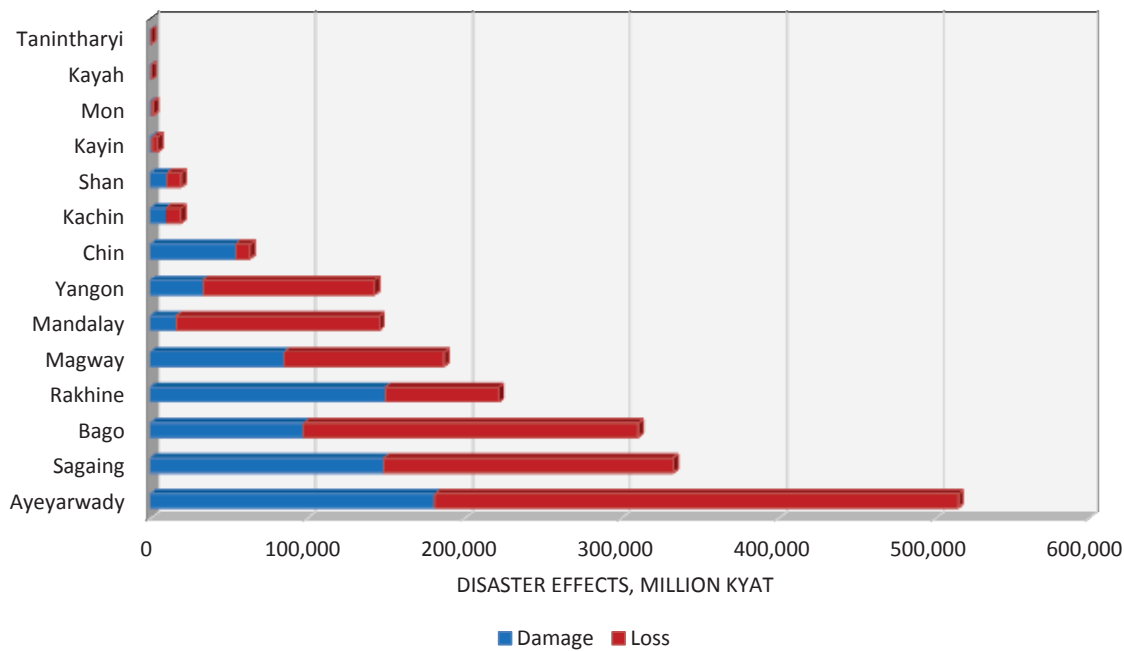
**Geographically, disaster effects were felt throughout the entire country, with an uneven distribution among states and regions.** In terms of damage and production losses, the most-affected states and regions were Ayeyarwady, Sagaing and Bago (see Table 2 and Figure 3). In terms of per capita effects (see Table 3 and Figure 4), Chin residents sustained the highest value of damages and losses (K 132,560 per person), closely followed by Rakhine (K 105,665 per person). Ayeyarwady, Sagaing and Bago residents sustained damage and losses of between K 83,000 and K 63,800 per person, which are also significant. It should also be noted that the inhabitants of Chin faced high values of destroyed assets (K 113,350), caused mostly by landslides, while residents of Ayeyarwady and Bago sustained the highest value of production losses, which translate into high decline of personal income. The disaster effects in terms of production losses and per casita are depicted on maps in Figure 5 and Figure 6 respectively.



State/Region	Per capita disaster effects		
	Damage	Losses	Total
Ayeyarwady	29,310	53,869	83,179
Bago	20,040	43,763	63,803
Chin	113,350	19,212	132,562
Kachin	6,141	5,600	11,741
Kayah	937	438	1,375
Kayin	982	2,122	3,104
Magway	21,795	25,939	47,734
Mandalay	2,686	20,970	23,656
Mon	422	428	850
Rakhine	71,423	34,240	105,664
Sagaing	27,997	34,529	62,526
Shan	1,906	1,462	3,369
Tanintharyi	215	4	219
Yangon	4,576	14,813	19,389

**Table 2.** Summary of estimated disaster effects by states and regions (million K)

Source: Assessment team based on population census, household survey, and the estimated values of damage and losses.



**Figure 3.** Most-affected states and regions in terms of damage and production losses

Source: Assessment team.

**Table 3.**

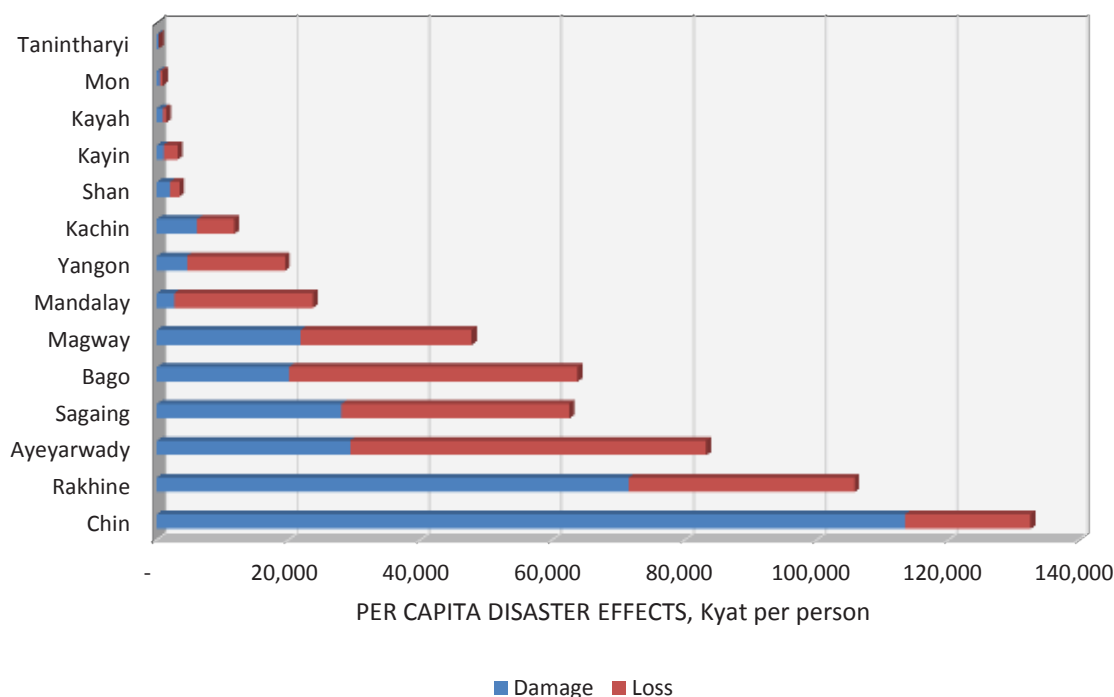
Summary of estimated disaster effects per capita (K/person)

State/Region	Per capita disaster effects		
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Tanintharyi	215	4	219
Yangon	4,576	14,813	19,389

Source: Assessment team based on population census, household survey, and the estimated values of damage and losses.

**Figure 4.**

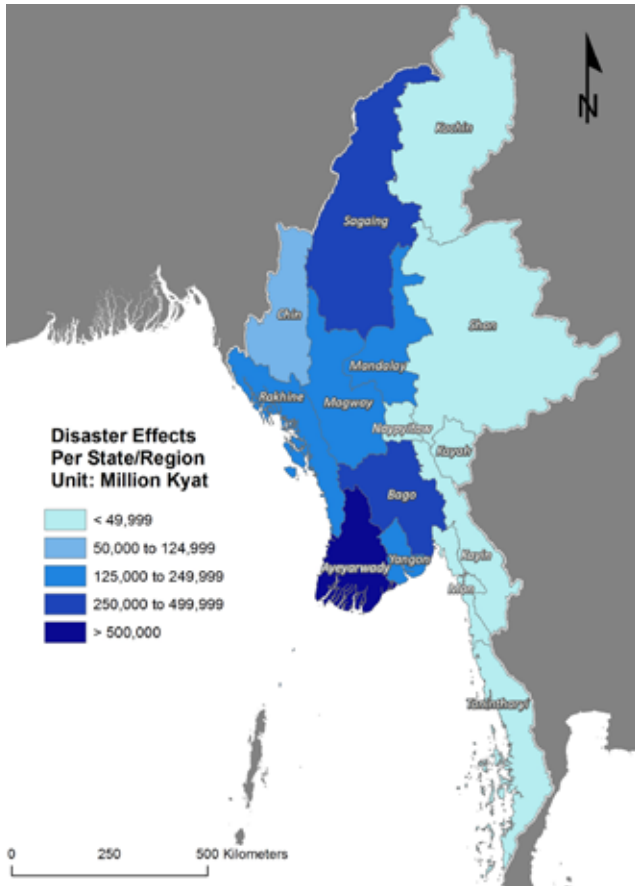
Per capita distribution of the disaster effects



Source: Assessment team.

**Figure 5.**

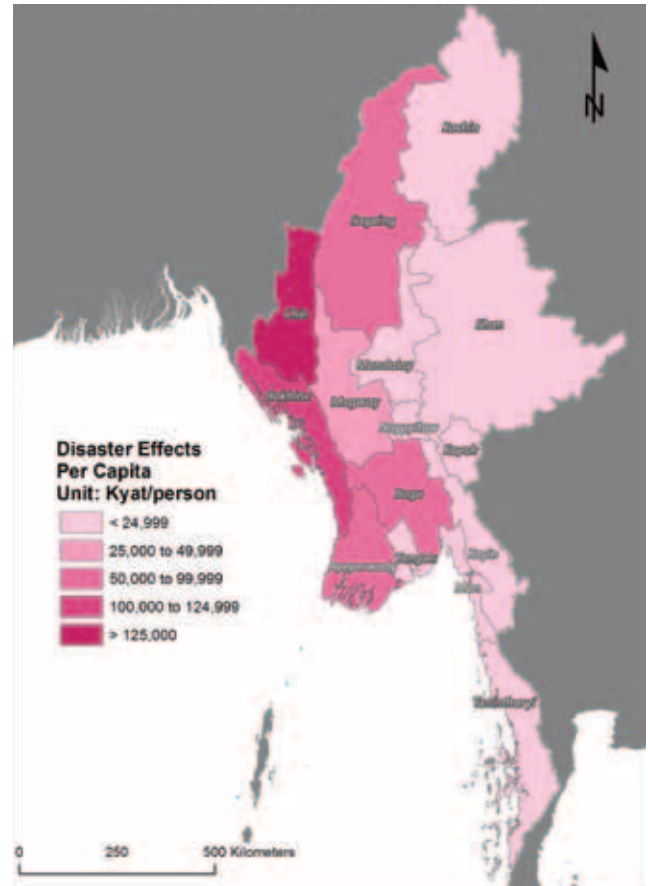
Disaster effects by state and region (million K)



Source: Assessment team.

**Figure 6.**

Disaster effects per capita by state and region (K per person)

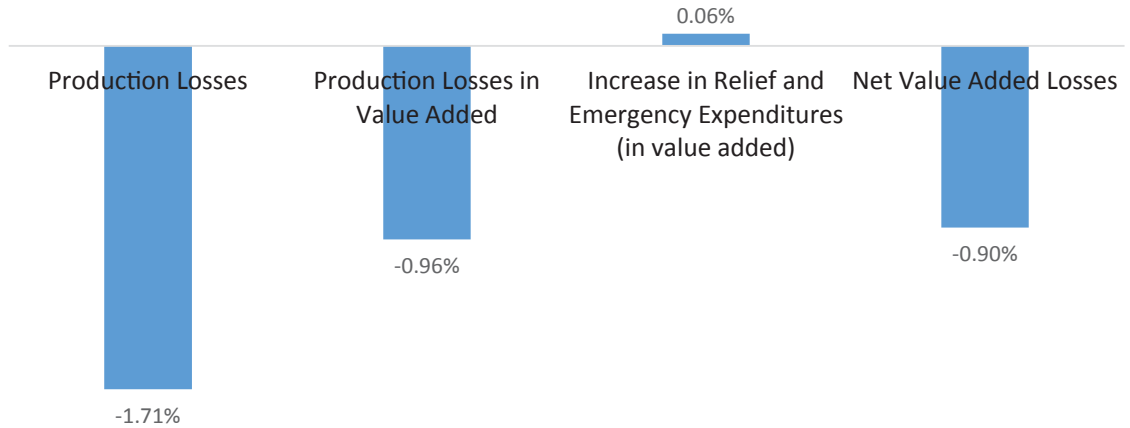


## Summary of Macroeconomic Impact Assessment

From a macroeconomic perspective, the floods and landslides are estimated to have caused K 1,080,573 million<sup>5</sup> of production losses to the economy for 2015/2016, or about 1.7 percent of last year's GDP (see Figure 7). In value-added terms, the economic loss is estimated at K 609,265 million, equivalent to around 1 percent of 2014/2015 GDP (Figure 7). GDP growth could drop by 0.8 percentage points in 2015/2016 if recovery efforts are not undertaken. In addition, the current account deficit is expected to increase to above 8 percent of GDP, and the fiscal deficit is projected at just under 5 percent of GDP. In the medium term, the economy is expected to bounce back, with strong recovery in the agriculture sector. The large impact is driven by the effect of the floods on crop and fisheries production. Crops alone account for over 20 percent of GDP in Myanmar, and are therefore a strategic sector of the economy.

<sup>5</sup> Note that under the damage and loss assessment methodology (see Introduction), increased relief and emergency expenditures are counted as a loss; but they are counted as an increase in the macroeconomic analysis (see Figure 7).

**Figure 7.**  
 Disaster losses  
 as a percentage  
 of 2014/2015  
 GDP



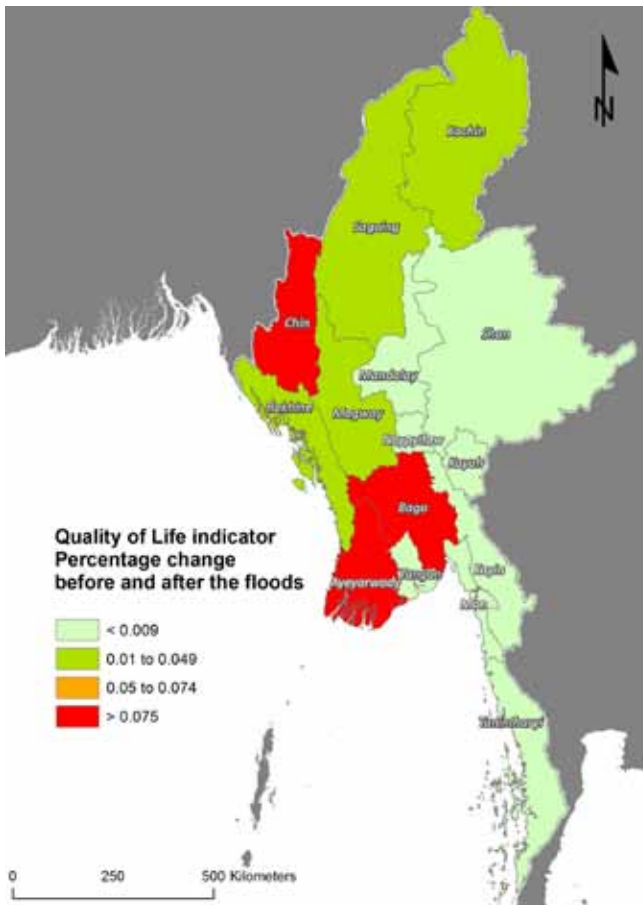
Source: Assessment team estimate.

**The overall impact is not insignificant when compared to other floods in the early 2000s.<sup>6</sup>** Recent floods in Bosnia and Herzegovina (2014) were estimated to have caused damages worth 15 percent of GDP, and losses close to 5.6 percent of GDP. The 2011 floods in Thailand caused around 11 percent of GDP in damage and losses. However, there are a number of factors to be considered regarding the 2015 floods and landslides in Myanmar. The impact of the disaster (i.e., the consequences of the effects of the disaster) is greater whenever production losses are high and the size of the affected economy is small. In the case of Myanmar, whose economy is relatively small, the macro impact is relatively high. In addition, in the case of Myanmar, most of the damage and losses occurred in states and regions where the population has lower values of personal income; thus their quality of life would be more affected than that of populations in other countries, and require more recovery assistance.

**Disasters impact affected populations' quality of life or well-being at the personal or household level, especially for more vulnerable population groups, including women, children, and the elderly.** A gap analysis of the quality-of-life indicators reveals that the impact of the floods and landslides has triggered a geographically widespread decline in the quality of life of the disaster-affected population, particularly in Ayeyarwady, Bago and Chin, which sustained the highest decline in the quality-of-life index (see Figure 8).<sup>7</sup> There seems to be a correlation between a low quality of life and vulnerability to external shocks: high exposure to a disaster was found to coincide with a significant decline in post-disaster quality of life in Chin, Bago, Ayeyarwady, Kachin, Rakhine and Magway. In particular, Chin's dramatic decline in quality of life combined with its pre-existing development deficits clearly call for a prioritization of assistance during the recovery phase.

<sup>6</sup> Further information is included in the macroeconomic impact chapter.

<sup>7</sup> Further information is included in the disaster impact on quality of life chapter.



Source: Assessment team.

**Figure 8.**  
Disaster impact  
on quality of life  
(percentage  
change of quality  
of life indicator  
before and after  
the disaster)

## Summary of Recovery and Reconstruction Needs

**Preliminary estimates highlight recovery and reconstruction needs in the order of K 2.035 trillion (Table 4).** The assessment recommends principles for the recovery based on international good practice and identifies key issues to be taken into account, such as institutional capacity, financing, regional concerns, and harmonization of national and development partner priorities. The next steps are to finalize a recovery strategy, mobilize internal and external resources to finance reconstruction, and accelerate the preparation and implementation of recovery activities.

**Table 4.**  
Summary of  
recovery and  
reconstruction  
needs by sector  
(million K)

	Short term (up to 4 months)	Medium term (up to 12 months)	Long term (1–3 years)	TOTAL
<b>PRODUCTIVE</b>	<b>324,346.1</b>	<b>298,118.5</b>	<b>255,856.3</b>	<b>878,320.9</b>
Agriculture, Fisheries and Livestock	229,472.8	166,104.5	--	395,577.3
Water Resources Management (Irrigation and Flood Control)	4,798.3	15,870.2	180,068.8	200,737.3
Industry and Commerce	90,000.0	75,000.0	75,000.0	240,000.0
Banking and Finance	75.0	41,143.8	787.5	42,006.3
<b>SOCIAL</b>	<b>9,932.6</b>	<b>70,489.0</b>	<b>47,179.0</b>	<b>127,600.7</b>
Health	5,332.6	12,631.0	14,383.0	32,346.7
Education	4,600.0	57,858.0	32,796.0	95,254.0
<b>INFRASTRUCTURE</b>	<b>12,222.3</b>	<b>296,755.2</b>	<b>515,447.0</b>	<b>824,424.5</b>
Housing	2,225.0	191,832.0	438,483.0	632,540.0
Electricity	1,019.5	1,762.6	2,209.0	4,991.1
Water and Sanitation	1,069.0	17,554.0	7,000.0	25,623.0
Transport	6,553.0	80,456.0	62,755.0	149,764.0
Communications	1,355.8	5,150.6	5,000.0	11,506.4
<b>CROSS-CUTTING</b>	<b>79,849.4</b>	<b>40,228.5</b>	<b>84,500.0</b>	<b>204,577.9</b>
Gender	2,770.9	3,500.0	4,000.0	10,270.9
Environment	0.0	1,700.0	63,000.0	64,700.0
DRM	750.0	13,700.0	17,500.0	31,950.0
Employment and Livelihoods	21,328.5	21,328.5	n.a.	42,657.0
Social Protection	55,000.0	(110,000.0) <sup>a</sup>	(551,375.0) <sup>a</sup>	55,000.0
<b>Total</b>	<b>426,350.4</b>	<b>705,591.2</b>	<b>902,982.3</b>	<b>2,034,923.9</b>

Source: Assessment team.

*Note:* n.a. = not applicable. Please see individual chapters for sectoral details on the recovery and reconstruction needs.

a. The proposed medium and long-term needs cash for work flood recovery programs will help provide temporary local employment to affected households for the repair and reconstruction of local infrastructure (schools, health clinics, housing, fish ponds, water and sanitation, wells and other water sources etc.). The bulk of the equipment and material costs are already covered by reallocations to sectoral reconstruction budgets. A part of this reconstruction budget needs to be reallocated for labor costs under the cash for work program.

## Way Forward

**The “build back better” principle serves as the guiding framework in the development and implementation of rehabilitation and recovery interventions.** The principle focuses on long-term, sustainable efforts to reduce vulnerabilities and strengthen capacities to cope with future hazard events. This approach takes into consideration the need for urgency while ensuring safety in implementing programs and projects. Within the given time lines, the government’s priorities and needs pose budgetary, institutional, administrative, and logistical challenges that will condition and frame the development partners’ post-flood interventions. It is recommended that the results and data from the Post-Flood and -Landslide Needs Assessment (PFLNA) be integrated in preparing the Comprehensive Recovery Plan and Strategy. This will create a good baseline that ministries, regions, states, and unions can use in preparing their respective recovery plans.

**Going forward, there is a need to prioritize activities for recovery and reconstruction based on the findings of this assessment and the available finances.** In the process, there are a number of issues, priorities, and guiding principles to consider:

**Key issues:**

- Existing government institutional capacity
- Limitation of local implementation
- Need for strong inter-sector and inter-institutional coordination for recovery
- Financial constraints and prioritization of interventions
- Harmonization of national priorities and those of international development partners
- Additionality versus more efficient use of available resources
- Need to ensure recovery fits with longer-term development plans
- Region-specific attention to socioeconomic, geographical, and physical contexts

**Priorities:**

- Use recovery as opportunity to reinforce ongoing reforms.
- Focus on specific needs among states and regions, townships, and village tracts.
- Respond quickly to agricultural replanting and winter crops, beans, pulses, summer rice, and other cash crops.
- Restore livelihoods by expanding microcredit, restructuring loans and/or provision of debt relief for the affected small and medium-sized enterprises and farmers.
- Support self-reconstruction of housing through provision of materials and cash grants tied to work.
- Implement integrated environmental and water resource management as a resilience-enhancing, risk-reducing strategy.
- Apply disaster risk-sensitive land use/urban planning
- Implement specific measures to address increased vulnerabilities.
- Strengthen institutional capacity of relevant institutions to lead and manage recovery.
- Use and strengthen local capacities, indigenous knowledge, and diverse cultural richness.

**Guiding principles:**

- Recovery must be sustainable and equitable and must increase resilience.
- Recovery should strengthen local communities and livelihoods.
- The socioeconomic focus of recovery should be on poverty and risk reduction, social inclusion, gender equity, and compensation to vulnerable disadvantaged social groups.
- The recovery should strengthen the provision of basic social services (education, health) with specific attention to gender and vulnerable groups.
- The strategy and response should be inclusive, nondiscriminatory, and conflict-sensitive.
- Recovery should support a seamless transition from short- to medium-term goals.
- A sound monitoring and evaluation mechanism with clear performance indicators must be part of the post-floods and -landslides recovery framework and plan.

# INTRODUCTION







## Country Context

### DISASTER RISK PROFILE

**Myanmar is exposed to a range of natural hazards, including floods, cyclones, earthquakes, landslides, and tsunamis.** Myanmar rests on a major earthquake belt and is subject to small earthquakes on a regular basis. Mountainous areas are prone to landslides. Predictions indicate that water-related disasters will be exacerbated by climate change and environmental degradation (see Box 1). Floods and droughts are expected to become more frequent and intense. Temperatures, rainfall, and runoff are likely to increase; extreme rainfall will become more frequent; and dry periods during the monsoon season may occur. All these changes will lead to augmented economic losses, particularly in the agricultural sector.

**Natural hazards in Myanmar are accompanied by high economic costs and social consequences.** The annual expected losses linked to natural hazards are approximately US\$184.8 million, equivalent to 0.9 percent of the country's 2008 GDP; these were the highest annual expected losses relative to GDP in all Association of Southeast Asian Nations (ASEAN) countries.<sup>8</sup> Impacts from disasters are felt across all sectors, and they present a challenge for Myanmar's quest for continued growth. In 2008, Cyclone Nargis killed over 130,000 people;<sup>9</sup> 2.4 million others lost homes and livelihoods.<sup>10</sup> The 2015 Global Assessment Report puts Myanmar first in terms of annual average loss in relation to social expenditure.<sup>11</sup>

**Physical exposure to geological and hydrometeorological hazards is only one aspect of understanding and calculating disaster and climate risks.** Location and exposure of the built environment—is important, but vulnerability—linked to people's ability to prepare for, respond to, or recover from a disaster—is equally important. Disasters disproportionately impact the poor and vulnerable, particularly women, children, the elderly, and people with disabilities. Due to the high degree of poverty in the rural areas in Myanmar, even low-intensity disasters have a big impact on households. In the rural communities, the poor often live in remote areas in low-quality housing, and lack access to basic services and local infrastructure, all of which affect their ability to deal with disaster events.

.....  
**Box 1.**  
Impact of  
climate change  
in Myanmar  
.....

In 2012 the government of Myanmar published a National Adaptation Program for Action (NAPA) aimed at analyzing past and expected impacts of climate change in Myanmar and at identifying priority actions for adaptation. According to NAPA, the observed climate variability and change in Myanmar over roughly the last six decades include the following:

- General increase in temperatures across the whole country (~0.08°C per decade), most notably in the northern and central regions
- General increase in total rainfall over most regions, though with notable decreases occurring in certain areas (e.g., Bago Region)
- Decrease in the duration of the southwest monsoon season as a result of a late onset and early departure times
- Increases in the occurrence and severity of extreme weather events, including cyclones/strong winds, flood/storm surges, intense rains, extreme high temperatures, and drought

<sup>8</sup> World Bank 2012. Figures are preliminary estimates and are not based on catastrophic risk modeling. The World Bank notes that "the annual expected loss of US\$184.8 million is lower than the historical average loss of US\$368 million for 1996 to 2010 because the longer EM-DAT time series for the number of people affected suggests that the 2008 Cyclone Nargis was a relatively severe event that seems unlikely to reoccur once every fifteen years. Due to data limitations the probable losses the country might experience as result of catastrophes are not reported in the analysis" (95).

<sup>9</sup> UNOCHA 2012.

<sup>10</sup> A quantitative comparison of the July–August 2015 floods, Cyclone Nargis, and other disaster events is included in the macroeconomic impact chapter.

<sup>11</sup> UNISDR 2015.

**NAPA makes the following climate change projections for Myanmar:**

- General increase in temperature across the whole country, particularly from December to May, with the central and northern regions experiencing the greatest increases
- Increase in clear sky days, exacerbating drought periods
- Increase in rainfall variability during the rainy season, including an increase across the whole country from March to November (particularly in northern Myanmar), and a decrease between December and February
- Increase in the risk of flooding resulting from late onset and early withdrawal of monsoon events
- Increase in the occurrence and intensity of extreme weather events, including cyclones/strong winds, flood/storm surge, intense rains, extreme high temperatures, and drought

Source: NECC 2012

## SOCIOECONOMIC CONTEXT

**Beginning in 2011, Myanmar launched major political and economic reforms aimed at increasing openness, empowerment, and inclusion.**<sup>12</sup> Since then, significant progress has been made in reforming the economy, with an estimated growth rate increasing from 5.3 percent in 2010/2011 to 7.3 percent in 2012/2013. The removal of trade and foreign exchange restrictions, coupled with rapidly rising domestic demand, have contributed to widening trade and current account deficits. Growth is expected to remain relatively strong over the medium term.<sup>13</sup> In the past two years, the government has increased spending on the social sectors.

**Despite progress, Myanmar remains one of the poorest countries in Southeast Asia.**<sup>14</sup> With a population of 51.4 million, the country has a per capita GDP of US\$1,105.<sup>15</sup> In 2010, the rate of poverty was estimated to be between 25.6 and 37.5 percent,<sup>16</sup> concentrated particularly in conflict-affected areas. In Chin State, the poverty rate stands at 71 percent; in Rakhine it is 78 percent. At least 70 percent of Myanmar's poor live in rural areas, and agriculture plays a critical role for both inclusive growth and poverty reduction.<sup>17</sup> However, urban poverty (34.6 percent) must also be addressed.<sup>18</sup>

**The past years have seen a dramatic increase in political and civil liberties and a significant reduction in armed conflict, although conflict continues in Kachin State and northern Shan State.** At the same time, new tensions and challenges have emerged, including outbreaks of unrest affecting the country's Muslim minorities and particularly those who identify themselves as Rohingya in Rakhine State. The government is pursuing efforts to bring an end to the multiple conflicts in ethnic areas.

<sup>12</sup> World Bank 2015a.

<sup>13</sup> World Bank 2015b.

<sup>14</sup> World Bank 2014.

<sup>15</sup> World Bank 2015a.

<sup>16</sup> World Bank 2015a.

<sup>17</sup> World Bank 2015a.

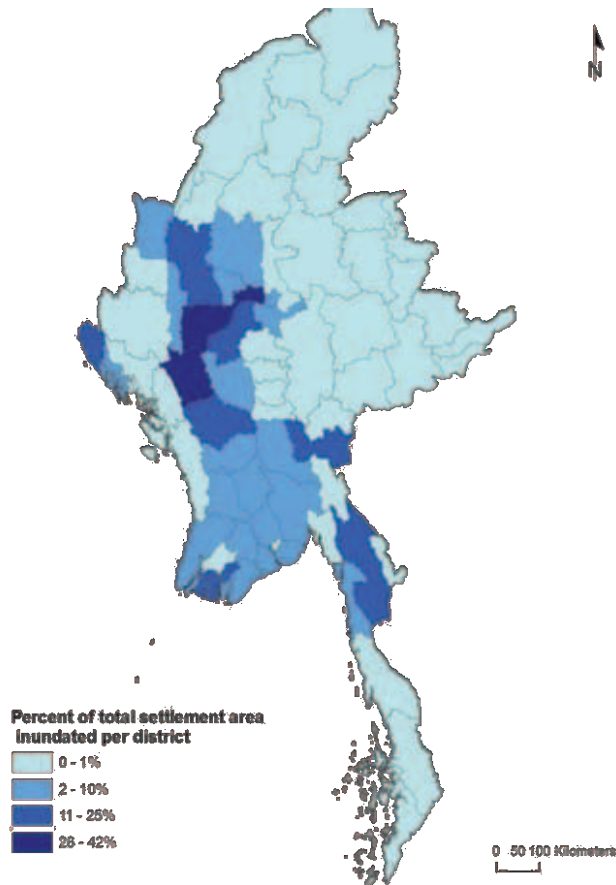
<sup>18</sup> World Bank 2014

## 2015 Floods and Landslides

**In July and August 2015, widespread floods and landslides affecting 12 out of 14 states in Myanmar displaced 1,676,086 people and caused 132 fatalities.**<sup>19</sup> The floods and landslides destroyed public and private infrastructure, including houses, railways, roads, bridges, schools, health facilities, and monasteries, and had extensive impacts on the agriculture sector. The worst-hit areas are in the central and western part of the country. The inundated areas are shown in Figure 9.

Myanmar's climate is largely tropical with three seasons: the monsoon/rainy season (May–October), cool season (November–February), and hot season (March–April). Rainfall during the monsoon season totals more than 500 cm in upper Myanmar and over 250 cm in lower Myanmar and Yangon, while Central Myanmar and Mandalay receive about 76 cm each. Torrential rains started on July 16, 2015, saturating the ground. On July 30, Cyclone Komen made landfall in Bangladesh, causing strong winds and additional torrential rains in Chin and Rakhine States and Sagaing, Magway, and Bago Regions.<sup>20</sup> The rains were exceptionally heavy; in the mountains of the country's central and northern regions, rainfall levels and river discharge rates reached unprecedented levels. In Magway Region, for instance, water levels in the Mone Dam reservoir reached 1 m below the crest.

**Figure 9.**  
Settlement  
areas inundated  
by district  
(percentage)



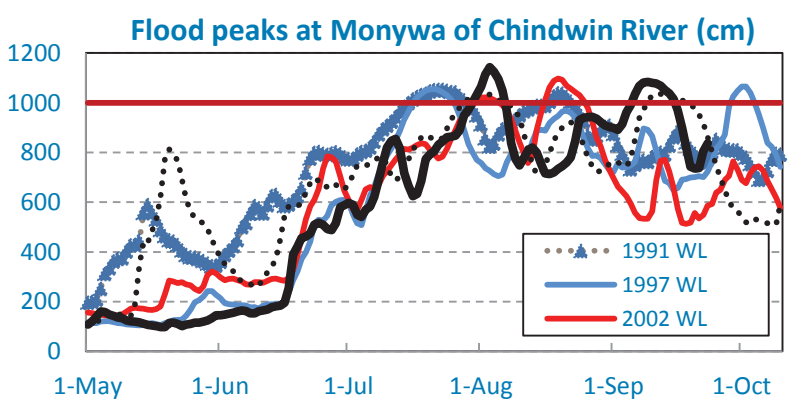
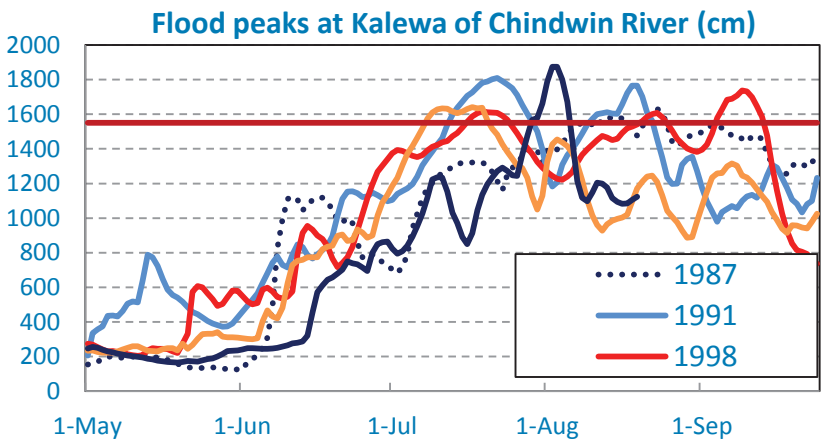
Source: Assessment team.

<sup>19</sup> GOM 2015c.

<sup>20</sup> GOM 2015c.

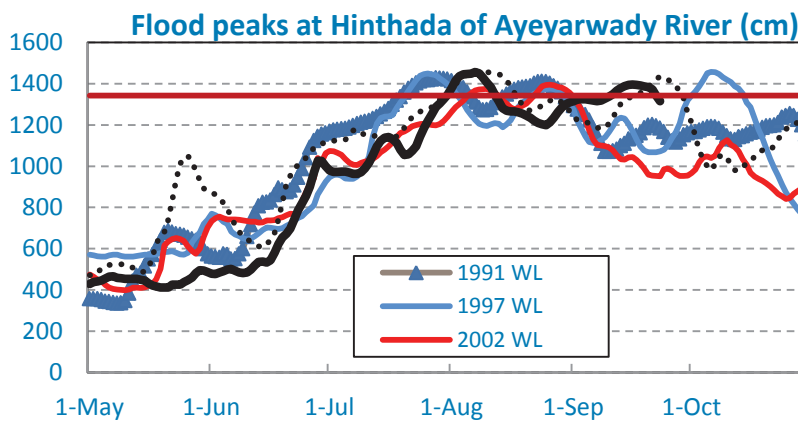
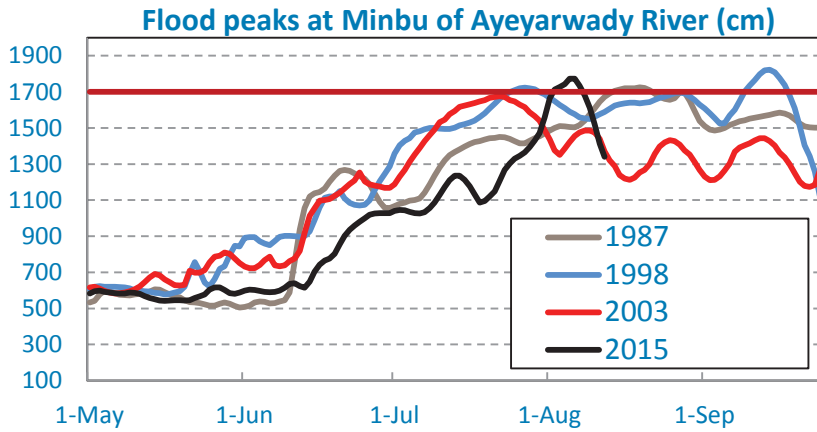
Results from a rapid post-event analysis<sup>21</sup> indicate that overall, the 2015 floods can be characterized as a rare event, one with an estimated return period of 20–50 years, depending on the location within the Ayeyarwady subcatchments. More extreme floods might have occurred in some of the smaller tributaries due to localized heavy rainfall, as anecdotal evidence and dam peak-outflow levels suggests. As a rule, rainfall intensities vary greatly throughout the Ayeyarwady basin. An estimation of rainfall return periods at the subcatchment level based on 10-day maximum rainfall sums shows very large differences throughout the basin, with mean return periods ranging from less than 1 in 10 years at Aunglan, Chauk, Myitkyina, and Pyay, to 1 in 30 years in Nyaung U, 1 in 40 years at Monywa, to more extreme 1-in-90-year rainfalls in the upstream areas of Katha and Sagaing subbasins (Figure 10 and Figure 11).

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**Figure 10.**  
 2015 flood levels compared with historic floods  
 .....



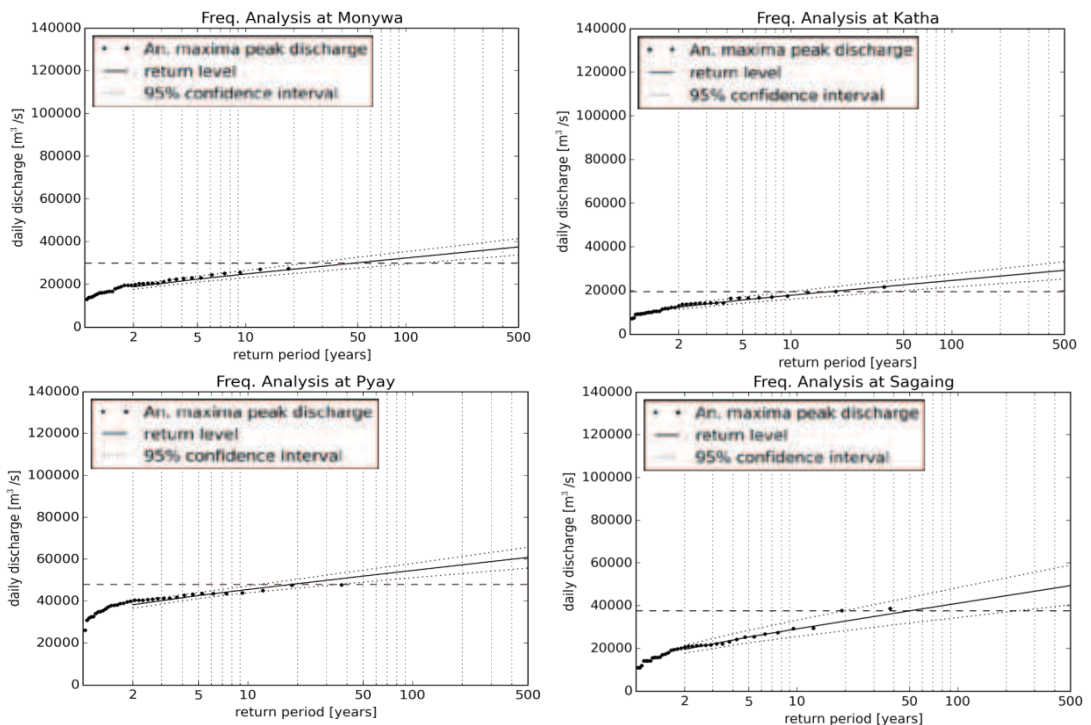
<sup>21</sup> Deltares 2015. The analysis included estimation of rainfall return periods, hydrologic simulation over the period 1979–2015 using satellite-derived data, and extreme value analysis (Gumbel) of return period of the 2015 flood based on measured discharges.

**Figure 10.**  
2015 flood levels compared with historic floods



Source: Deltares 2015 based on data from the Department of Meteorology and Hydrology.  
Note: WL = water levels.

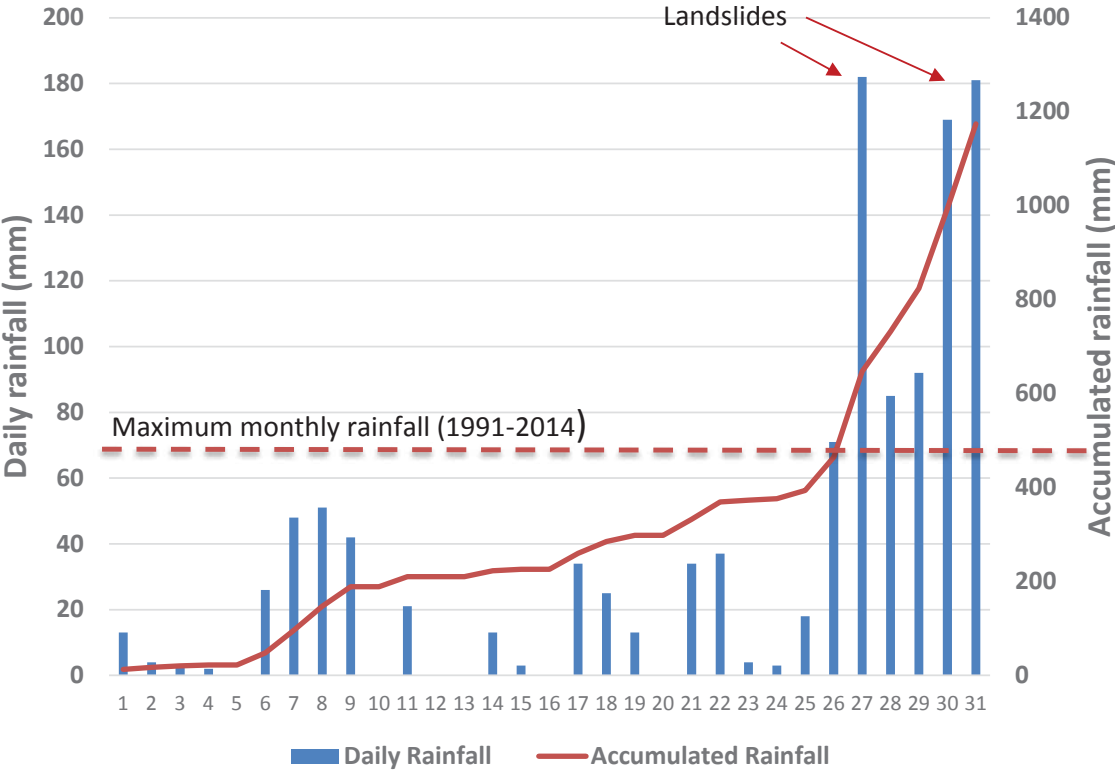
**Figure 11.**  
2015 flood peak discharge return period analysis



Source: Deltares 2015.  
Note: An. = annual; Freq. = frequency. Frequency analysis shows the Gumbel distribution of the measured annual maximum discharges for 1980–2014. Red line shows 2015 disaster event.

**The floods also caused morphological changes.** River banks eroded, damaging and threatening the stability of roads and other infrastructure. In several locations, newly eroded river channels cut through existing agricultural areas. Rivers in Myanmar are naturally dynamic due to highly variable monsoon climate and the high sediment levels. During the floods, increased sedimentation occurred. The Ayeyarwady delta experienced a floodplain type of flooding, with relatively low flood levels but over a large area. This especially affected unprotected villages and settlements in flood-prone areas. The combination of heavy rainfall, strong winds, high soil saturation, and unstable soils in hilly areas caused landslides that destroyed houses, roads, bridges and other infrastructure.

**Unprecedented extreme rainfalls caused landslides in the Chin State.** Within the last seven days of July, over 30 percent more rain fell than in any other month over the past 25 years. The monthly rainfall of July measured at the weather station in Hakha would be equal to a 1-in-1,000-year rainfall (see Figure 12 and Figure 13). This explains the widespread and devastating landslides within Chin State and in particular the reactivation of a large, old, and deep-seated landslide on which—as a detailed geologic and geo-engineering study revealed (Win Myint, Kyaw Htun et al. 2015) —parts of Hakha had been built. The landslides caused extensive destruction to roads and homes. Many affected areas are remote and were difficult to access, particularly in Chin State. Due to the massive damage and persisting landslide risks, geologists and engineers were assessing the feasibility of relocating the capital, Hakha, to a safer location.

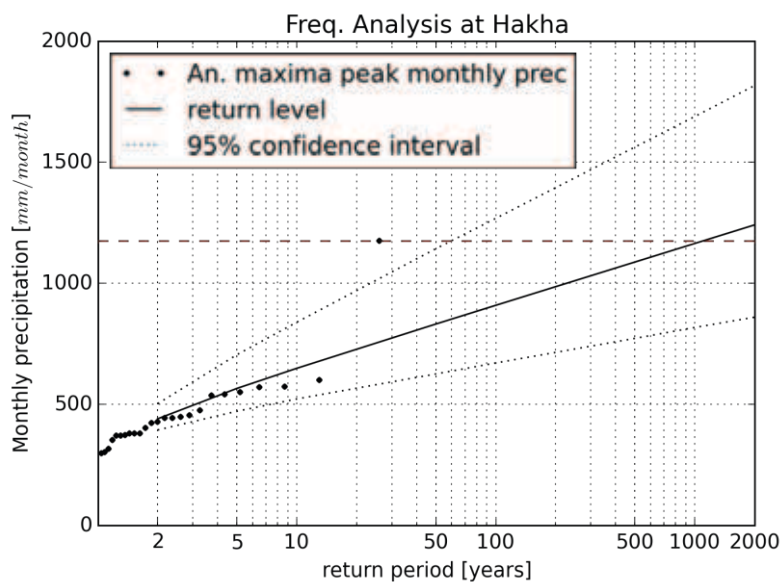


**Figure 12.** Rainfall in Hakha in July 2015

Source: Deltares 2015

**Figure 13.**

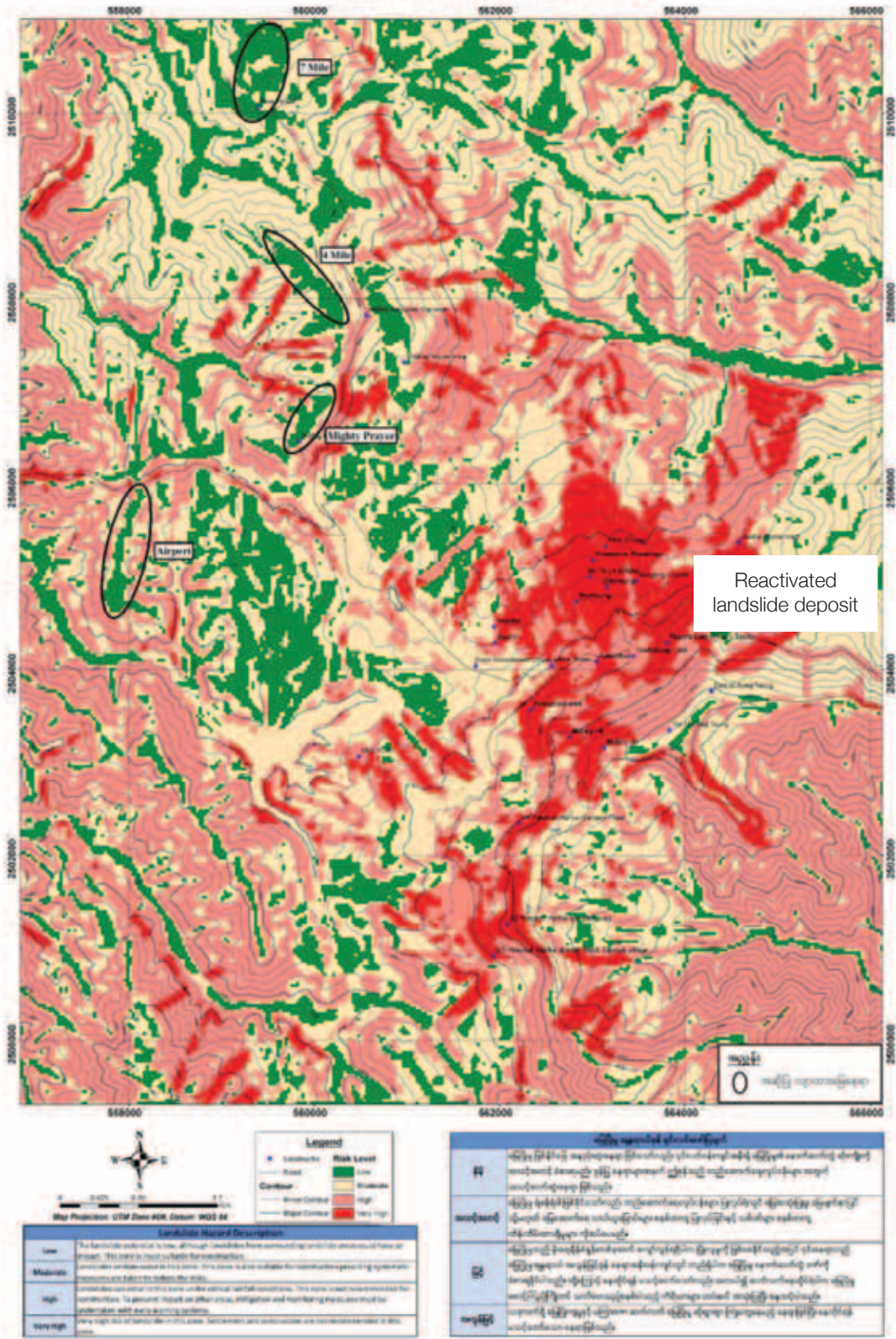
Frequency analysis of monthly maxima per year at Hakha



Source: Deltares 2015.

Note: an. = annual; freq = frequency. Frequency analysis is of monthly maxima per year.  
Red line shows 2015 disaster event.





**Figure 14.**  
Potential  
landslides  
zonation map,  
Hakha, Chin  
State

Source: Win Myint, Kyaw Htun et al. 2015.

## Response from the Government, Development Partners, and Communities<sup>22</sup>

**On July 31, 2015, Myanmar's president declared a state of emergency in Sagaing Region, Magway Region, Chin State, and Rakhine State, designating them as disaster-affected zones, in accordance with Article 11 of the Natural Disaster Management Law.** On August 10, 2015, the Recovery Coordination Committee (RCC) was formed to lead recovery, including developing a recovery strategy and establishing a Recovery Coordination Center to provide operational and information management support to the National Natural Disaster Management Committee (NNDMC) and the RCC. Chaired by the minister of the Ministry of Construction (MOC), the RCC consists of 28 members from respective line ministries. The UN with development partners has been providing support to the establishment of the Recovery Coordination Center, which became operational October 1, 2015. On August 14, the vice president outlined a broad national recovery coordination structure, coordination mechanisms, and guiding principles for building back better. The government has also adopted guiding recovery principles that take into account the particular needs of the most vulnerable, including women, youth, people with disabilities, and the elderly. To assess the impact on key sectors, understand of the scale of economic impact, and support the process of recovery and reconstruction planning, on September 16 2015, the NNDMC requested support from the World Bank in conducting a Post-Disaster Needs Assessment (PDNA).

**As of October 4, K 28.8 billion has been spent for flood response activities by the government.**<sup>23</sup> Over K 187 billion has been committed to response activities, according to the government of Myanmar and the UN Financial Tracking Service. The government has allocated the following: K 42.2 billion from the President's Reserve Fund, K 6.5 billion from the national government, and K 22.3 billion from state and region governments, and there have also been contributions from the private sector and civil society.<sup>24</sup>

**On August 4, Myanmar called for international humanitarian assistance to aid in effective flood response.** Through the AHA Centre, ASEAN member states deployed the ASEAN Emergency Response and Assessment Team (ASEAN ERAT) and mobilized the Disaster Emergency Logistic System for ASEAN (DELSA) to support the government of Myanmar during the crisis.<sup>25</sup> As of October 6, the government of Myanmar had received US\$18.2 million in cash and in-kind contributions from ASEAN, Australia, Bangladesh, Brunei Darussalam, Cambodia, Canada, China, India, Indonesia, Israel, Italy, Japan, Mongolia, Nepal, New Zealand, Norway, Republic of Korea, Singapore, Sri Lanka, Thailand, Vietnam, and the private sector. According to the Financial Tracking Service, as of October 5, US\$35.6 million had been contributed or pledged for projects in the Myanmar flood response plan, including contributions from ASEAN member states, the United Nations' Central Emergency Response Fund, multilateral institutions, private companies, and individuals.<sup>26</sup>

**Response to the floods and landslides has demonstrated the resilience of civil society, human solidarity, and people's ability to help themselves.** Community groups quickly mobilized to facilitate access to immediate food and nonfood aid and to ensure equal distribution of that assistance. In addition to drawing on traditional avenues such as seeking donations through monasteries and establishing collection points, affected people also used mobile phones and social media to collectively mobilize assistance. There were examples of village youths setting up Facebook groups to communicate needs with networks in less-affected areas. Community structures played a pivotal role in the immediate aftermath of the floods in helping communities to cope. Acting on warnings issued by township authorities through village leaders, communities largely self-mobilized to move to safer locations as water levels rose. Even after the initial phase, those affected by the floods have continued to rely on community coping mechanisms for dealing with needs.

<sup>22</sup> Further information on disaster response is included in the disaster risk management chapter.

<sup>23</sup> GOM 2015a.

<sup>24</sup> GOM 2015a.

<sup>25</sup> GOM 2015b.

<sup>26</sup> GOM 2015a.

## Assessment Methodology

### POST-DISASTER NEEDS ASSESSMENT

**The PDNA is an internationally recognized methodology used in large disasters worldwide to analyze disaster effects and disaster impact and to identify recovery needs, understood from human, socio-cultural, economic, and environmental perspectives.** The PDNA is a government-led exercise, supported by a multidisciplinary, multiagency team. The current assessment was supported by experts from the European Union, the World Bank/Global Facility for Disaster Reduction and Recovery, the United Nations, and other relevant stakeholders. The assessment methodology is based on PDNA guidelines<sup>27</sup> with three main elements: assessment of disaster effects, assessment of disaster impact, and recovery strategy and needs.

**The assessment of the disaster effects is based on the quantification of damage and losses.** Damage to infrastructure and physical assets is the quantification of public and private sector infrastructure and assets destroyed in the disaster. Damage includes either total or partial destruction of the assets. The assessment assumes that a certain level of damage will occur to flooded buildings, given that the exposure of wood or other traditional materials to floodwaters will require the building's repairs or replacement. The PDNA estimates include damages to building content. Losses due to disruption of access to goods and services are defined as changes in economic flows and higher costs in production arising from the disaster. They occur until full economic recovery and reconstruction is achieved, in some cases lasting for several years. Typical losses include the decline in output in productive sectors. Disaster effects also include a qualitative assessment of the increased risks and vulnerabilities resulting from the event.

**The assessment of the impact of a disaster encompasses the impact on the macroeconomy, employment, livelihoods, and households.** Economic impact at the macro level includes the estimation of the disaster's likely effects on economic performance and the temporary macroeconomic imbalances that may arise from the disaster. Social and household impact includes the impacts of the disaster on household and community livelihoods, employment, and gender.

**The assessments of disaster effects and disaster impacts assist in determining recovery needs, taking into account “build back better” (BBB) principles.** BBB is an approach to reconstruction that seeks to reduce vulnerability and improve living conditions, while promoting more effective and sustainable reconstruction. BBB uses the opportunity of having to rebuild to examine the suitability and sustainability of reconstruction activities. The identified recovery needs inform short-, medium-, and long-term recovery and reconstruction interventions through a recovery strategy. Accordingly, the principal goal of a PDNA is to help governments assess the full extent of a disaster's impact on the country and, on the basis of these findings, produce an actionable and sustainable recovery strategy for mobilizing financial and technical resources. The assessment provides a sound basis for strategic recovery planning by national and subnational authorities, helping them to prioritize, sequence, and mobilize resources, and direct resources to the needs of the most-affected populations.

### QUALITY OF LIFE INDEX

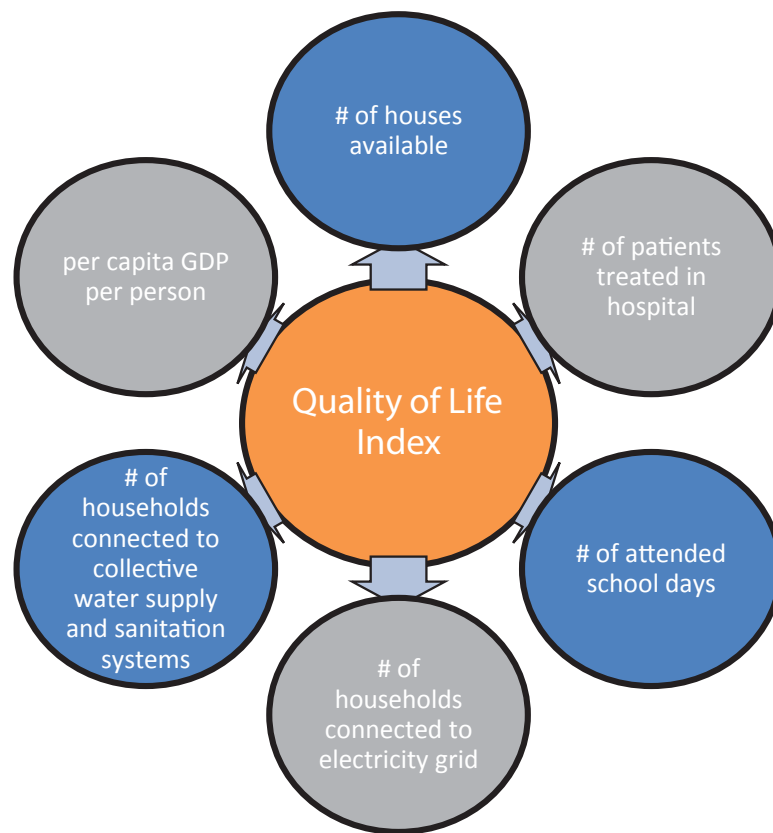
The 2015 Myanmar floods and landslides have not only had significant negative impact on the national economy, but—most importantly—have also caused an immediate and high decline in the quality of life and well-being of affected households and communities. During the 2015 Myanmar Post-Flood and -Landslide Needs Assessment (PFLNA), existing sectoral baseline information and the estimated value of the main disaster effects (as observed during field surveys) were used to estimate the sectoral indicators that define quality of life. The quality-of-life index is a composite index that has been conceived to do the following:

<sup>27</sup> EU, GFDRR, and UNDP 2013.

1. Comprehensively and quantitatively measure the disaster's impact on the quality of life through a set of selected socioeconomic indicators
2. Identify the geographical location and demographic characteristics of the most-affected population to enable to assist decision makers in prioritizing and targeting prospective recovery interventions
3. Provide a readily available quantitative post-disaster baseline that will enable national authorities and international partners to periodically monitor the improvement (or indeed further deterioration) of the quality of life during the recovery and reconstruction process<sup>28</sup>

The quality-of-life index is composed of several equally-weighted indicators that are assessed prior to the disaster, immediately after the disaster, and periodically re-evaluated during the recovery and reconstruction process (see Figure 15).

**Figure 15.**  
Quality-of-life weighted indicators



Source: Assessment team.

The composite quality-of-life index derived for the case of the Myanmar disaster focuses priorities for recovery in several ways. It provides a measure of negative disaster impact on the affected population's living conditions; it shows the impact's geographical distribution; and it provides a quantitative means to measure progress in achieving recovery over time. The quality-of-life index may be reevaluated periodically to determine the advance or progress in achieving recovery and reconstruction.

<sup>28</sup> For more detail, see the chapter on the disaster's impact on the quality of life.

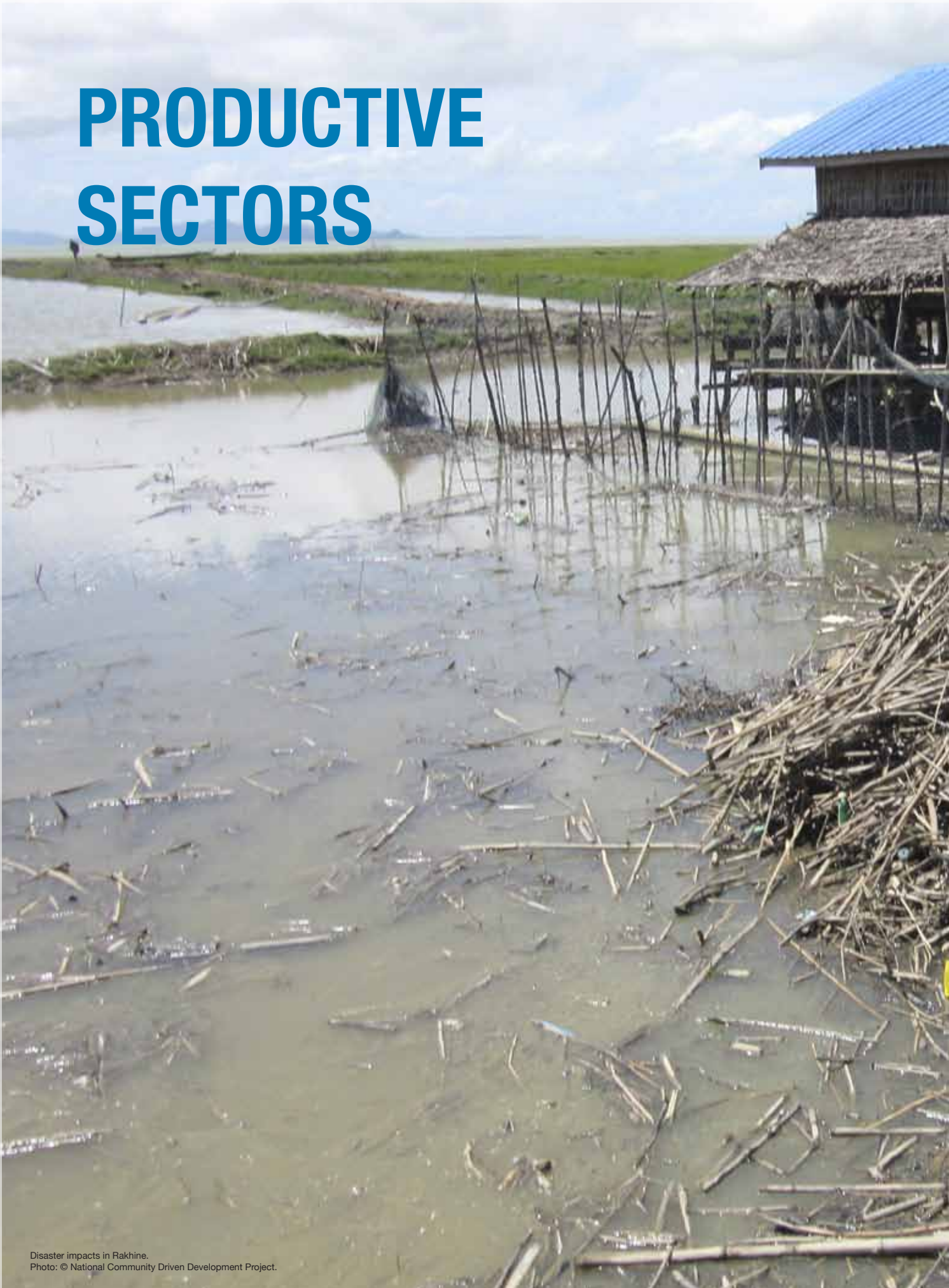
## SPECIFICS AND LIMITATIONS OF THE POST-FLOOD AND LANDSLIDE NEEDS ASSESSMENT

**The PFLNA was carried out based on data and information gathered between September 24 and October 12, 2015.** The assessment adopted a multi-sectoral and multidisciplinary approach for assessing disaster impacts and prioritizing recovery and reconstruction needs. The assessment was undertaken in coordination with the different ministries, unions, states, regions, affected communities, and development partners. Based on the recovery priorities of the affected population, the assessment synthesizes information to conduct informed analysis on damages, losses, and related needs and produces a single consolidated report. That report serves as a basis for creation of a comprehensive recovery framework that guides the design and implementation of early and longer-term recovery plans. The sectoral teams assessed the impacts of the disaster in the existing systems, along the value chains and across sectors; engaged in proper costing of economic and social recovery needs; focused on prioritizing and sequencing public interventions by geographical areas and sectors; and identified opportunities for reinforcing ongoing reforms and linking national goals.

**The assessment team was constrained by the limited time frame available for the assessment and the availability of data.** The assessment was carried out over a very condensed time period, from September 24 to October 12, 2015. Quality and accessibility of data posed challenges to the sectoral assessment teams. The government's management information processes are weak and not well-coordinated. In response to that problem and to the limited time frame, the Advisory Group to the Recovery (composed of experienced sector specialists to guide the recovery planning process) assisted sectoral teams with the interpretation and analysis of the available data. Data provided by the ministries were translated and shared with the sectoral teams. Specific constraints are described in the sectoral chapters.

**Damages in Myanmar in the 2015 disaster were not homogenous because the damages had different characteristics (depending on whether they were caused by floods, heavy rains, mud or rockslides, etc.).** Landslides caused major destruction in infrastructure, including transportation and communications, in the mountainous areas. The floods hit major agricultural areas, including regions in Sagaing, Magway, Ayeyarwady, and Bago, which jointly account for around 89 percent of the national production of crops. Across the sectors, the value of production losses was higher than that of damages to physical assets, which is typical of a disaster caused by a hydrometeorological event.

# PRODUCTIVE SECTORS





## Agriculture, Livestock, and Fisheries

### SUMMARY

**The disaster in Myanmar has damaged 20.4 percent of the cultivated area—2,952,753 hectares (ha)—in the impacted regions.**<sup>29</sup> Out this damaged area, 32.7 percent is estimated to be totally lost for production in the 2015 monsoon season. The rest of the affected area is damaged but still able to produce crops. 11.8 percent of the crop production quantity during a regular monsoon season is projected to be lost. The affected cultivated area is only a fraction of total cultivated area in the impacted regions. Total cultivated area of the 12 affected states and regions is 2,952,753 ha, implying that the floods have totally destroyed only 6.6 percent of total cultivated area. Areas planted with paddy for the monsoon season were the most affected, but fields with unharvested off-season paddy crops also suffered. Other areas growing other crops—such as pulses, groundnuts, sesame, sugarcane, and maize—were marginally affected, with very small areas fully lost.

Total damages and losses to crop production are estimated at K 389,462.7 million. Of this amount, K 54,252.6 million represents total crop damage, and K 335,210.1 million represents total crop loss. These high losses are the result of the cyclone's trajectory and timing; the flooding affected the main crop-growing regions in Myanmar during the peak monsoon production season. Destruction to plantations of perennial crops was more limited and was concentrated in tea- and rubber-producing areas in Chin and Shan States.

Total livestock damages and losses are estimated at K 17,777.9 million. Damages were estimated at K 7,627.4 million; they account for the relatively large share of total impacts because of the larger effects of floods on farmers' infrastructure (such as farm buildings and animal shelters). The losses were K 10,150.5 million. These losses include the losses in draught power for farmers, and the loss in meat and egg production.

In the commercial and artisanal fisheries subsector, the reported impact has been largely on the aquaculture ponds and the inland fisheries ponds, mostly leasable fisheries. Damages include impacts on buildings, hatchery farms, fishing gear, and equipment, including engines, boats and vehicles. Total fishery-related damages and losses were K 329,959.1 million, of which K 299.4 million was damages and K 329,659.7 million was losses.

**In aggregate, the estimated damages and losses in the agricultural sector come to K 737,199.6 million.** This amount represents 1.1 percent of national GDP and 4.2 percent of agricultural GDP. The priority now is to restore production levels in crops, livestock, and fisheries, in part by providing seeds and other material for replanting, restocking dead animals, and providing seeds to reactivate the aquaculture and inland fisheries ponds.

### PRE-DISASTER CONTEXT

**The agriculture sector, consisting of crops, livestock, and fisheries, contributes 26.6 percent of the national GDP to the Myanmar economy; it employs around 52 percent of the national labor force and provides livelihoods for over 70 percent of the population.** In 2014–2015, the crops subsector alone accounted for 18.8 percent of GDP. The active agricultural population in 2010 was 22.3 million persons, or 86.81 percent of total agricultural population. According to the 2014 Population Census, 76 percent of poor live in rural areas, and internal rural-urban migration movements are starting to drive urbanization.

<sup>29</sup> Affected states and regions in this sector are Ayeyarwady, Bago, Chin, Kachin, Kayah, Kayin, Magway, Mandalay, Mon, Rakhine, Sagaing, Shan, and Yangon.



Agricultural land represents 17.5 percent of Myanmar's total land area of 68 million ha. The country's location, a tropic monsoon climate, and an extensive coastline favor crop production and fishing. Rainfall is highly seasonal and concentrated in the hot, humid months of the southwest monsoon (May to October). In contrast, the northwest monsoon (December to March) is relatively cool and almost entirely dry. This climatology favors rice growing during almost all year.

Land ownership is the main source of social and economic disparities in rural areas. Around 41.6 percent of rural households are landless.<sup>30</sup> Size of holdings and regional cultures also influence the extent of the disparities. Regarding sources of income, the household size is the main factor determining whether household heads work in their agriculture holdings as much as they engage in nonagriculture activities.<sup>31</sup> Differences in time spent in farming by men and women depend on the traditional roles in agricultural work.<sup>32</sup>

**Crops.** Most farms in Myanmar are small in scale, with an average size of 2–3 acres (0.8–1.2 ha). The main cultivated crops are (i) rice, which covers around two-thirds of the total area under cultivation, but which has the lowest average yield among Eastern Asian countries (2.5–3.0 tons/ha); (ii) beans and pulses, which are becoming a major export crop and are farmed on around 4.2 million ha; (iii) oilseeds, grown on 3.3 million ha, with production levels insufficient for national demand; and (iv) vegetables and chilies, grown on around 0.8 million ha, principally in the highland areas. Most of the paddy in Myanmar is planted and grown during the monsoon season, starting in May. Other important crops produced during the monsoon season are sesame, groundnuts, and pigeon peas. Most beans, pulses, and oilseeds in the country are produced later, during the cool and dry seasons, when only a small number of farmers grow paddy because there is insufficient water for the crop.

Most of the rice varieties in Myanmar have long durations of growth. Around 70 percent of paddy production occurs during the last quarter of the year, between November and December, contributing to a higher volatility in rice prices. Paddy yields vary significantly across the country, but they are usually low because good-quality seeds are not widely available and because farmers lack knowledge of good farming practices. Official estimates report a paddy yield of 3.94 tons/ha in 2014–2015. Other sources report yields for dry paddy equivalent to be lower; the U.S. Department of Agriculture reports a yield of 2.7 tons/ha in dry paddy equivalent, and a 2013–2014 survey by the World Bank and Livelihoods and Food Security Trust (LIFT) reports 2.6 tons/ha in dry paddy equivalent, or 3.4 tons/ha in wet paddy equivalent. Farmers are not fully benefitting from established markets for inputs (fertilizers, seeds, pesticides). Training in and knowledge about use of fertilizers are still lacking. Informal exchanges and own savings play a significant role in Myanmar's seed sector. Around 95 percent of all rice seed planted in Myanmar, and even a higher percentage in other crops, are traded through informal systems.

**Livestock.** Livestock plays a critical role in the smallholder mixed crop-livestock systems that prevail in Myanmar. Livestock production accounts for around 7.5 percent of the overall GDP. Livestock-raising patterns differ substantially across Myanmar, depending on the agro-ecological zone and the cropping system; the role of livestock—cattle, sheep, and goats—is most important in the dry zone. According to the 2014 Population Census, 8.2 million smallholder households are engaged in keeping and/or breeding livestock and/or poultry. Available evidence suggests that these households

<sup>30</sup> Per ecoregion, landless rural households were found to be 20.9 percent of the total rural households in the hills zone, 38 percent in the dry zone, 56.2 percent in the delta, and 51.7 percent in the coastal zone, according to the World Bank's Systematic Country Diagnostic (World Bank 2014b).

<sup>31</sup> Men, usually the landless poor, engage more frequently than women in paid hard menial labor in agriculture (17.4 percent of male household heads versus 14.2 percent of female household heads), in fishing (3.6 percent versus 0.3 percent), and in forestry-related activities (24.9 percent versus 14.2 percent). Women may attend young children or earn additional income through other means, such as caring for poultry or transplanting nursery paddy (Win 2012).

<sup>32</sup> Men plough the land with oxen, and women traditionally transplant paddy. Available evidence shows that during the monsoon season, males in agricultural activities devote on average 29.1 hours per acre to the preparation of the land, versus 19.9 hours per acre spent by female. In turn, females devote slightly more time to management (caring for the crops) than men (37.8 versus 35.6 hours per acre) (Win 2012).

have in aggregate around 15 million head of cattle, 3.3 million buffalos, 5 million goats, 1 million goats, 127 million chickens, and 7.7 million of ducks. All livestock species have increased in number over the last two decades, though the chicken population has increased the most (because of an increase in commercial layer and broiler chickens). Pig, duck, goat, and sheep populations have also increased significantly. Livestock contributes significantly to households' access to animal proteins and supports the farm economy through draught power and byproducts (hides and leather). Although commercial production has developed near the main cities in the country, most of the livestock production depends on family-based systems. The shortage of livestock for draught power is one of the constraints on agricultural production in Myanmar.

**Fisheries.** Associated with Myanmar's water resources are substantial fisheries in the major rivers, along the 1,900 km of coastline, and in the 500,000 ha of mangrove swamps. By developing the potential for aquaculture in its delta region, Myanmar has doubled the fisheries production in the last decade. Fish and shrimp are now major export industries. In 2014–2015, fishery production in Myanmar amounted to 5.3 million metric tons. Of this amount, marine capture fisheries contributed 2.8 million tons (54 percent), inland fisheries 1.4 million tons (26 percent), and aquaculture 0.99 tons (20 percent). Available estimates suggest that in 2014 the landed value of fish from inland fisheries accounted for K 3.46 trillion, from leasable fisheries for K 0.54 trillion, and from aquaculture for K 2.16 trillion. Among all agricultural households, almost 5.08 percent were reported to be engaged in fishing. In 2013–2014, the sector provided employment to nearly 1.27 million fishermen and 0.22 million fish farmers, excluding employments in trading, transportation, and processing industries. Out of the households engaged in fishing, more than 80 percent did it mostly for home consumption while the rest mostly sold their caught aquatic products. In terms of boats and equipment, a total of 28,401 vessels operated in Myanmar in 2014–2015, of which 90 percent were small fishing boats and the rest offshore vessels. In the last decade the number of small fishing boats has decreased, and the nonpowered boats have decreased more rapidly than boats with small engines. In 2014–2015 a total of 2,718 sets of fishing gear were registered in the country, an increase of 23 percent over the last decade.

## POST-DISASTER SITUATION

The three crops hit hardest by the floods and landslides were paddy, groundnut, and sesame. All three suffered extensive damage.

**Crops.** As of September 16, 2015, the Ministry of Agriculture and Irrigation (MOAI) reported 601,116.3 ha of farmland (1,485,391 acres) had been flooded. This area represents around 20.4 percent of the total cultivated area in the affected areas (2.95 million ha, or 7.30 million acres). Of this flooded area, 196,277.8 ha (485,013 acres) were totally destroyed and are not expected to yield any crop.

- In terms of absolute impacted area, the main crop affected was paddy. Cyclone Komen hit Myanmar in the middle of the monsoon season, when most paddy had already been transplanted. It is estimated that 537,442.7 ha of monsoon paddy area were flooded (1,328,050 acres, 27.4 percent of the area cultivated). Out of that area, paddy production in 376,644.9 ha (930,710.0 acres) will be at least 5 percent lower than expected for a regular monsoon season. In 160,797.8 ha (397,340 acres, 8.2 percent of the cultivated area) the production is totally lost for this year.
- Most of the lost paddy plantations are in Ayeyarwady (102,058.9 ha, 252,193 acres), Bago (19,823.1 ha, 48,984 acres), Sagaing (16,921.1 ha, 41,813 acres), and Yangon (15,400.3 ha, 38,055 acres). Those states/regions contain around 70 percent of the total area cultivated with monsoon paddy this year (1,370,795.2 ha, 3,387,309 acres).
- Floods affected 6,227.3 ha of sesame (15,388 acres, 5.2 percent of the area cultivated); of this area, 5,675.5 ha (13,980 acres, 4.7 percent of the cultivated area) were totally destroyed—5,451.1 ha (13,470 acres) in Sagaing and 206.4 ha (510 acres) in Ayeyarwady.

- Floods affected 4,264.6 ha of pigeon peas (10,538 acres, 3.4 percent of the cultivated area); of this area, 913.8 ha (2,258 acres, 0.7 percent of the cultivated area) are lost for the season.
- Floods affected 4,041.2 ha of groundnuts (9,986 acres, 5.8 percent of the cultivated area); of this area, 774.2 ha (1,913 acres, 1.1 percent of the cultivated area) are completely lost for this season.
- Floods affected 2,848.2 ha of maize (7,038 acres, 9.9 of the cultivated area), of which 1,049.8 ha (2,594 acres) were in Chin State and 1,758.4 ha (4,345 acres) were in Sagaing. In total, around 8 percent of the total maize cultivated area is totally lost.

Damages in the agriculture sector also include the impact of landslides on 2,235.1 ha (5,523 acres) cultivated with paddy rice, tea, rubber, corn, and other crops in Chin and Shan.

**Livestock.** First estimates based on data from the Department of Livestock suggest that 274,260 animals were dead following the floods (around 0.6 percent of the herd in the affected areas, and 0.05 percent of the total national herd). Of these, 20,198 were large livestock (0.3 percent of the total number of cows, buffalos, pigs, and goats in the affected areas), and 254,062 were small livestock (0.7 percent of chickens and ducks in the affected areas). Some 219,408 animals raised for meat were killed, along with 9,932 large animals that helped in productive functions. The effects on the livestock subsector include damages to livestock shelters, beehives, and animal feed in Magway, Rakhine, Sagaing, and Yangon, for a total value of K 108.2 million. The 325 livestock shelters damaged are valued at K 48.8 million.

**Fisheries.** The impact on fisheries has been particularly severe. Data from the Department of Fisheries indicate that around 13,571.7 ha (33,537 acres) of fish ponds and 21,343.6 ha (52,741 acres) of shrimp ponds have been damaged. This totals 34,915.4 ha (86,278 acres) of aquaculture ponds damaged, or 18.9 percent of the total aquaculture area in 2014–2015. The most-affected region is Rakhine, where 21,344 ha (52,741 acres) of shrimp aquaculture area were damaged, equal to over 60 percent of the total damaged aquaculture area. Other regions affected by damage to fish ponds are Ayeyarwady (6,473 ha, 15,995 acres), Yangon (4,095 ha, 10,118 acres), and Bago (2,764 ha, 6,830 acres). Forty fish ponds, of which 4 are publicly owned and 36 privately owned, have been reported as damaged. Damages in fisheries include the impact on buildings, hatchery farms, electricity rooms, and other facilities, as well as on fishing materials and equipment, including engines, boats, and vehicles. With respect to inland fisheries, impact has been reported only for leasable fisheries, of which 37 have been damaged. This impact will likely reduce production by around 78,427 metric tons, or 24 percent of the expected production for this year (estimated at 326,672 metric tons).

## ESTIMATED VALUE OF THE EFFECTS AND THE IMPACT OF THE DISASTER ON THE SECTOR

The effects of the disaster in the agricultural sector have been substantial. Total effects, including damages and losses, are estimated at K 737,199.6 million, of which K 62,179.4 million are damages and K 675,020.3 million are losses (Table 5). Most of the damages have affected farmers, livestock owners, and fishermen, and include impacts on plantations of perennial crops, warehouses and storage facilities containing farmers' saved seeds, animals and livestock, private infrastructure and shelters, aquaculture facilities and fishery ponds, and fishing equipment, gear, and boats. Losses include decreases in production from totally destroyed crop-growing areas and areas with lower yields;<sup>33</sup> decreases in production of meat, eggs, and honey; and smaller harvests from aquaculture facilities and inland fisheries ponds. Losses also include the cost of animal feed and of renting animals for draught power. In aggregate, total damages and losses represent 1.1 percent of the national GDP for 2014–2015 and 4.2 percent of agricultural GDP for the same period.

<sup>33</sup> Losses to creditors providing finance for agricultural inputs are covered in the banking and finance chapter.

The disaster has severely hit some of the main crop-growing regions, including Sagaing, Magway, Ayeyarwady, and Bago (Table 6). These four regions produce around 92.4 percent of crops nationwide.

- In absolute terms, the most affected regions/states are Sagaing (agricultural damages and losses of K 100,761.5 million, or 3.4 percent of agricultural regional GDP), Ayeyarwady (K 166,157.3 million, 5.6 percent), Bago (K 185,065.0 million, 9.6 percent), Mandalay (K 100,988.2 million, 6.6 percent), and Yangon (K 87,613.8 million, 10.1 percent).
- Even in regions with a smaller agricultural sector, the disaster has had a large impact. In Chin State, the K 9,515.3 million of total damages and losses represents 9.2 percent of agricultural regional GDP (4.1 percent of total regional GDP); in Rakhine State, the K 47,631.7 million of total damages and losses represents 7.8 percent of agricultural GDP in the region (1.6 percent of total regional GDP).

**Table 5.**

Quantification of damages and losses by subsector (million K)

Subsector	Damage			Loss			Total effects		
	Value	Public	Private	Value	Public	Private	Value	Public	Private
Crops	54,252.6	0.0	54,252.6	335,210.1	0.0	335,210.1	389,462.7	0.0	389,462.7
Livestock	7,627.4	0.0	7,627.4	10,150.5	0.0	10,150.5	17,777.9	0.0	17,777.9
Fisheries	299.4	75.0	224.4	329,659.7	0.0	329,659.7	329,959.1	75.0	329,884.1
<b>Total</b>	<b>62,179.4</b>	<b>75.0</b>	<b>62,104.4</b>	<b>675,020.3</b>	<b>0.0</b>	<b>675,020.3</b>	<b>737,199.6</b>	<b>75.0</b>	<b>737,124.6</b>

Source: MOAI; MLFRD.

**Table 6.**

Geographic distribution of damages and losses (million K)

Geographic distribution of damage and losses	Damage			Losses			Total effects		
	Value	Public	Private	Value	Public	Private	Value	Public	Private
Ayeyarwady	7,808.4	0.1	7,808.3	158,348.8	0.0	158,348.8	166,157.3	0.1	166,157.1
Bago	23,746.6	0.0	23,746.6	161,318.4	0.0	161,318.4	185,065.0	0.0	185,065.0
Chin	6,232.6	2.0	6,230.6	3,282.7	0.0	3,282.7	9,515.3	2.0	9,513.3
Kachin	40.6	0.0	40.6	4,329.6	0.0	4,329.6	4,370.2	0.0	4,370.2
Kayah	0.3	0.0	0.3	65.8	0.0	65.8	66.2	0.0	66.2
Kayin	10.3	0.0	10.3	49.6	0.0	49.6	59.9	0.0	59.9
Magway	708.2	3.5	704.7	30,680.4	0.0	30,680.4	31,388.5	3.5	31,385.0
Mandalay	48.0	13.0	35.0	100,940.2	0.0	100,940.2	100,988.2	13.0	100,975.2
Mon	229.2	0.0	229.2	329.4	0.0	329.4	558.6	0.0	558.6
Nay Pyi Taw	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rakhine	11,940.7	45.4	11,895.3	35,691.0	0.0	35,691.0	47,631.7	45.4	47,586.3
Sagaing	4,255.4	2.2	4,253.2	96,506.1	0.0	96,506.1	100,761.5	2.2	100,759.3
Shan	187.5	0.0	187.5	2,835.9	0.0	2,835.9	3,023.4	0.0	3,023.4
Yangon	6,971.6	8.8	6,962.8	80,642.3	0.0	80,642.3	87,613.8	8.8	87,605.0

Source: MOAI; MLFRD.

**Crops.** Early estimates suggest that losses in crop production total K 335,210.1 million. Monsoon paddy is the single most affected crop. The area of monsoon paddy production totally destroyed by floods translates into 1,370.2 thousand metric tons (65.6 million baskets) of lost paddy production, 21.3 percent of the expected paddy production for this season. Of that lost production, 560.3 thousand metric tons (26.8 million baskets) correspond to production areas that were totally destroyed, and the rest to areas where production will be lower than expected. The value of the total losses is estimated at almost K 312,324.7 million. The most affected regions are Ayeyarwady, with a loss of around 727.2 thousand metric tons (34.8 million baskets, 63.3 percent of the expected production), Sagaing (193.1 thousand metric tons or 9.2 million baskets lost, 50 percent of the expected production), Bago (185.7 thousand metric tons or 8.9 million baskets lost, 8.4 percent), and Yangon (121.72

thousand metric tons or 5.8 million baskets, 15.9 percent). Other crops affected (with a lower value of production) are groundnuts, with a loss of 5.13 thousand metric tons (0.2 million baskets, 2.8 percent of the expected production and valued at K 5,648.1 million), maize (14.35 thousand metric tons or 0.6 million baskets, 17.5 percent of the expected production and valued at K 2,730.7 million), and sesame (5.51 thousand metric tons or 0.2 million baskets, 9.6 percent of the expected production and valued at K 5,230.6 million).

**Livestock.** Total damages in the livestock subsector have been estimated at K 7,627.4 million, of which damages due to dead animals are K 7,470.5 million. Regions most affected by damages due to dead animals are Rakhine (K 6,099.7 million), Sagaing (K 660.4 million) and Ayeyarwady (K 296.5 million). Damages to private infrastructure have been estimated at K 108.2 million, and damages to private animal shelters at K 48.8 million. Estimates of losses amount to K 10,150.5 million; the most significant of these are reductions in revenues from available draught power (K 8,265.3 million), meat production (K 1,122.2 million), and egg production (K 540.7 million).

**Fisheries.** Damages in the fisheries subsector have been relatively modest but losses were severe. Damages are estimated at K 299.4 million. Aquaculture facilities and hatchery farms have been damaged in Bago, Rakhine, Yangon, and Magway. Damages to fishing gear, equipment, and boats total K 131.5 million; to aquaculture facilities K 42.1 million; and to fishery ponds K 78.4 million. The losses in inland fisheries amount to K 303,425.2 million. In the aquaculture ponds, official losses in the fish ponds are K 20,960.3 million, and in the shrimp ponds they are K 5,274.1 million, totaling K 26,234.4 million. The most recent estimates, from 2013–2014, indicate that production value for the leasable fisheries is no less than K 540 billion, and for the aquaculture ponds it is over K 2,159.8 billion. Based on these estimates, the total losses in inland fisheries represent 56.2 percent of the total production value in the referred year, and the losses in aquaculture ponds represent 1.2 percent.

The loss of income for the 1.1 million people affected by the floods, and the extensive damage to critical infrastructure linking farms to markets, will have negative multiplier effects on the supply of agricultural produce. The flooding will negatively affect the main rice crop (harvested in October–December), currently at an early reproductive stage.

**Impact on crops.** The disaster will most likely result in a reduced yield in all affected areas, especially in the paddy fields. Reduced production will lead to a decrease in the demand for seasonal labor, and this demand is expected to decrease even further during the upcoming monsoon harvesting season and the following winter season.<sup>34</sup> Reduced production will also have a direct impact on the incomes available to farmers and workers. In addition to the immediate risk posed to food security, lower household incomes will diminish access to agricultural inputs (mainly seeds and fertilizers) necessary for the upcoming winter and summer agricultural seasons. Replanting has already been carried out in some regions/states, but the expected yield in these areas will quite likely be lower due to the delay in sowing and the impossibility of using good agricultural practices. To cope with the income losses, people are borrowing food and seeds from local markets, or taking out loans from money lenders at high interest rates (minimum 10 percent). Agricultural banks do not provide loans to buy small livestock, which are an important economic asset. The production decrease will have longer-term impacts on household income and food consumption which may lead to increased economic vulnerability and food insecurity.

In addition to the loss of their primary crops and decreases in household incomes, farmers face other difficulties. Agricultural land is still covered by water as well as mud, sand, and debris. This situation might hamper winter and summer crop production. After the floodwaters receded, most farmers cultivated varieties of crops with a shorter growing period, largely by spreading seeds on the land as opposed to transplanting and sowing. Farmers also lacked the cash to hire laborers for weeding.

<sup>34</sup> The proposed recovery and rehabilitation activities may offer alternative employment opportunities and income sources that could on a temporary basis offer relief to workers affected by a drop in demand for farm-related seasonal labor. One example could be setting up cash-for-work programs that paid delta farmers to reclaim and rehabilitate streams, ponds, and creeks in order to improve water retention for crop irrigation, support aquaculture, and reduce the likelihood of flooding.

**Impact on livestock.** The damage to the livestock subsector—primarily the death of animals but also damage to infrastructure such as animal shelters, beehives, and feed stock—will reduce productive physical assets and have an impact on the food, nutrition, and economic security of the population affected. Significant loss of small livestock will particularly affect women’s livelihoods and household food consumption.

Losses of draught power caused by the death of livestock were also considered in monetary terms. Larger animal such as buffalos and cows are often used for land preparation and transportation of goods during the agricultural season. The loss of these animals could also further constrain the capacity of affected households to prepare land for the upcoming agricultural winter season. The farmers who lost animals will need to rely on third-parties rental, imposing additional costs to their household budgets.

**Impact on fisheries.** The damages to fisheries mainly refer to fish and shrimp pond infrastructure that was damaged by the floods. The impacts on boats, fishing gear, nets, and other fishing equipment was also considered as part of the calculation. Most of the impacts of the disaster on open freshwater fishing were due to rising water levels in the rivers, which prevented fishers from continuing their fishing activities. The loss of almost 35,000 ha of fish and shrimp ponds from floods and landslides has resulted in a loss of income and food for fishers, which is likely to lead to a lower nutritional status. Several fish ponds were flooded and most of the farmed fish escaped, resulting in high production losses. In Rakhine alone, more than 20,000 ha of shrimp ponds were affected.

The fishery/aquaculture losses were due mainly to a lower catch in inland waters (especially rivers), a result of fishers’ inability to continue their activities in high waters coupled with reduced access to fishing boats and gear after the flood. Losses also included reduced production in fish/shrimp ponds. In fact, the farmed fish and shrimp were lost or died due to the flood and could not be used to generate income (sale) or for consumption. This situation could also lead to an increased level of malnutrition, especially among households relying on fish proteins as part of their diet.

## RECOVERY AND RECONSTRUCTION STRATEGY

**The estimated cost of recovery and reconstruction for the agriculture, livestock, and fisheries subsectors is K 395,577.4 million** (Table 7). This cost was estimated using the DALA (damage, loss and needs assessment) methodology. The estimation of financial needs to achieve post-disaster recovery and reconstruction is based, respectively, on the value of the production losses<sup>35</sup> and the value of damages to physical assets.<sup>36</sup>

These interventions will build on and continue the efforts of the government of Myanmar to delivery an early recovery response. Until September 16, 2015, this early response included distribution of rice seeds for replanting (94 metric tons); assistance of rice food (K 98 million); feed supplement and animal feed (over K 147 million); distribution of small livestock (2,500 ducks, 5,000 chickens) for restocking in Ayeyarwady and Sagaing Regions (over K 10 million); and quick small-scale vocational training on pasture management, animal feeding management, and animal caring.

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<sup>35</sup> Economic recovery activities are essentially short- to medium-term interventions designed to mitigate and shorten the sectoral, macroeconomic, and personal or household disaster impact. Recovery activities in the agricultural sector normally include replanting the crops eliminated by the disaster, preventing and controlling animal disease, providing animal food and replanting pasture, restocking fry and fingerlings, and making in-kind donation of tools and gear for the fishermen. The amount of financing or needs for recovery is estimated on the basis of a fraction of the value of production losses (usually 35 to 45 percent of the production losses).

<sup>36</sup> Reconstruction refers to the replacement or repair of physical assets destroyed or damaged by disasters. Following a post-disaster “building back better” strategy, those assets are rebuilt with the inclusion of improved, disaster-resilient standards to ensure continued availability after disasters, and to reduce the negative impact of such events in the future. The needs for reconstruction in the agriculture sector are estimated as a function of the value of assessed damage, using a coefficient ranging from 1.25 to 1.45.

Short term (up to 4 months)	Program of activity	Value	Responsible agency
Agriculture	Distribute seeds and other inputs for off-season replanting in affected areas	13,476.1	MOAI
Agriculture	Support off-monsoon rice and crop diversification in Ayeyarwady delta and other affected areas: equipment <sup>a</sup> , land preparation.	31,565.4	MOAI
Agriculture	Support off-monsoon rice and crop diversification in Ayeyarwady delta and other affected areas <sup>b</sup> : refinancing needs	42,204.3	MOAI, MADB
Agriculture	Support off-monsoon rice and crop diversification in Ayeyarwady delta and other affected areas: soft-lending needs (1/2)	75,904.9	MOAI, MADB
Livestock	Provide animal feed, vaccinations, and veterinary services (including soft lending programs, particularly for cattle and pigs, and livestock bank programs)	3,686.8	MLFRD
Fisheries	Provide seeds, fingerlings, medicines for aquaculture facilities and inland fisheries	62,635.3	MLFRD
<b>Subtotal short term</b>		<b>229,472.9</b>	
Medium term (up to 12 months)	Program of activity	Value	Responsible agency
Agriculture	Heavy-machinery rehabilitation works in landslide-affected areas in Chin and Shan States (combined with the use of various contractual services provided by local private contractors, and the use of local work force under cash-for-work and food-for-work programs)	8,008.4	MOAI
Agriculture	Rebuild affected farmers' stocks of own-saved seeds and planting material (including farm implements, tools, and local storage facilities, especially seed stock storage facilities)	69,512.4	MOAI
Agriculture	Rehabilitate landslide-affected plantations of perennial crops in Chin and Shan States (6 years)	1,185.0	MOAI
Agriculture	Support off-monsoon rice and crop diversification in Ayeyarwady delta and other affected areas: soft-lending needs (2/2)	75,904.9	MOAI, MADB
Livestock	Rehabilitate and rebuild private infrastructure, including animal shelters	227.5	MLFRD
Livestock	Restock animal herds and build capacities (including in animal management and health care, pasture management), provide livestock banks	10,832.2	MLFRD
Fisheries	Restore fishing gear, equipment, and boats	190.7	MLFRD
Fisheries	Rehabilitate aquaculture facilities and ponds	174.8	MLFRD
Fisheries	Rehabilitate and rebuild buildings and other facilities	68.6	MLFRD
<b>Subtotal medium term</b>		<b>166,104.5</b>	
<b>TOTAL</b>		<b>395,577.4</b>	

**Table 7.**  
Recovery and reconstruction needs (million K)

Source: PFLNA estimates.

Note: MADB = Myanmar Agricultural Development Bank.

a. Water pumps and agriculture machinery for existing crops and post-monsoon crops are especially needed.

b. Ayeyarwady delta comprises Ayeyarwady Region, Bago Region, and Yangon Region.

## RECOVERY AND RECONSTRUCTION PLAN

**In the short term (up to the first four months), the main priorities for each subsector account for K 229,472.9 million.** Recovery in the agriculture sector would need to focus on immediate activities aimed at the restoration of production levels.

The recovery actions for the crops subsector are estimated to cover the following:

- Distribution of seeds and others planting material, fertilizers, pesticides, machinery for land preparation, and pumps for areas where water resources are available in the post- and pre-monsoon seasons and where supplementary irrigation is feasible. The cost for providing this assistance is estimated at K 13,476.1 million.
- Support for off-monsoon rice and crops diversification in the Ayeyarwady delta (Ayeyarwady Region, Bago Region, and Yangon Region) and other affected areas where feasible. This intervention will provide quick relief in one of the worst-hit areas, which depends heavily on rain-fed rice cropping, and it will also pave the way to diversification of the cropping system. The intervention consists of two components: (i) prepare land using small farm machinery and low-lift pumps (and diesel) for supplementary irrigation (K 31,564.4 million); and (ii) support refinancing and soft-lending needs of affected farmers. The first component primarily aims to improve productivity, so that both post- and pre-monsoon crops can be cultivated in most of the delta regions with access to fresh water.<sup>37</sup> The second component will need to address the total refinancing needs in the Ayeyarwady Delta of K 42,204.3 million, and the total soft-lending needs of K 151,809.9 million. The recommendation is that half the soft-lending needs be met in the short term, and the other half in the medium term.<sup>38</sup>

The recovery intervention for the livestock subsector aims to build on and expand the early response delivered by the government, and could include distribution of animal feed, vaccinations, and veterinary services to livestock owners, at a cost of K 3,686.8 million.

The recovery intervention for the fisheries subsector could include distribution of seeds, fingerlings, and medicines for aquaculture facilities and inland fisheries ponds, at a cost of K 62,635.3 million.

**In the medium term (within the first 12 months), the prioritized interventions are estimated to amount to K 166,104.5 million.** Reconstruction could include the following: replacement of tools and machinery; restocking of lost animal feed stock; reconstruction/rehabilitation of agriculture and irrigation infrastructure, fish ponds, small farmer-managed irrigation systems, and privately owned small farmers' embankments; and rehabilitation of agricultural land.

The reconstruction needs for the crops subsector include the following:

- Rehabilitating landslide-affected areas with heavy machinery in the Chin and Shan States, estimated at K 8,008.4 million.
- Restoring the stock of saved seeds and planting materials of affected farmers across the country, estimated at K 69,512.4 million.
- Rehabilitating landslide-affected plantations of perennial crops in the Chin and Shan States, estimated at K 1,185.0 million. This intervention focuses on lost area planted with tea and rubber.
- Supporting refinancing and soft-lending needs so affected farmers can grow off-monsoon rice and diversify crops in Ayeyarwady delta, estimated at K 75,904.9 million, corresponding to the other half of the total estimated soft-lending needs in the delta.

<sup>37</sup> For example pre-monsoon jute, rain-fed rice, and post-monsoon oilseeds/pulses were highly successful in the 1970s. In the present time, crops that can be cultivated in this way throughout the year include sesame in the pre-monsoon season, rain-fed rice in the monsoons, and pulses, maize, sunflower, and groundnuts in after the monsoon (cool season).

<sup>38</sup> As explained in the chapter on the banking and finance sector, the estimates of loans needing refinancing and the soft-lending needs do not only relate to Myanmar Agriculture Development Bank operations, and they assume a large proportion of loans from informal lenders, which are outside the usual scope of the financial sector operations. As the scale of doubtful loans is confirmed and the formal lenders build up their capacities, the financial sector could be in a better position to meet partially the refinancing and financing needs estimated for the sector.



The reconstruction needs for the livestock subsector include the following:

- Rehabilitating and rebuilding private infrastructure of livestock owners, including animal shelters, estimated at K 227.5 million.
- Restocking animal herds and scaling up capacity building in animal management, animal health, and pasture management in affected townships. The total cost of these activities is estimated in K 10,832.2 million.

The reconstruction needs for the fisheries subsector include the following:

- Restoring fishing gear, equipment, and boats, estimated at K 190.7 million.
- Rehabilitating aquaculture facilities and ponds, estimated at K 174.8 million.
- Rehabilitating and rebuilding buildings and other facilities, estimated at K 68.6 million.

## RECOVERY AND RECONSTRUCTION IMPLEMENTATION

**Implementation will be carried out under the leadership of MOAI and MLFRD, with support from development partners.** Given the urgency of the situation, a fast-track institutional mechanism with the required delegation of authority will be applied, and activities under both recovery and reconstruction will have to start simultaneously. Both ministries can avail themselves of and deploy the necessary capacity and procedures for setting up such a mechanism, and can implement the proposed activities.

Nevertheless, delivery within the indicated time frame remains a challenge, given other likely country-specific constraints (for instance, whether the domestic market can ensure a quick supply of the required inputs). As explained in the chapter on the banking and finance sector, it is not currently feasible to reach the full amount of refinancing and lending needs identified for the crops subsector. These needs are far higher than what the current financial sector in Myanmar can manage, even with cash injections and capacity growth in the near future. Even assuming an increase in the capacity of the formal financial system in the near future, a large proportion of the identified needs in the agriculture sector will remain unmet.

The short-term recovery interventions would aim at enabling farmers to continue with their agricultural activities for the upcoming winter and summer seasons (distribution of seeds, fertilizers, etc.), as well as rehabilitating the agricultural land covered by sediment and debris. In this context, direct cash transfers to the affected households could help them quickly buy inputs and invest in agricultural production recovery. In addition, extension services are required for production of typical dry season crops, such as beans and pulses, oil seeds, paddy, maize, and sugarcane. Dry season paddy usually requires irrigation systems with access to water, which cover only 15 percent of total monsoon paddy area. Livestock restocking and reconstruction of animal shelters, together with distribution of animal feed and vaccines, will be given utmost priority; the most vulnerable households—for which livestock represent a significant source of food, nutrition, an income security—should be targeted. To restore the fishery and aquaculture subsector, fish/shrimp ponds should be rehabilitated, and new fishing equipment, together with fingerlings and fish feed, should be provided.

Medium-term interventions should focus on strengthening the food value chains, ensuring the integration of smallholders, mainstreaming crop diversification, promoting adoption of good agricultural practices, and implementing trainings, as well as developing climate change adaptation measures that contribute to the disaster recovery and reconstruction.

Recovery and reconstruction interventions will pay particular attention to existing disparities between landless poor rural households, smallholder farmers, and large landowners. A robust information system consisting of data collection, analysis, and monitoring and evaluation will be put in place to ensure efficient, transparent data that can be disaggregated by gender.

## SECTOR ASSESSMENT METHODOLOGY

The assessment is based mainly on secondary information and on interviews with high-level government senior advisors and government staff from the MOAI and the MLFRD. Meetings with government officials were held at the beginning and the end of the analysis process to validate the information received and to seek endorsement on the estimates of damages and losses. The team of high-level national senior advisors was convened by the government to assist and provide the assessment team with expert knowledge on the sectoral background, context, and trends.

Baseline data were sourced from the Agricultural Census 2010 and the Population Census 2014. Other relevant sources were agriculture country briefings, market-price bulletins elaborated by the MOAI, and reports from the United Nations Food and Agriculture Organization, LIFT, World Bank, and other international organizations working in Myanmar. The post-disaster quantitative data on damages and losses were sourced from the government, and consisted mostly of notes reporting on and assessing post-disaster data from MOAI and MLFRD. Data were collected through reports from the regional offices for each department at the central level in Nay Pyi Taw.

Given some limitations in the available and reported data, losses in crop production and artisanal fisheries might not be fully accurate, and will likely be overestimated:

- MOAI-reported regular yields for paddy rice during monsoon season are higher than those of other available sources. Yields are assumed to apply to wet paddy, so a moisture-related correction should be applied.
- Specific information on the damaged irrigation schemes in the affected areas was unavailable. Thus estimates on crop losses factor in lower yields only during the monsoon season, when the floods hit. But that impact on lower yields will likely extend to the following seasons and last until those schemes are fully rehabilitated.
- Disaggregated data on catches in inland fisheries were not available. Production volume and prices for inland fisheries are based on FAO-led surveys in selected areas carried out in 2013–2014. Production volume was corrected assuming the same growth rate of production as reported in the Fishery Statistics 2015 (published by the Department of Fisheries, MLFRD). Prices were assumed to range between US\$1.16 and US\$3.19 per kg of catching, and were later corrected with a 7.5 percent inflation rate. Both the assumptions and the corrections were discussed with and validated by members of the national senior advisors team.
- Disaggregated data on aquaculture production, both amount and production value of fish and shrimp ponds, were unavailable. Thus the estimates of aquaculture losses were elaborated at a national aggregate level based on the expert knowledge of national senior advisors and on information provided by private stakeholders currently operating in the subsector.



Damaged embankment.  
Photo: © Enlightened Myanmar Research.

## Water Resource Management (Irrigation and Flood Control)

### SUMMARY

**The mid-2105 floods had a severe impact on water resources and irrigation infrastructure.**

In higher mountain regions, high discharge rates and debris caused damage to infrastructure such as spillways, weirs, and river embankments. In lower areas, wide spatial flooding damaged irrigation infrastructure and weakened dikes. No major damage to key infrastructure such as dams was reported. The overall cost of damage amounts to K 13,277 million. All damaged assets reported in this chapter were publicly owned, and no losses were identified for this sector (losses in agricultural production are reported in the agriculture sector chapter).

Myanmar is endowed with abundant water resources. High annual rainfall is common, and river discharge tends to vary spatially and by season. Water resources thus play a key role in disaster risk and require sound management—though this remains a major challenge in the country. Given that most of the population relies on agriculture, Myanmar has significant opportunities for fully developing its irrigation potential. Overall recovery needs in the short term (four months) and medium term (up to one year) amount to K 20,669 million and should aim to do the following:

- Restore damaged infrastructure, including embankments and sluice gates for the protection of tidal sea water intrusion and embankments protecting urban areas as well as agricultural land from river floods
- Restore secondary/tertiary irrigation infrastructure
- Perform thorough safety check on key infrastructure, including all affected dams and weirs
- Conduct strategic dredging in major drainage systems and in rivers
- Consider key no-regret investments in water infrastructure
- Conduct an initial capacity gap analysis and develop capacity building and training strategies

Considering Myanmar's fragmented institutional setup and reactive way of dealing with water resources, the most important recommendation is to move **toward integrated management of water resources**. This includes

- Strengthening the ongoing work of the National Water Resources Committee (NRWC) on the development of a sound legal and institutional basis for improved water resources management
- Strengthening technical and managerial capacity and financial resources
- Adopting key approaches for planning, operating, monitoring, and forecasting measures
- Strengthen the consideration of water related no-regret investments

### PRE-DISASTER CONTEXT

**Sector background.** Myanmar is endowed with rich water resources. Rainfall is abundant—around 2,300 mm per year—though with high variability between regions, from 500 mm in the central dry zone to 6,000 mm in the coastal and mountain regions. The levels of the many rivers also vary significantly between monsoon and dry season. Most rivers are entirely on Myanmar national territory, a great advantage for river basin management. Myanmar is affected by tropical cyclones, which cause flooding and droughts; these impacts will likely intensify because of climate change. The mostly undeveloped rivers carry large amounts of sediments, and unrestricted mining and poor sanitation make water quality an increasing concern. Groundwater availability is a significant but yet unquantified resource.

Water resources are also the basis for and a key element in many other sectors. Most of Myanmar's rural poor are located in the dry zone and along the Ayeyarwady delta, and they rely on water resources and agriculture for their livelihood. Out of all the cultivated agricultural area, only 12 percent is irrigated. Seventy percent of Myanmar's irrigated agriculture production is located in the dry zone, although most of these schemes function below their potential and there is great opportunity for

irrigation improvement and expansion. Moreover, Myanmar has yet to realize the full potential of different water harvesting approaches in different regions. The Ayeyarwady Integrated River Basin Management Project has started to initiate such approaches.

Myanmar has a large hydropower potential of around 100,000 megawatts (MW), of which only 2,600 MW has been developed. The government is increasingly interested in sustainably developing hydropower, and wishes to manage controversies over hydropower developments better than in the past. If not well managed, water resources constitute one of the biggest potential natural hazards in Myanmar, as this latest disaster proves. Any disaster risk management strategy will have to include a comprehensive approach to forecasting rainfall events as well as manage river discharge and reduce the impact of damages water resource management infrastructure on the economy and livelihoods.

**Legal and institutional framework.** A legal and institutional framework to manage water resources in Myanmar is being developed. The current fragmented framework includes outdated sectoral laws, involves over 34 government agencies in water management, and faces daunting capacity and budgetary challenges. No single institution has the overall mandate to manage water resources, and there is no river basin organizations authority to manage water at basin level. Although some river basin organizations have recently emerged and water user associations exist, their functions and mandate are unclear. The National Water Resources Committee (NWRC) was established in 2013 to promote cooperation between the sector agencies. The National Water Policy includes considerations for establishing river basin organizations. Myanmar currently has one research-based river basin organization, namely the Ayeyarwady River Basin Research Organization, a member of the Network of Asian River Basin Organizations. Other socially active organizations that voice their concerns on damming the rivers, however, do not function as river basin organizations. Annex 4 provides a more detailed description of the water resources sector in Myanmar.

## POST-DISASTER SITUATION

Effects on water resources and irrigation infrastructure and assets. The widespread floods and landslides that occurred between July and August 2015 had a severe impact on water resources and irrigation infrastructure. The biggest damages were caused by extreme discharge rates in rivers, which not only damaged assets but also caused soil erosion and severe flooding of farmland. In the Ayeyarwady delta, the floods covered a large spatial area; they caused less physical damage than in mountainous areas but had more impact on the basic structure of dikes and dams.



**Figure 16.**

Damage to side structure of Mone Dam spillway and erosion of the river bank

In the mountainous region of central and northern Myanmar, rainfall levels and river discharge rates reached unprecedented levels. Most residents said they had never seen such levels before. The consequence was damage to dam spillways (Figure 16) and river embankments, along with erosion of side slopes and the structure of weirs. Though no breach of dams, weirs, or large irrigation canals occurred, the situation was very serious, with water levels rising dangerously high in some reservoirs. In the Magway Region, for instance, water levels in the Mone Dam reservoir reached 1 m below the crest.

**Figure 17.**  
An official of the Regional Irrigation Department indicates the water level during the peak flood in Mone River, Magway Region



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The floods also caused morphological changes. River banks eroded, in turn damaging and threatening the stability of roads and other infrastructure. In numerous locations, water overtopped river banks and flooded communities with water levels far above normal. In one location at the Mone River, the team witnessed flood marks of more than 10 m above the current water levels (Figure 17 and Figure 18). In several locations, newly eroded river channels cut through existing agricultural areas. Along riverbeds and floodplains, remaining wooden debris indicated the level of sedimentation that occurred during the event. The Dutch Disaster Risk Reduction Team reported up to 3 m of silt deposited in some locations. It should be noted that rivers are naturally dynamic in Myanmar, due to the highly variable monsoon climate and the high sediment levels. River bank erosion is often a natural and healthy process, although the level of risk can be quite high if assets are placed inappropriately.

**Figure 18.**  
A resident marking the water level, at around 3 m above the ground. The house was located at least 5–10 m above the current level of the river.



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In the Ayeyarwady delta, inundation occurred in the floodplain, with relatively low flood levels over a relatively large area. This flooding especially affected unprotected villages and settlements in flood-prone areas. Further affected were agriculture areas and related flood-protection and irrigation infrastructure, from larger diversion canals to tertiary irrigation infrastructure such as gates and embankments. Breaches occurred at several of the small-scale dams, especially those built with natural materials, but also took place at some of the concrete-reinforced embankment structures.



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**Figure 19.**  
Temporary  
repair of an  
irrigation canal  
undertaken by  
local authorities

**Increased risk and vulnerabilities.** As described above, flooding did not cause any major failure of key infrastructure like dams or dikes. Damage to spillways and weirs reached several million U.S. dollars in cost, but did not impede the flow of water. Similarly, damages to irrigation canals and embankments are high in the number, but do not constitute a structural failure of a whole irrigation system. Initial repairs, including temporary repairs with sandbags to irrigation canals to prevent inundation of agricultural farm plots and restore the flow of water for irrigation, were done fairly soon after the event by responsible authorities.

The disaster did expose, however, the overall level of risk and vulnerability that exists in Myanmar. No coherent and systematic analysis of the underlying causes of this flood event is being undertaken; there is no comprehensive collection and monitoring of data, modeling and forecasting, or risk analysis. Flood protection standards are not periodically updated based on new information and analysis.

## ESTIMATED VALUE OF THE EFFECTS AND THE IMPACT OF THE DISASTER ON THE SECTOR

Most reported damages (about 77 percent) are to dam spillways, river embankments, and main irrigation networks. More than 90 percent of the damaged water resources and irrigation assets are located in three regions: Magway Region (52 percent), Rakhine State (24 percent), and Sagaing Region (15 percent).

All assets reported damaged (Table 8) were publicly owned. There may have been damages and losses to privately owned assets, but these were not identified or quantified within this sectoral assessment. Possible damage to private assets was included in the agriculture sector chapter. No losses were reported by the government agencies involved in the Myanmar post-flood and -landslide assessment. Potential losses, such as decreases in revenues due to hydropower station downtime, would be calculated under the electricity sector chapter.

**Table 8.**  
Quantification  
of damages and  
losses  
(million K)

Water resources and irrigation	Damage			Loss			Total effects		
	Total Value	Public	Private	Total Value	Public	Private	Total Value	Public	Private
Dams, weirs, spillways	4,944	4,944	—	n.a.	n.a.	—	4,944	4,944	—
River embankments	4,144	4,144	—	n.a.	n.a.	—	4,144	4,144	—
Irrigation systems	3,500	3,500	—	n.a.	n.a.	—	3,500	3,500	—
Pumps and other assets	689	689	—	n.a.	n.a.	—	689	689	—
<b>Total</b>	<b>13,277</b>	<b>13,277</b>	<b>—</b>	<b>n.a.</b>	<b>n.a.</b>	<b>—</b>	<b>13,277</b>	<b>13,277</b>	<b>—</b>

Source: Assessment team calculations.  
Note: n.a. = not applicable; — = not available.

**Figure 20.**  
Damage  
to spillway  
channel at  
Kyeoo Kyeewa  
Dam in Magway  
Region



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**Table 9.**  
Geographic  
distribution of  
damage and  
losses  
(million K)

State/Region and irrigation	Damage			Loss			Total effects		
	Total Value	Public	Private	Total Value	Public	Private	Total Value	Public	Private
Ayeyarwady	386	386	—	n.a.	n.a.	n.a.	386	386	—
Bago	124	124	—	n.a.	n.a.	n.a.	124	124	—
Chin	273	273	—	n.a.	n.a.	n.a.	273	273	—
Kachin	40	40	—	n.a.	n.a.	n.a.	40	40	—
Magway	6,940	6,940	—	n.a.	n.a.	n.a.	6,940	6,940	—
Mandalay	32	32	—	n.a.	n.a.	n.a.	32	32	—
Rakhine	3,215	3,215	—	n.a.	n.a.	n.a.	3,215	3,215	—
Sagaing	1,938	1,938	—	n.a.	n.a.	n.a.	1,938	1,938	—
Shan	323	323	—	n.a.	n.a.	n.a.	323	323	—
Yangon	6	6	—	n.a.	n.a.	n.a.	6	6	—
<b>Total</b>	<b>13,277</b>	<b>13,277</b>	<b>—</b>	<b>n.a.</b>	<b>n.a.</b>	<b>n.a.</b>	<b>13,277</b>	<b>13,277</b>	<b>—</b>

Source: Irrigation Department, Department of Water Resources Utilization (both within the Ministry of Agriculture and Irrigation), Department of Water Resources and Improvement of River Systems (Ministry of Transport).  
Note: n.a. = not applicable; — = not available.



## RECOVERY AND RECONSTRUCTION STRATEGY

**Long-term vision.** Water resources are a fundamental part of Myanmar's overall development, and any long-term vision for the sector will need to be based on interactions and linkages with other sectors like agriculture (through irrigation systems), energy (through hydropower generation), transport (using rivers for water transport, industry, cultural/ecotourism, water and sanitation (domestic water supply), and disaster risk management.

The short- and medium-term recovery and reconstruction strategy therefore has to be embedded in a larger vision of integrated water resources management in Myanmar. This is not only a matter of policies, investments, and implementation. It further requires a shift in thinking from a reactive to a proactive approach to managing water resources. In order to provide long-term guidance for the proposed recovery strategy, we briefly describe key aspects of sound integrated water resources management and then offer details on the short- and mid-term recovery plans.

To manage water as a valuable resource as well mitigate disaster risks, Myanmar should

- Provide a sound legal and institutional basis for improved water resources management
- Strengthen technical and managerial capacity and financial resources
- Adopt key approaches for planning, operating, monitoring, and forecasting measures
- Consider key water-related no-regret investments

**Strengthening of the National Water Resources Committee.** Considering the fragmentation of institutions responsible for water resources, we recommend giving the NWRC more operational responsibility to manage water resources in an integrated way. Lessons should be drawn from these recent floods to provide the committee with the mandate to convene responsible institutions and work toward more coordinated approaches for water resources management and flood risk management.

**Policy and regulatory development.** Following the Myanmar National Water Policy introduced in 2014, the next step is a comprehensive water law. This also includes developing regulations, which will most likely affect the implementation, enforcement, and ultimate effectiveness of the overall Myanmar legal framework. In particular, effective coordination of policy across states and regions will require a legal basis at the union level.

**River basin-level planning.** Water resources are ideally managed at the river basin level. A river basin management plan would be the foundation of decision making on water allocation, disaster risk analysis, and environmental management. Efforts to develop a sound river basin management plan for the Ayeyarwady River basin are currently ongoing and should be continued; as demand and capacity increases, this plan could be scaled up to apply to other river basins in Myanmar.

**Dam safety.** Given the large number of medium-size and large dams and the key role of these dams in irrigation, flood protection, and hydropower, dam safety strategies must be developed. As a first step, a comprehensive dam safety assessment should be undertaken. Neighboring countries have experience with dam safety, from which best practices and lessons can be drawn.

**Flood forecasting and risk analysis.** To manage the impact of water resources on natural hazards in Myanmar, flood forecasting needs to be an integral part of disaster risk management. Expanding and modernizing hydrometeorological observation systems are central to this effort, along with building capacity to collect, monitor, and analyze data and establishing an early warning system. To minimize the potential impact of floods and make informed investment decisions, a risk analysis should be undertaken to identify the potential risk of flooding. Based on this analysis, investment decisions for infrastructure investments can be made, and settlement and land-use policies can be devised to minimize damage to the population and losses to economic production.

**Stakeholders' involvement.** To reduce the impact of floods, civil society and other stakeholders (such as farmer associations, authorities responsible for spatial planning, etc.) should be involved in flood

management strategies. If stakeholders and citizens in general understand the nature of flood events and the approaches to managing them, they can not only reduce the potentially harmful impact of floods, but can also increase acceptance of the decisions taken in connection with managing floods.

**Overall capacity building.** Myanmar capacity-building challenges are daunting. In order to create effective water management institutions, proper staffing and funding are necessary. Capacity needs are wide, from modern project management skills, financial management, and procurement, to more technical skills such as knowledge of hydrology, impact forecasting, and environmental and social management. Meeting these needs requires offering training opportunities as well as cooperation with international organizations, academic institutions, and NGOs.

## RECOVERY AND RECONSTRUCTION PLAN

Table 10 provides an overview of recovery initiatives, the time frames involved, and estimated costs. The principle of build back better has been taken into account.

**Short-term and medium-term recovery needs.** As described above, the short- and medium-term strategy for recovery should not only seek to repair damages, build back better, and improve resilience; the measures taken should be part of a broader vision for developing water resources management in Myanmar. The assessment has identified the following measures as priority initiatives:

- **Restore damaged infrastructure** such as spillways, weirs, embankments, and irrigation canals.
- **Restore secondary and tertiary irrigation infrastructure**, including drainage infrastructure, to allow communities to plant crops in time for the dry season and limit economic losses.
- **Perform a thorough safety check on key infrastructure**, including all dams and weirs. Given the lack of comprehensive dam safety measures and the water levels in the reservoirs, any potential impact of the flood on structures should be investigated. This includes analysis of sedimentation levels in reservoirs and rivers.
- **Conduct strategic dredging** of sedimentation in reservoirs, rivers, and canals.
- **Consider key no-regret investments in water infrastructure**, e.g., modernizing and expanding hydrometeorological gauging stations.
- **Conduct an initial capacity gap analysis** and develop capacity building and training strategies for key managerial and technical staff.

### Longer-term initiatives

Based on the recovery plans discussed with individual government departments, several larger initiatives have been proposed, though no comprehensive feasibility studies have been undertaken on which to base them. The scope and reasons for these initiatives are part of the larger sector development agenda and go beyond the impacts of this assessment; hence the initiatives have not been included in the proposed recovery needs. They should be seen as options within a broader framework of improving river basin management or disaster risk reduction in Myanmar and are subject to further viability analysis. They include the following:

- Improve the flood protection level in the Ayeyarwady, Chindwin, Kaladan, Sittaung, and Thanlwin river basins by increasing the height of the river banks, subject to feasibility. This activity should be guided by spatial planning and flood plain restoration. Estimated cost: around K 47 million; type of activity: disaster risk reduction/build back better.
- Carry out comprehensive and repeated dredging of sedimentation in rivers and reservoirs. This activity should include research studies for stable channel regime in respective rivers with the objective of gradually reducing the cost of dredging in the future. Estimated time horizon: five years; estimated cost: K 56 million; type of activity: disaster risk reduction/build back better.
- Invest in pumps and tube wells to expand irrigation in dry season for higher agricultural productivity and cropping intensity. Investment should be based on studies analyzing economic and environmental viability and combined with implementation of the groundwater law drafted

by Ministry of Construction. Further regulations are also needed to prevent groundwater overextraction. Estimated cost: K 75 million; type of activity: sector development.

<b>Short term (4 months)</b>			
	Program of activity	Value	Responsible agency
Dams, weirs, embankments, irrigation networks	Repair leakages, canal structure, hydraulic structure, access roads, networks drainage, etc.	4,536	Irrigation Department, Ministry of Agriculture and Irrigation (MOAI)
Irrigation pump systems	Repair pumps and canal systems	215	Department of Water Resources Utilization, MOAI
Dredging, improvement of rivers	Repair damage to buildings, construct groynes	47	Water Resources and Improvement of River Systems, Ministry of Transport (MOT)
<b>Medium term (12 months)</b>			
	Program of activity	Value	Responsible agency
Dams, weirs, embankments, irrigation networks	Repair spillways, weirs, embankments, irrigation infrastructure, strengthen dikes, repair and construct new drainage as part of BBB approach	15,870	Irrigation Department, MOAI
Subtotal recovery needs (4–12 months)		20,669	
<b>Long term (1–5 years)</b>			
	Program of activity	Value	Responsible agency
Ayeyarwady flood protection	Raise level of river bank in several vulnerable river basins if studies confirm effectiveness	47,430	Irrigation Department, MOAI
Dredging, improvement of river embankments and drainage systems	Dredge, strengthen river banks	23,693	Water Resources and Improvement of River Systems, MOT
Dredging	Repeat dredging	32,430	Water Resources and Improvement of River Systems, Ministry of Transport (MOT)
Improvement of agricultural productivity through increasing yield and cropping intensity (yield in dry season)	Invest in pumps and tube wells for irrigation based on comprehensive study	75,000	Irrigation Department, MOAI
River banks	Strengthen and protect river banks	1,516	Water Resources and Improvement of River Systems, MOT
Subtotal recovery needs (1–5 years)		180,069	
<b>Total</b>		<b>200,737</b>	

**Table 10.**  
Recovery needs  
(million K)

Source: Assessment team based on government calculations.

## RECOVERY AND RECONSTRUCTION IMPLEMENTATION

To implement the recovery plan most effectively and sustainably, it should be aligned with other ongoing sector developments. The National Water Resources Committee should take the lead in coordinating international organizations, donors, and other organizations contributing to this recovery strategy and overall sector vision. This includes the Asian Development Bank, the World Bank, and the governments of Japan, Norway, and the Netherlands, who have active engagement in water resources management.

With World Bank support, Myanmar has created a programmatic framework to support the water resources sector in several projects. The first of these is the Ayeyarwady Integrated River Basin Management Project, which provides International Development Association funding of US\$100 million for (i) water resource management institutions, decision support systems, and capacity building; (ii) hydromet observation and information systems modernization; and (iii) Ayeyarwady River navigation enhancements. Within this programmatic framework, recovery measures outlined above could be considered as future projects, e.g. a dam safety project.

## SECTOR ASSESSMENT METHODOLOGY

The methodology for this assessment followed the international standard methodology of the Post-Disaster Needs Assessment framework described in the Introduction to this report. The team prepared the assessment under the assumption that all infrastructure assets reported in this chapter, such as dams, weirs, embankments, canals, irrigation systems etc. were publicly owned. Any privately owned irrigation systems were considered to be on private farmland property and therefore reported under agriculture damages. Similarly, losses that were linked to the water resource management sector (such as shutdown of a hydropower station of a dam) were reported under the electricity sector chapter.

The team did not do any primary data collection for this chapter; it collected data from government agencies, as follows:

- Irrigation Department (Ministry of Agriculture and Irrigation)
- Department of Water Utilization (Ministry of Agriculture and Irrigation)
- Department of Water and River Improvement (Ministry of Transport)
- Department of Inland Water Transport (Ministry of Transport)
- Department of Meteorology and Hydrology (Ministry of Transport)
- General Administration Department (Ministry of Home Affairs)

The departments at union level received the data on damages and recovery from the respective state/regional authorities. The team had the opportunity to undertake a two-day field to one township affected by the floods, Phwin Phyu Township in Magway State. The sites visited included two dams (Mone Dam and Kyeoo Kyeewa Dam), the Mezali Weir, and irrigation canals. The damage seen at these sites constitutes some of the largest individual parts of the reported damage.



Flooded street in Magway  
Photo: © National Community Driven Development

## Industry and Commerce

### SUMMARY

**Many of the flood-affected areas are within the vicinity of industrial activities and have had an impact on the commercial sector as a result of lost sales.** About 26–27 percent of industrial establishments are located in states and region affected by the flooding. Agribusiness and fishery processing industries, particularly rice mills, edible oil mills, and packaging, have been the most heavily affected. The most common form of commercial activity in the affected areas is retail and distribution, which includes individual retailers, larger retail chains, and wholesale distributors. Access to finance is a major constraint to the private sector; limited access makes management of business cycles and unexpected events more challenging.

**The flooding is likely to cause noticeable losses for businesses trying to recover activities to pre-disaster levels.** A rapid survey conducted as part of the assessment found that food processing was the most affected industrial sector, for these reasons: (i) direct impact of flooding, landslides, and heavy rain on assets (building and facilities); (ii) disruption in operations due to insufficient input supplies; and (iii) disruption in operations due to damaged infrastructure. Infrastructure allows access to inputs and delivery of goods to markets and is therefore crucial to industry and commerce. More specifically, agroprocessing activities depend on roads and bridge for timely receipt of inputs (rice, beans/pulses) and for delivery of processed goods to buyers in the next stage of the value chain or to end consumers.

### PRE-DISASTER CONTEXT

**Small and medium enterprises (SMEs) dominate the economy of Myanmar.** Of the approximately 127,000 registered enterprises in Myanmar, 99 percent are classified as SMEs. An additional 600,000 microenterprises, mostly informal family-run and cottage industries, are estimated to be operating in Myanmar. This is true in the areas affected by the flooding and along the various values chains that have been affected by shortages of raw materials, primarily agricultural products such as rice paddy, beans/pulses, sesame, and wood.

**As they are in most countries, industrial and commercial firms in Myanmar are clustered in large and dense cities, specifically Yangon and Mandalay.** Yangon and Mandalay are key locations for industry and trade agglomeration in Myanmar; 47–50 percent of the country's business establishments are located in these areas, and they contribute 73–75 percent of total sales of Myanmar's manufacturing and commerce sectors. In addition to sourcing raw materials from abroad, manufacturing firms in Yangon and Mandalay also source their inputs, primarily agricultural inputs, domestically from other states/regions in Myanmar. The commercial sector in Yangon and Mandalay also facilitates the movement of goods from outer cities through retail and distribution channels and across borders, e.g., goods move through Muse for trade with China and through Thamu for trade with India.

**About 26–27 percent of industrial establishments are located in states and regions affected by the flooding—for example, Hinthada in Ayeyarwady Region; Monywa in Sagaing Region, and Ponnagyun in Rakhine State.** Table 11 presents a list of key industrial and commercial activities located in the affected regions and states. Ayeyarwady Region, located in the fertile river delta, is the largest rice producer and home to 30 percent of the total number of rice millers in Myanmar. Processing of beans and pulses, on the other hand, is typically handled by larger wholesalers in Yangon. Wood processing, textiles manufacture, and mineral processing (copper and gold) take place in Sagaing, Magway, and Kachin State, although food processing is the staple industry in these areas. Fish processing and tourism-related services (hotels, cafes, and restaurants) are important activities in Rakhine State. Meanwhile, small food-processing operations (e.g. bakery, condiments) are common in most states/regions and are typically carried out by small enterprises.

Small manufacturing operations, such as steel crafting, furniture, and auto repair, are also commonly carried out by small enterprises.

**Retail and distribution is the most common form of commercial activity in the flood-affected areas.** This activity includes individual retailers, larger retail chains, and wholesale distributors. Distribution activities tend to be located in regions/states with larger populations, such as Ayeyarwady, Magway, Sagaing, and Rakhine. In the areas there are typically aggregators of agriculture products, which have links to larger distribution/trading hubs such as in Mandalay and Yangon, from which products are distributed to the entire country and exported.

Region/State	Industry	Commerce	Number of firms (% of total)
Chin	Small agroprocessing and manufacturing workshops	Retail	139 (0.4%)
Kachin	Minerals, wood processing	Retail	915 (2.4%)
Sagaing	Rice mills, edible oil mills, other agroprocessing, wood processing, textiles, manufacturing workshops	Retail, logistics & distribution	2,504 (8%)
Magway	Cement, thanaka, iron, agroprocessing (rice, beans & pulses, edible oils, maize), manufacturing workshops	Retail, logistics & distribution	924 (3%)
Rakhine	Fish processing, wood processing, tourism services, manufacturing workshops	Retail, logistics & distribution	409 (1.3%)
Ayeyarwady	Agroprocessing (rice milling) and fish processing, wood manufacturing workshops	Retail, logistics & distribution	3,593 (11.5%)

**Table 11.** Key industrial and commercial activities located in affected states/regions

Source: UNDP Business Survey 2014.

**Access to finance is a major constraint for the private sector; limited access makes managing business cycles and unexpected events more challenging.** The World Bank Group's Enterprise Survey carried out in 2014 as part of the Investment Climate Assessment cited access to finance as the greatest obstacle in doing business in Myanmar. This survey of over 1,000 firms indicated that the financial sector is not playing a sufficiently large role as a financial intermediary and that, instead, most financing needs are covered by firms' own funds. According to the survey, a mere 1 percent of fixed asset investment is financed by bank borrowing, and 92 percent of firms responding said they relied on their own funds—a higher level than in comparator countries. Meanwhile, only 30 percent of firms reported having a bank account—the lowest level among all the comparator countries. Of the small, medium, and large enterprises sampled in the Enterprise Survey, an average 23 percent of firms cited access to finance as the main obstacle to doing business when asked to select from a list of major obstacles. Access to finance is also among the top three obstacles cited by firms across all firm sizes and the main obstacle for microenterprises (36 percent) and small enterprises (25 percent). In addition, access to finance is one of the most frequently identified main obstacles in all three broad industry subsectors, namely manufacturing (23 percent), the retail trade (36 percent), and services (14 percent).

## POST-DISASTER SITUATION

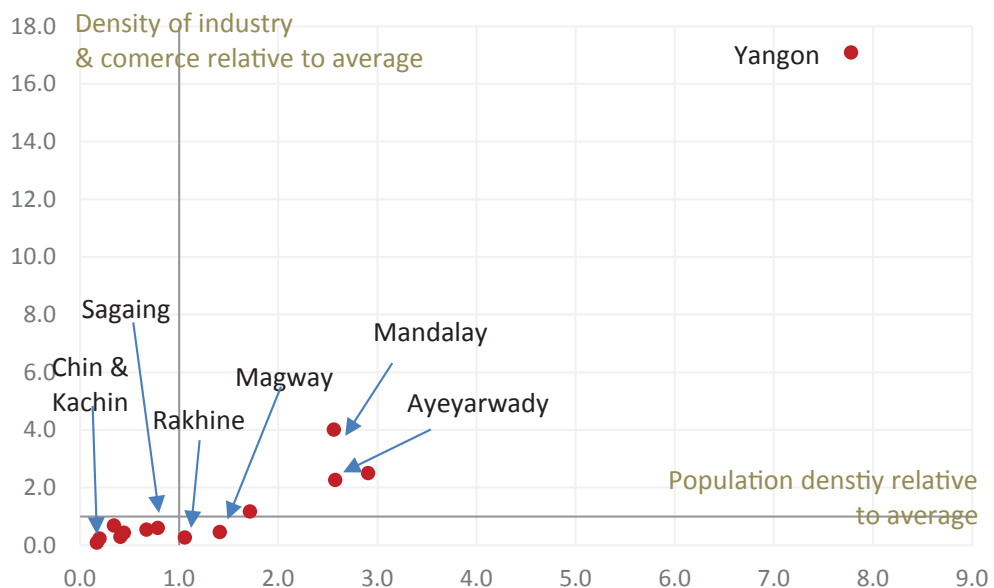
The assessment team carried out a rapid survey in the five areas that were most heavily affected directly and indirectly by the flooding. A sample of 212 firms in the industry and commerce sectors was surveyed during October 2–9, 2015, in Kalay and Monywa in Sagaing; Magway; Hinthada in Ayeyarwady; Ponnagyun and Sittwe in Rakhine; and Mandalay (see assessment methodology section for this chapter). Although Chin State was heavily affected, it was excluded from this survey because of time constraints and because there is less industry and commercial activity in this state relative to the other areas. Its omission should not significantly affect the estimates of damage and loss in this assessment. Given the nature and time frame of the rapid survey, the sample certainly cannot fully represent how the disaster affected operations of industry and commerce firms in the area. Nevertheless, the findings from the median responses from the rapid survey are still useful.

The survey found that food processing was the most affected industrial sector, and cited several reasons for this:

- **Direct impact** of flooding, landslides, and heavy rain on assets (building and facilities).
- **Disruption in operations due to insufficient input supplies.** Crop failure and late delivery of inputs caused disruptions of supply of necessary inputs for rice millers, beans/pulses processors, and furniture makers. Damage suffered in the fishery and aquaculture industries in Ayeyarwady and Rakhine States severely impacted the fish-processing industry.
- **Disruption in operations due to damaged infrastructure.** Infrastructure allows access inputs and delivery of goods to markets and is therefore crucial to industry and commerce. Agroprocessing activities depend on roads and bridges to ensure timely receipt of inputs (rice, beans/pulses) and for delivery of processed goods to buyers in the next stage of the value chain or to end consumers.

The impact of the disaster is also likely to be felt by firms in commerce and industry in other cities. Figure 21 presents density of population and density of industry and commerce (relative to the national average). The figure suggests that the disaster affected areas that had relatively low density of commerce and industry firms (value in vertical axis is lower than 1). But because industry and commerce are associated with downstream activities of the agriculture sector, the impact of the floods is also likely to affect operations of industry and commerce in areas that were not hit by the floods but are dependent on agriculture output from the affected areas (for example, Mandalay and even Yangon).

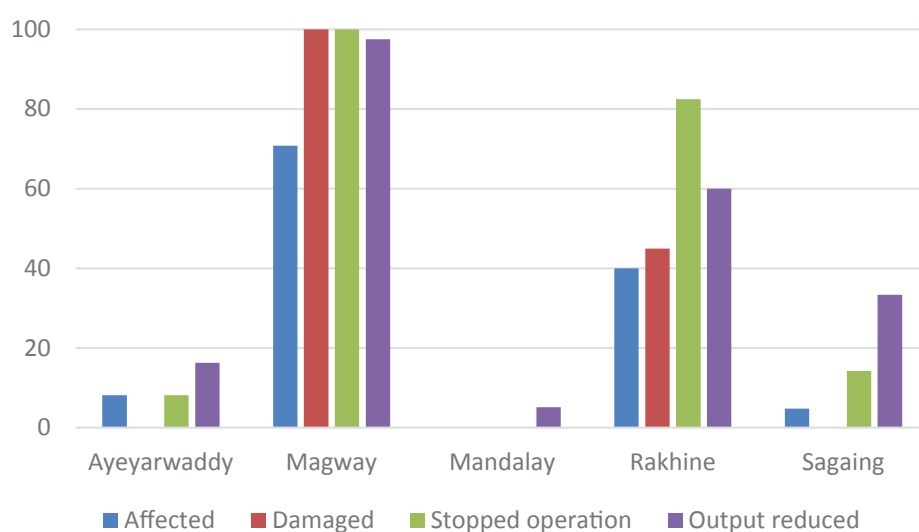
**Figure 21.**  
 Density of industry and commerce (per km<sup>2</sup>)



Source: Assessment team calculations.



**Results from the rapid survey suggest that there is considerable variation in the degree of damage to industrial and commercial firms caused by the flooding.** Figure 22 presents estimate of the type of damage sustained by industrial and commercial enterprises by firms affected by flood in the surveyed areas. All of the firms in the survey sample in Magway Region (Pwint Phyu Township was selected for the survey and was particularly heavily affected) suffered badly from the flooding, which either directly damaged their premises or resulted in operational closure. Rakhine State is the second-most affected area for industry and commerce, followed by the Sagaing Region. It is worth noting that except for in Magway, firms reported a higher proportion of losses through output reductions (sales) and were less directly affected by the flooding. This suggests that firms in Ayeyarwady, Rakhine, and Sagaing are also suffering from a disruption in operations due to delays or stoppage in the supply of inputs and slowdowns in getting products to markets (end consumers, who purchase their products).



**Figure 22.** Percentage of firms in sample affected by the flood and the types of damage and losses they sustained

Source: Assessment team calculations.

**The flooding is likely to cause noticeable production losses for businesses trying to recover activities to pre-disaster levels.** Table 12 presents the estimated length of business recovery in the areas with losses resulting from damage to facilities and property. Responding to the survey in mid-October, most industrial and commercial firms affected by the flooding estimated that they would need at least another two weeks to one month to recover their business to pre-disaster levels. Due to extensive damage and the loss of output, industrial and commercial firms surveyed in Magway and Rakhine reported needing longer times than firms in other states/regions.

Region/State	Estimated length of business recovery
Ayeyarwady	Up to 1 month
Magway	Up to 1 month
Rakhine	Up to 2 weeks
Sagaing	Up to 2 weeks

**Table 12.** Estimated length of business recovery (median response)

## ESTIMATED VALUE OF EFFECTS AND THE IMPACT OF THE DISASTER ON THE SECTOR

The estimated total damages and losses for industry and commerce are included in Table 13; the geographic distribution of damages and losses is shown in Table 14. It should be noted that where production losses in the industry and commerce sector arise from lower agriculture and fishery primary production, the geographic distribution of these production losses follows the distribution in the primary sectors. On the other hand, the geographical distribution of damage and losses to industrial and commercial establishments follows the distribution obtained through data from the sample survey of industry and commerce.

**Table 13.**  
Estimated total damage and loss (million K)

Subsector	Value of damage (million K)	Production losses (million K)					Total damage and production losses (million K)
		Operation interruption	Operation slowdown	Until full recovery	Due to future losses in raw materials	Total	
Industry	27,587.5	4,057.3	13,203.9	35,736.3	247,193.6	300,191.1	327,776.8
Commerce	27,723.9	4,010.8	9,400.0	35,788.0	76,109.0	125,307.8	153,031.7

Source: Estimation by assessment team.

**Table 14.**  
Geographic distribution of damage and losses (million K)

State/Region	Damage	Industry		Damage	Commerce	
		Losses	Total effects		Losses	Total effects
Ayeyarwady	5,725.3	117,657.2	123,382.5	7,293.0	41,795.9	49,088.8
Bago	2,429.9	30,819.1	33,249.0	2,678.6	9,314.4	11,993.0
Chin	393.0	1,776.0	2,170.6	449.1	837.9	1,287.0
Kachin	63.4	3,304.0	3,367.4	132.9	988.8	1,121.7
Kayah	0	42.9	42.9	0	16.8	16.8
Kayin	35.6	52.8	88.4	16.2	13.9	30.1
Magway	7,754.4	32,349.1	40,103.5	8,757.2	29,349.1	38,106.3
Mandalay	0	17,113.3	17,713.3	0	10,539.5	10,539.5
Mon	135.2	255.2	390.4	99.1	74.3	173.4
Rakhine	4,263.9	17,334.3	21,598.2	3,309.3	5,700.4	9,009.7
Sagaing	6,315.4	57,026.2	63,341.6	4,720.8	20,146.8	24,867.6
Shan	29.6	1,931.1	1,960.7	63.2	597.9	661.1
Yangon	440.0	20,528.3	20,968.3	204.5	5,932.1	6,136.6

Source: Assessment team estimations.

## RECOVERY AND RECONSTRUCTION STRATEGY

Recovery from the disaster is dependent on repairing damages and recovering from sales losses. Sales losses are the result of the impact of the damage to inputs, which affects the value chain. For example, damage to inputs affects rice millers, who have reduced access to paddy for processing, and beans/pulses traders, who are unable to sell to export markets due to lack of supply. Such impacts could be fairly long-lasting, because crop that was damaged will take a growing season or longer to replace. Loss of market share could also result as international buyers purchase from other locations in the absence of supply from Myanmar (such as Vietnam for rice). It will take time to get this market share back for Myanmar suppliers once product is available again.

The immediate strategy/vision for the sector involves two cross-cutting initiatives. First is to support both public and private sector financing of the recovery effort to enable firms to quickly recover to pre-flood levels of production and sales. Recovery from damages and losses will not be an easy task without support from the government to enable lenders, both public and private, to actively provide financing. In the longer term, it will be necessary to develop stronger measures to mitigate such events in the future through better infrastructure and warehousing facilities, as well as through the development of financial instruments, such as insurance, so that business are better prepared in the future. Second is to immediately repair the damaged connectivity and logistics infrastructure that is preventing surviving firms in the affected areas from connecting to markets or suppliers and making it more difficult for affected firms to rebuild their businesses. This initiative would also facilitate development of logistics infrastructures (warehousing) in areas that are less likely to be affected by flooding. It is also important to develop a robust early warning system for natural disasters to allow the private sector to diversify the sourcing of its inputs as early as possible.

In the immediate/short term, it is vital to make financing available to industrial and commercial firms that have suffered damages and output and sales losses. As many of them may face financial difficulties when repaying existing debt in the near term and may have little financial capacity to fund their recovery, it is necessary for the government to step in where it can. Government credit guarantees to private financial institutions for lending to affected enterprises will open up financing opportunities for enterprises that do not exist now due to excessive lending risk. In addition, government financial institutions such as credit cooperatives should channel lending to small-scale industrial and commercial firms.

As for connectivity logistics infrastructure, the key for reviving economic activities is to repair roads, bridges, and communication networks. In this context, connectivity is about enabling firms and consumers to access the network of infrastructures that would allow them to link with the nearest centers of economic activities. At the minimal, public connectivity infrastructures in heavily affected areas in Magway, Chin, Sagaing, and Rakhine have to be rebuilt immediately to allow industry and commerce activities in those areas to recover and be connected with the nearest demand growth poles.

For longer-term and larger loans needed to finance the restoration of buildings and replacement of machinery and inventories, the government should use guarantees to enable private sector financial institutions to step in. State-owned commercial banks should also provide lending on a longer-term basis and at lower interest rates for firms affected by the flooding. The government should make funding available at longer-term and low rates to both public and private sector financial institutions to enable them to on-lend to flood-affected firms at favorable terms and rates.

To mitigate risks of similar events in the future, the government should promote the provision of a wider range of insurance services by enabling broader private sector participation in the sector from both domestic and international insurers. Efforts should be made at both the local and national level to improve warehousing facilities to better enable the storage of key commodities such as rice, bean/pulses, sesame, and other products. A major factor in the output and sales losses to the private sector was the inability to secure raw materials such as rice paddy due to damages of stock held

by farmers and traders. This problem could be avoided if more effective warehousing was made available. Better warehousing would have additional benefits by enabling farmers and traders to hold stock until more favorable prices prevail—an improvement over the current practice of selling goods at prevailing market prices for lack of storage capacity.

Given that supply chains are vital in commerce and industry activities, the sector would benefit from improved early warning systems for natural disaster. An effective system—one that is built on a solid platform of gathering real-time data, mapping hazard risk, and communicating warnings—could help firms in commerce and industry take necessary steps to manage their supply chains, e.g., storing inputs and products in different locations and diversifying suppliers.

## RECOVERY AND RECONSTRUCTION PLAN

**Short term.** To support the private sector in recovering from the estimated losses of over K 110 billion in output and sales, short-term financing support is needed (Table 15).

**Table 15.**  
Recovery and reconstruction needs: short term

Action	Responsible agency	Measure	Estimated public funding	Time frame
<b>Recovery</b>				
Credit guarantees	Ministry of Finance	Explore the provision of guarantees to private financial institutions for short-term lending	Backing for up to K 40 billion of up to 1-year lending	Effective immediately and available for 1 year
Credit cooperative lending to micro-, small, and medium enterprises	Ministry of Cooperatives	Immediately assess demand for loans up to K 5 million for 6-month term, extendable once	K 40 to 50 billion in lending made available in affected areas	Effective immediately and available for 1 year
<b>Building resilience</b>				
Build back better connectivity logistics infrastructure	Ministry of Construction (Department of Public Works), Ministry of Communications and Information Technology	Identify and prioritize rebuilding of connectivity logistics infrastructures (roads, bridges, communication networks)	See damage and loss assessment for road infrastructure and telecommunications	Effective immediately until projects are completed

Source: Assessment team estimations.

**Medium to long term.** To sustain private sector efforts in recovering from damages incurred, and to support financing of measures to mitigate future risks of similar events through improved infrastructure and warehouse/storage facilities, medium- and long-term financing should be enhanced (Table 16).

Action	Responsible agency	Measure	Amount	Time frame
<b>Sustaining recovery</b>				
State-owned commercial bank lending	Ministry of Finance	Reform MADB and MEB to improve operational efficiency, risk management, and lending practices to enable 5-year lending to affected firms	K 40–50 billion in capital to SCBs	Implemented in steps as part of MOF state-bank restructuring plan
<b>Building resilience</b>				
Financing scheme to support private sector commodity warehousing/storage	Ministry of Finance	Explore possibility for offering credit guarantees for 5-year loans for warehousing/storage facilities	Backing for up to K 100 billion for up to 5-year lending	Effective in phases over 2-year period
Enable medium- and long-term financing	Central Bank of Myanmar	Modernize the banking sector to lay the basis for improved access to finance for SMES	No public expense	Immediate and to be reviewed after 1 year
Provide access for commerce and industry firms to an effective EWS for natural disaster	National Disaster Management Committee	Develop a solid EWS platform to inform supply chains of industry and commerce	To be determined	Immediate

**Table 16.**  
Recovery and reconstruction needs: medium to long term

Source: Assessment team.

Note: EWS = early warning system; MADB = Myanmar Agricultural Development Bank; SCB = State-owned Commercial Banks; SMES = small, and medium enterprises.

## RECOVERY AND RECONSTRUCTION IMPLEMENTATION

Financing from public and private sector financial institutions will be needed to support recovery from losses in the industry and commerce sector and strengthen future risk mitigation measures, such as development of the insurance sector. To ensure that financial institutions are able to provide the necessary financing, partnerships and coordination/management arrangements will be needed, and development partners will have an important role to play in providing capital and technical assistance. These emergency measures should be seen as part of disaster relief only; if used excessively such schemes could distort markets, and they should not be mainstreamed into the operations of the financial sector. Establishing an emergency relief organization could ensure that such funding was provided only for disaster relief and mitigation.

## SECTOR ASSESSMENT METHODOLOGY

Whereas in other sectors—such as agriculture, public services, and transportation—the government has actively collected data related to the damage and losses caused by the flooding, this has not been the case in the industry and commerce sector. It has been more difficult to collect data for this assessment using government sources as the government didn't collect relevant data.

To assess damage and production losses, baseline data sources from the government were used. To obtain additional baseline information as well as typical disaster effects, a special field sample survey was conducted that assessed the affected areas and the indirect effects on the value chain and distribution. The rapid survey in the five most heavily affected states and regions was conducted by Myanmar Survey Research. A sample of 212 firms in the industry and commerce sectors was surveyed from October 2 to October 9. There were 19 respondents in Kalay, 21 in Monywa, 40 in Sittwe and Ponagyun, 40 in Pwint Phyu, 49 Hinthada, and 40 in Mandalay. The survey included respondents from agribusiness/processing (118), manufacturing and services (36), and distribution and retail (56).

This assessment also used information provided by the agriculture sector team on the quantities and value of primary production losses that would not reach the industry and commerce sectors for processing and marketing, respectively, together with unit price–level data at farm-gate, wholesale, and retail levels, to ascertain the value-added losses in industry and commerce. Limited consultations were held with the Ministry of Commerce. Other data sources, including the Myanmar Enterprises Survey carried out by the World Bank Group in 2014 and the United Nations Development Programme Enterprise Survey, were utilized to better understand the pre-disaster situation.

## Banking and Finance

### SUMMARY

**Because Myanmar's financial sector is in an early stage of development, with limited outreach in rural areas, the losses caused by this year's disastrous floods and landslides were very limited.** Damages to financial institutions' property were negligible, while only one institution—Myanmar Agricultural Development Bank (MADB)—had losses on a scale that could negatively affect its national operations. Even the insurance sector, due to a lack of agricultural insurance and very limited presence outside cities, avoided significant losses.

**The sector must meet very significant needs in order to build back better and to grow sufficiently in scale and outreach that it can reduce the vulnerability of rural inhabitants to future natural disasters.** The funding needs related to making the financial sector more accessible to flood-prone populations amount to K 49,506 million in credit lines to MADB; K 1,181 million in technical assistance to MADB; and K 7,500 million in credit or equity to two microfinance institutions (MFIs). Despite needing profound restructuring and capacity building, the MADB remains a crucial vehicle for agricultural funding, and large-scale investments should be made to strengthen this key player. Many important initiatives are under way to strengthen Myanmar's financial sector, but this chapter focuses on those designed to increase access to financial services in flood-prone areas. They should be prioritized and implemented.

Note that the figures in this chapter for financial sector losses are not added to the overall Post-Flood and -Landslide Needs Assessment loss figures, as this would be double-counting. The vast majority of these losses reflect loans that farmers cannot repay without further assistance because of their reduced farming income, and these are already covered in the agricultural sector chapter. These figures do not include the needs assessed for the recovery of commerce and industry, which are detailed in the previous chapter. Neither do these figures reflect the overall financing needs estimated by our colleagues covering agriculture, that figure being far higher than we estimate the current financial sector being able to manage, even with important cash injections and capacity growth in the years to come.

### PRE-DISASTER CONTEXT

Myanmar's financial sector is still in its infancy. "Myanmar's private banking sector is small and segmented. A number of private banks, mostly connected to private business conglomerates, emerged from a partial liberalisation of the banking industry in 1988. Entry to the banking market was further liberalized in 2010 for domestic banks and four new private banks were granted licenses."<sup>39</sup> Before the 2011 government reforms, banks' ability to operate as market-driven financial intermediaries was very limited.

As outlined in the industry and commerce chapter, access to finance is consistently identified as the main barrier to enterprises' growth. The latest FINDEX figures suggest that 23 percent of adults have an account in a formal financial institution, and most of these adults are in cities. In rural areas, such as those impacted by this year's floods and landslides, most of the population has no access to formal financial services. Farmers have no access to insurance (other than fire plus flood insurance for their buildings), no mortgages, no long-term loans, no venture capital. A handful of farmers manages to lease agricultural equipment through "hire purchase";<sup>40</sup> most of this equipment goes to plantations or large farms close to big towns. Farmers have to rely mainly on MADB and cooperatives, because while microfinance institutions are growing rapidly, they are doing so from a very small base.

<sup>39</sup> OECD 2014, 11.

<sup>40</sup> "Hire purchase" is a term used by financiers in Myanmar. The total portfolio of agricultural equipment hire purchase is estimated to be under K 200 billion.

The main formal source of credit for farmers is MADB, which has around 2 million borrowers as of September 2015—i.e., 5.5 percent of total rural population, or 24 percent of households.<sup>41</sup> Not long before the floods, MADB started to charge only 5.0 percent interest on its seasonal crop loans (the vast majority of its portfolio). The 1 percent margin over MADB's 4 percent cost of funds from Myanma Economic Bank means that MADB will find it more difficult than to be self-sustaining.

Cooperatives report having over 2.9 million members, but there is no breakdown of the proportion of those members who are rural (clearly a majority, but unclear how big). Cooperatives are reportedly present in 307 of Myanmar's 325 townships, and there are 33,294 cooperative societies.<sup>42</sup> Even if all cooperative members were rural, however, that would represent only 8 percent of the population, or 35 percent of rural households. It should be noted that many cooperative borrowers are also MADB borrowers, so that these two figures do not represent separate and complementary outreach. Furthermore, cooperatives' loans are mostly limited to K 100,000 and so have limited impact. A positive aspect of cooperatives is that their staff work directly with the end clients in villages, unlike MADB staff. A negative aspect of cooperatives is that, as they admit themselves, the quality of information and loan analysis is low. The need to develop the capacity of cooperative staff, at various levels, is great.

## PRE-DISASTER CONTEXT

It is important to remember that Myanmar's financial sector is still in its infancy. "Myanmar's private banking sector is small and segmented. A number of private banks, mostly connected to private business conglomerates, emerged from a partial liberalisation of the banking industry in 1988. Entry to the banking market was further liberalized in 2010 for domestic banks and four new private banks were granted licenses."<sup>43</sup> Before the 2011 government reforms, banks' ability to operate as market-driven financial intermediaries was very limited.

As outlined in the Industry and Commerce chapter, access to finance is consistently identified as the main barrier to enterprises' growth. Latest FINDEX figures suggest that 23 percent of adults have an account in a formal financial institution, and most of these adults are in cities. In rural areas, such as those impacted by this year's floods and land-slides, most of the population has no access to formal financial services. Farmers have no access to insurance (other than fire + flood for their buildings), no mortgages, no long-term loans, no venture capital. A handful of farmers manage to lease agricultural equipment through hire purchase<sup>44</sup>, most of this equipment going to plantations or large farmers close to big towns. Most of all, farmers have to rely on MADB and on Cooperatives, because whilst microfinance institutions are growing rapidly, they are doing so from a very small base.

The main formal source of credit for farmers is MADB, which has around 2 million borrowers as of September 2015—i.e., 5.5 percent of total rural population, or 24 percent of households.<sup>45</sup> Not long before the floods, MADB started to charge only 5.0 percent interest on its seasonal crop loans (the vast majority of its portfolio). The 1 percent margin over MADB's 4 percent cost of funds from Myanma Economic Bank means that MADB will find it more difficult than to be self-sustaining.

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<sup>41</sup> The calculation uses the 2014 census figures for rural population (plus nonenumerated) of 36,555,301, and the average household size of 4.39 people.

<sup>42</sup> Small villages tend to have one per village, and in some cases one society includes several village, but towns and cities have numerous cooperative societies.

<sup>43</sup> OECD 2014, 11.

<sup>44</sup> The total portfolio of agricultural equipment hire purchase is estimated to be under K 200 billion.

<sup>45</sup> The calculation uses the 2014 census figures for rural population (plus nonenumerated) of 36,555,301, and the average household size of 4.39 people.



The microfinance sector has expanded rapidly with more than 200 institutions entering the market within the past 3 years and currently reaching around 1 million clients. The regulatory framework for microfinance has a number of weaknesses including restrictions on both funding and lending side on rates and amounts which constrains sustainable growth of the sector. The Livelihoods and Food Security Trust Fund (LIFT) of the United Nations Development Programme has been the main source of financing for microfinance. LIFT is also a keen observer and coordinator of this sector and has contributed to important initiatives (such as the upcoming TCX Currency Exchange Fund) and new products (such as the soon-to-be released loan-consolidation loans).

The rural population's vulnerability to natural disasters is very high. Only a minority of rural inhabitants have access to formal credit<sup>46</sup> (see Table 17). In particular, "the landless, youth, and female populations face continued constraints in accessing credit."<sup>47</sup> With no other formal products available, a significant but unknown proportion of the rural population<sup>48</sup> relies on informal loans with very high interest rates (60–240 percent).

The extent of agricultural input provider credit is impossible to establish with clarity, given that such credit is entirely unregulated and not centrally recorded. One report cites a single agricultural input provider as having 1.5 million clients to which it offers an average credit of K 50,000; this would result in a potential total annual portfolio outstanding of K 75,000 million.<sup>49</sup> However, other reports suggest that the scale of such supplier credits is not very significant. For example, a detailed Fertilizer Policy report states that "sales to farmers are essentially cash only and the few credit sales incur 2 to 3 percent per month interest charges."<sup>50</sup> The Myanmar Farmers Association stated that agricultural input providers were a common source of credit for farmers, but banks and cooperatives did not give the same impression. In the two villages visited by the assessment team, reportedly no farmers used supplier credit, feeling that it either wasn't available or was too costly (e.g., required giving back twice the amount of seeds acquired). For the moment, an approach involving tripartite lending (bank lends to agricultural input provider, which lends to farmer) is not a realistic large-scale solution, given commercial banks' limited rural presence. Nevertheless, partnerships of agricultural input suppliers with banks and MFIs should be supported, through conferences and perhaps even one-off vouchers, to get both sides used to working with each other.

<sup>46</sup> Note that the latest round of Qualitative Social and Economic Monitoring (World Bank and EMR 2015) finds that access to MADB loans has increased to 70 percent from an initial 13 percent, and also that interest rates had decreased across all forms of credit. Overall, however, it would appear that it is still a minority of farmers who have access to formal credit.

<sup>47</sup> World Bank and EMR 2015, 7.

<sup>48</sup> According to UNCDF (2014a), about 9.2 million people have loans from an unregulated financial institution, and "the majority of citizens rely on unregulated providers" (7). On the other hand, LIFT and World Bank (2015) report only 11 percent of farmers accessing informal loans. LIFT's forthcoming "loan-consolidation loans" product may help to better understand the true degree of indebtedness to informal lenders.

<sup>49</sup> UNCDF 2014b, 37.

<sup>50</sup> IFDC and UASID 2014, 12.

**Table 17.**

Rural access to finance in Myanmar

Credit provider	Maximum loan size (K)	Annual interest rate (%)	Number of borrowers	Share of rural households (%)	Comments
MADB	1 million	5.0	2 million	24.0	Main farming subsidy in Myanmar. Without these loans, many farmers would be in difficulties
Cooperatives	100,000	13.8	2.918 million	35.0	Amount is too small to address all needs. Often same borrowers as from MADB.
Hire purchase companies	None	13.0	minimal	minimal	Only richer farmers can access; need to pay part of equipment cost up front.
MFI	3 million (most much smaller) <sup>a</sup>	30.0	about 1 million	about 12.0	K 3 million is merely the legal limit to MFI loans. Many (not most) MFI clients are urban.
Pawnshops (licensed)	None	60–120	3.1 million, mostly urban	unknown (likely to be small)	In rural areas, pawnbrokers tend to be unlicensed.
MSY (Ever Green) village finance	Average per beneficiary 19,183	Unknown	1.8 million beneficiaries	21.6%	This assumes that 1.8 million beneficiaries are all borrowers, rather than borrowers and dependents.
Informal lenders	Varies; often above 1 million	ranges from 60 (usual) to 240	unknown	unknown	Vast majority of villagers met by the assessment team borrowed from informal lenders. LIFT and World Bank study <sup>b</sup> suggests only 11% use them.
Traders and input suppliers	Unclear	36–60	Over 1.5 million (largest supplier)	unknown	Access uneven.

Source: Based on interviews as well as the sources in the bibliography.

Note: a. IFC-CGAP Microfinance Sector Assessment by Duflos et al. (2013) states that there are 2.8 million microfinance borrowers, but this includes MADB and cooperative borrowers. The 1 million figure quoted during sector assessment meetings seems realistic for “pure” microfinance, and more in line with the MIX-Market figure of 717,000 (2015). All agree that PACT GMF is massive compared to all other MFIs, and PACT has only around 600,000 borrowers.

b. LIFT and World Bank 2015.

## POST-DISASTER SITUATION

For most of the financial sector actors, the post-disaster situation is the same as the pre-disaster situation, i.e., they remain under-invested in farmers and rural communities. This is reflected in the almost nonexistent damages and low levels of losses detailed in the following section. MADB is the one institution that is at considerable risk of incurring losses at a level that may significantly impact its activities and balance sheet, as can be seen below. The environment for insurance is also likely to be impacted, given that foreign reinsurance may be more expensive in the years to come, with the increased perceived risk of more serious floods and landslides. However, there is insufficient data to estimate the increase in cost of reinsurance.

## ESTIMATED VALUE OF THE EFFECTS AND THE IMPACT OF THE DISASTER ON THE SECTOR

Overall, given the very limited presence of the formal financial sector in the regions impacted by this year's floods and landslides, infrastructure and physical asset losses to the sector have been negligible (Table 18). MADB is the only banking institution invested in rural areas to any large degree. Yet MADB staff have reported that, while one or two branches did have to close for a few days, there were no significant damages to any buildings or equipment, nor any loss of cash or of financial records. None of the commercial banks or MFIs the assessment team met with reported any significant damages to their infrastructure or physical assets, though one or two branches did have to close for a few days. Similarly, Myanmar Insurance has reported that none of its offices or physical assets were damaged by the floods.

In terms of hire purchase assets, there were reports of some agricultural equipment dealers having significant amounts of equipment flooded, but the banks are not responsible for equipment that has not yet been leased out. Even after it is leased out, most contracts oblige the equipment dealer/showroom to repay the bank/hire purchase company, regardless of whether the dealer gets paid on time by the end client. Thus whatever hire purchase equipment was damaged, it should not be counted as damages to the financial sector.

Overall, the damage figures for the financial sector are negligible. Loan losses caused by the floods, however, are a more complicated issue to assess, and will be addressed by subsector. The damages and losses are summarized in Table 18. This table draws on information gathered in interviews with the respective organizations and other financial sector players, as well on sources found in the bibliography.

Subsector/component	Impact (million K)			Ownership	
	Damage	Losses	Total	Public	Private
Commercial banking sector	0	< 100 <sup>a</sup>	< 100	0%	100%
MFIs	< 100	2,250 <sup>b</sup>	2,250	0%	100%
SFIs	< 100	57,405 <sup>c</sup>	57,405	100%	0%
Leasing companies	0	402 <sup>d</sup>	402	0%	100%
Cooperatives	< 100 <sup>e</sup>	4,807	4,807	0%	100%
Insurance sector	0	417 <sup>f</sup>	417	100%	0%
<b>TOTAL</b>	<b>&lt; 300g</b>	<b>65,381</b>	<b>65,381</b>		

**Table 17.**  
Rural access  
to finance in  
Myanmar

Source: Based on interviews with these organizations and other financial sector players, as well on sources found in the bibliography.

Note:

- The only private bank that we have encountered with any flood-related losses (excluding leasing, i.e. hire purchase) is Small and Medium Industrial Development Bank (SMIDB). This is not a commercial bank in the usual sense, in that it is overseen by the Ministry of Industry, but it was placed here because it is owned by 875 shareholders, none of which are government entities (although some are government employees). SMIDB reports that that only a few commercial clients, and one or two SME clients, have been impacted by the floods. SMIDB also reports that all its clients who are required to do so take the flooding option on their fire insurance for buildings used as collateral (which they all must have), so its flood losses should be minimal. Nevertheless, we await more precise flood-related figures from SMIDB.
- The figure of US\$1.8 million was obtained from LIFT, the main source of microfinance funding in Myanmar. However, this figure combines microfinance losses with reductions in social funds used to give grants to the neediest beneficiaries. PACT—by far the largest MFI in the country, and one of the few with a widespread presence in affected areas—assessed its microfinance losses (including interest lost) at US\$500,000.
- Note that only MADB has losses. See the text for an explanation of how the range of potential loss figures for MADB was calculated.
- See text for a description of how hire purchase losses were calculated.
- Figures were provided by the Ministry of Co-operatives, reportedly simply based on amounts members said they needed to be able to start earning again sufficiently to repay both the original loan and the supplementary loan.
- There are likely to be no losses on the part of private insurers, as they are very small and focused on cities and towns. See text for the calculation of Myanmar Insurance's losses. Note that no losses linked to pricier future policies are included here.
- These loss figures will not be added to the overall country loss figures. They should already be factored into the agricultural loss calculations (as well as a very small amount reflecting real estate and home content losses).

**State banks/specialized financial institutions.** MADB usually collects data from its branches only once a year, in March, for the compilation of its annual report. As of September 17, 2015, when a meeting was held with the MADB team, it appeared that MADB had not yet sought any information on the extent of potential losses linked to the floods and landslides. The MADB team did manage to provide some information, including figures on 10 branches affected by floods (out of a total of around 50 impacted branches). These figures were said to be “likely loan losses” and were reportedly based on discussions between MADB staff and affected clients.<sup>51</sup> MADB later sent a table of estimated losses with figures for 49 affected branches. Compared to the 10 branches for which data had already been supplied, however, the newly provided figures were much lower; on average, the previous estimated loss figures had been 3.88 times higher. Upon further investigation, MADB counterparts revealed that for this table, their approach was reportedly to simply take a 5 percent provisioning figure (on the nationwide portfolio) for flood-related losses—they the manner in which they attributed losses per branch was hard to understand, with numbers that reflected very different ratios from those in branch portfolio volumes.<sup>52</sup>

Given the inconsistent information that supplied by MADB, the best we can do is to evaluate a range of loss values that are likely to hold the actual figure. The optimistic extreme of this range would be the latest figures provided by MADB, which MADB calculated as being a total of K 44,098 million. The pessimistic extreme of the proposed range would involve assuming that all affected branches’ likely losses have been undervalued to the same average degree as the 10 initially quoted branches.<sup>53</sup> Thus keeping initial estimates for the first 10 branches, and multiplying the remaining 39 branches’ forecasted losses by 388 percent (average difference for first 10 branches), we reach an estimated loss figure of K 182,191 million. A compromise figure would take the initial “likely loss figures” for the 10 branches, and retain the lower figure for the other 39 branches: this would result in an estimate of K 87,116 million in MADB losses. For the damage and loss table (Table 18), we have used this “compromise” calculation, both because it is within the proposed range and because the pessimistic loss estimate of K 182 billion—representing around 18 percent of total seasonal loans disbursed<sup>54</sup>—seems very high, given the historical ability of MADB to keep losses low.

**Private banking and leasing sector.** Because no private banks lend to farmers, and because loans to rural areas tend to be few and far between, flood-related damages to private banks’ assets were negligible. Some very minor losses were incurred by one or two private bank branches when they had to close for a few days, but none of the banks put a value on this, as they considered these losses immaterial. Most banks with which the assessment team met stated that they had zero flood-related losses or late loan repayments, and a minority of banks stated that a very small number of clients were late in making payments or had requested grace periods. Once again, these interest losses were statistically negligible. Larger banks have very recently started issuing credit cards, but overall volumes are very small, and this business is focused on urban clients. Thus there are no flood-related losses in the nascent credit card portfolios.

**Mortgages.** Mortgages are not currently offered in Myanmar, for a host of reasons. One reason that savings for periods of over 12 months are not allowed; thus all banks’ borrowed liquidity is short-term. Some banks do offer real estate hire purchase products, in some cases for terms of up to three years, but these are not common, and such leased property would be only in urban or suburban areas.

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<sup>51</sup> Note, however, that in the normal MADB lending process, MADB staff do not visit villages or clients, but rather rely on village counselors to provide information on potential borrowers; indeed, MADB rules preclude staff from visiting villages, according LIFT and World Bank (2014).

<sup>52</sup> The reason for using this new calculation approach was that the general manager “did not want to show a large amount of loss for the flood-affected branches.”

<sup>53</sup> This may offer a particularly pessimistic picture if the initial 10 branches for which figures were received were on average much more badly impacted than the other 39. For the moment, however, our questions about this remain unanswered.

<sup>54</sup> On October 12, 2015, MADB stated that its total loans outstanding were K 1,002,920 million. Compared to the total portfolio outstanding figure of K 568 billion for end of March 2015, the pessimistic scenario would reflect an even less likely 32 percent portfolio loss.

**Hire purchase.** This is the one area where potential losses might be expected, especially in terms of lower demand going forward. The vast majority of hire purchase transactions in Myanmar follow a dealership guarantee model, whereby the dealer takes responsibility for collecting the end client's payments, and also commits to paying the bank even if the end client fails to pay on time.

No banking group reported that any dealers were late with their payments, though in a few cases dealers requested one or two months' grace period for the due principal payments (there is no interest due because in this model, all interest is paid at the beginning of the lease period). In all cases, the banks were confident that the dealers would pay their dues, even the one dealer who reportedly had a parking lot full of flooded agricultural equipment. The reason given is that these dealers have been in business a long time and earn lucrative margins (despite the interest rate being limited by law to 13 percent); thus they have sufficient liquidity to absorb their limited losses, and have too much to lose by not respecting their contracts.

What banks seem to be ignoring, however, is that the impact—on some dealers and on many farmers—may be a lower risk appetite and less liquidity. This would mean less demand for hire purchase of agricultural equipment in the coming year or two. On the other hand, this concern should be tempered by the fact that the vast majority of dealer networks seem (at least directly) unaffected by flood damages, and by the fact that the end clients are relatively wealthy, and in most cases can probably manage to make their payments.

Nevertheless, in order to reflect the likely reduction (at least in some parts of the rural population) in demand for hire purchase agricultural equipment, we assume that there will be a 10 percent reduction in the current hire purchase agricultural equipment portfolio<sup>55</sup> for the next two years, and thus that the concerned banking group will lose the margin between the 13 percent interest it charges and the 8 percent it can receive from depositing those funds. This amounts to a potential loss over those two years of K 402 million in hire purchase gross profit margin for those players.

**Cooperatives.** The cooperative sector, despite its relatively massive rural outreach, also reported no damages to its offices, at any level. The Ministry of Co-operatives had already calculated a loss figure, which is the amount of additional post-flood loans that have been requested by members. These post-flood loans amount to K 4,807 million. After cooperative societies (which operate at the village level) request such loans, they reportedly have their case reviewed by a state representative, and loans are released to all long-standing cooperative members of the given village, if significant flood damage is confirmed.

This amount of additional loans is currently being disbursed, and recipients do not have to repay the principal until July 2016; before then only interest needs to be repaid, in six monthly installments. Although most of these loans are likely to be repaid eventually, they are being considered as a loss here because the fate of the loans they replace remains unclear—at some stage, significant write-offs may be unavoidable.

**Microfinance institutions,** There is only one large MFI in Myanmar, PACT GMF. Especially given that PACT is one of the few sizeable MFIs that was significantly exposed in areas flooded this year, it is also the main MFI to suffer flood-related losses. PACT stated that its microfinance-related losses (due to the floods/landslides) amounted to US\$0.5 million, and that much of this amount had already been restructured or refinanced by the LIFT program. It is unlikely that other MFIs would have very significant loss amounts, given their limited scale and their concentration outside this year's flood-impacted areas. LIFT itself provided higher loss figures, as it combined "pure" microfinance loss figures with "social welfare fund" losses, i.e., amounts granted to beneficiaries to help them recover from flood-related losses. The overall loss figure provided by LIFT was US\$1.8 million.

<sup>55</sup> Based on portfolio or revenue figures provided by YOMA, AYA, KBZ, and Myanmar Oriental banking groups.

**Insurance sector.** The insurance sector consists essentially of one entity, Myanmar Insurance, which has a very limited branch network and does not engage in agricultural or rural insurance. Unsurprisingly, it suffered no flood-related damages to its branches.

Its losses were also negligible. Myanmar Insurance reports having received only seven to eight flood-related claims, one of which was around K 400 million (coffee mix distributor); the others were very small. For such property loans, Myanmar Insurance is partially reinsured with Munich RE, and its liability would be limited to the initial K 30 million per claim, plus 13 percent of any amount between K 30 million and K 500 million, as well as 100 percent of any amount above K 500 million (very rare). If we assume an average value per claim of K 200 million, this brings Myanmar Insurance's losses from these eight flood-related claims to K 417 million ( $8 * 30$  million [first loss]) +  $(8 * (200 - 30$  [average claim minus first loss] \* 13 percent). The assessment team has been trying to get a more accurate figure of claims from Myanmar Insurance, but this calculation gives a good idea of the tiny scale of these flood-related losses. There was one major international client's flood-related claim, for an amount of US\$397 million, but that claim is reportedly 100 percent covered by a foreign reinsurer, and thus involves no immediate losses to Myanmar Insurance.

A longer-term loss may be the increased cost of obtaining reinsurance from international reinsurers, but Myanmar Insurance has no information on how much this cost will increase, so no assumptions are being made on that front. Myanmar Insurance and the Ministry of Finance (MOF) Financial Regulation Department believe that private insurers' flood-related claims are next to zero, for the reasons stated in the previous section, and this was in line with what the largest private insurance company told the assessment team.

However, both Myanmar Insurance and the largest private insurance company have shared their concern that, given people's increased awareness of the risk of floods, demand for insurance could significantly increase. The problem is that current regulation does not allow insurance companies to price their policies according to risk. All fire plus flood policies, for example, must be priced the same, regardless of the actual risk of flooding in the client's area. Insurance companies also currently do not have the right to refuse clients, meaning that Myanmar Insurance or private insurance companies could find themselves with large liabilities and insufficient revenue to cover losses.

## RECOVERY AND RECONSTRUCTION STRATEGY

The only significant flood-related recovery required for the financial sector per se is to ensure that MADB has the necessary support to keep operating at levels similar to (or higher than) past levels. Providing this support will require more detailed analysis of MADB's doubtful loans, as well as government intervention to ensure that Myanmar Economic Bank's loans to MADB can be restructured; this restructuring is necessary so that MADB can restructure its loans to clients impacted by the disaster. Other segments of the financial sector can continue as before without any additional government or donor intervention.

The real question for the financial sector is how it can build back better—that is, how it can increase access to formal financial services in rural areas and thus decrease the rural population's vulnerability to natural disasters. The focus here is on initiatives and recommendations that will help to expand financial services in flood-prone rural areas. This does not mean that initiatives not included here are unimportant, merely that they could not all be prioritized.

Despite its weaknesses, MADB can hardly be avoided as a delivery vehicle for making further financing available to farmers. Most farmers in the country are still without access to formal financial products, so the implementation partner must have a proven ability to reach larger numbers of the rural population—especially given that the alternative, i.e., informal lenders, charge such astronomical

interest rates. Although the cooperatives may have more members,<sup>56</sup> MADB is more tested in terms of delivering relatively large loans rapidly.<sup>57</sup> Given the importance of the MADB loans to those communities that receive them, it is important to ensure not only that MADB can continue serving existing clients, but also that it have the funding and technical support required to successfully expand into other geographical areas and other crops. The proviso is that this partnership include steps to start the restructuring of the MADB, a stated goal of the government.

A World Bank study of MADB has identified many areas that need to be strengthened.<sup>58</sup> Channeling funds released to the MADB specifically for post-flood recovery purposes could offer the perfect opportunity to start reforms on a small scale (for this operation and the branches through which these funds will flow) and to test the proposed changes before they are implemented on a bankwide scale. The technical assistance program will help with the following: transition from paper-based to computerized transactions, computerized portfolio management, regular management meetings to assess portfolio quality and extent to which lending and saving targets are being met, streamlined loan approval processes, and direct credit risk assessment by meeting end clients.

Although MADB will continue, at least in the medium term, to be the main source of funds for rural areas, it is also important to secure faster outreach growth in the microfinance sector. Many significant issues are simply legal and regulatory impediments that need to be addressed, but beyond that, there is a case for supporting the expansion of two (new or existing) MFIs into flood-prone townships. This is in part because MADB cannot be everywhere, but in part because MFIs play a very important role in funding noncore agricultural expenses, allowing households to complement core agricultural income by engaging in other aspects of farming, trading, or other economic activities.

While there is no expectation that private banks will massively expand into towns and villages in the foreseeable future, private banking groups have nonetheless already identified hire purchase financing as a way to do business in rural areas. In order to speed up the development of this product, there is a need for moveable and real estate collateral registries. Without such registries, loan providers' willingness to lend is decreased, given that borrowers' full ownership of collateral cannot be verified (and the presence of other lenders cannot be detected). In order to be successful, the hire purchase business needs to be governed by a tailor-made law that includes clear and easy mechanisms by which financiers can recover their equipment clients default on payments.

In terms of the insurance sector, the reality is that private insurance companies based in Myanmar will not be able to significantly broaden their liabilities in rural areas, nor will they have an interest in doing so. For now, disaster risk insurance will remain a state prerogative, as explained in the disaster risk management chapter. Nevertheless, the current legislative environment potentially puts both Myanmar Insurance and private insurance companies at significant and unreasonable risk. This problem is addressed below.

One initiative that would significantly help to reduce the vulnerability of rural inhabitants is setting up the infrastructure for effective mobile banking. This would not only make offering financial services to rural communities more affordable, but it could also enable the poorest households to have access to government cash payments more quickly and affordably. Currently, this initiative does not involve any extra budget, but does require strong government support to rapidly pass pending legislation, and to minimize bureaucratic hurdles slowing these initiatives down.

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<sup>56</sup> Tables provided by the Ministry of Co-operatives, dated August 2015, state that cooperatives have a total of 2.92 million members. Meanwhile, MADB reported that they had around 2 million active borrowers (on paper, they have 4 billion borrowers, but they reported that only around 1 million of those are active, and usually only in order to secure loans).

<sup>57</sup> MADB seasonal loans can be up to K 1,000 million, whereas cooperatives offer a maximum of K 100 million as their standard loan product.

<sup>58</sup> LIFT and World Bank 2014.

## RECOVERY AND RECONSTRUCTION PLAN AND IMPLEMENTATION

### Short term

#### 1. Establish a Memorandum of Understanding (MOU) for an MADB expansion and restructuring program, and support affected MADB borrowers.

- With the support of the Ministry of Agriculture and Irrigation (MOAI) and MOF, MADB should offer loan restructuring (offering an extra 12 months for the principal repayment) to borrowers who are proven to have been negatively impacted by the floods/landslides.
- MOAI and MOF, along with the chosen international partners and MADB management, should establish an MOU outlining the scope of partnership between the donor and MADB.
- This consultancy work should include working with MADB to get sound information on doubtful loans caused by the floods, and should determine which townships are most in need of access to MADB and should be prioritized for expansion.

Forecasted cost (drawing up MOU only; no loan refinancing yet): K 75 million.

### Medium term (April 2015–March 2016):

#### 1. Restructure doubtful MADB loans

- The restructuring is to be supported in the context of a long-term partnership and a restructuring road map.
- Once the scale of doubtful loans is confirmed, a credit line should be offered to allow MADB to remain at its usual lending levels, despite the flood-impacted loans that were restructured.
- With the help of technical assistance in the associated MADB program, these funds should be tracked by a parallel, fully computerized accounting system (starting in those branches using the new funds), in part so that this type of approach becomes more familiar to MADB staff.
- This loan should not go via Myanma Economic Bank or other intermediaries, but directly from MOF.
- The assumption should be that one-third of MADB's currently estimated (compromise figure) doubtful loans will remain unpaid and require refinancing.

Forecasted size of loan (to be confirmed by Terms of Reference research): K 28,750 million.

#### 2. Implement the MADB restructuring and expansion program into flood-prone areas

- The MADB Partnership should include the following elements:<sup>59</sup>
- For loans under this project, move (perhaps progressively) to a new risk management approach, where MADB staff assess clients themselves, and where loan approval procedures are streamlined.
- Starting with branches where bad loans are being refinanced, as well as in new branches being added in flood-prone areas, ensure computerization and real-time access to loan files and portfolio information (this will start in months 5–17, but will continue in the long term).
- A separate credit line should be made available, conditional upon expansion of MADB branches in a certain number of flood-prone townships that currently have no MADB branch; a given proportion of the credit line is reserved for lending in those expansion townships.
- The new credit line should also be linked to nonpaddy crops, both through the addition of crops not previously funded (including fruit and nut trees, which will help prevent soil erosion in future floods), and through an increase in the amount that can be funded per acre of nonpaddy crops (up from 20,000 per acre, to a level to be determined). This will give farmers the option of diversifying away from rice, as recommended in the agricultural chapter.

<sup>59</sup> These include many, but not all of the recommendations from LIFT and World Bank (2014). Note that such restructuring is in line with government priorities—indeed, earlier in 2015, the president's office reportedly sent a letter to MADB management saying they should start preparing for privatization. While privatization is likely to be a distant prospect, the sort of restructuring being proposed would be vital a precursor.



- In terms of technical assistance, we assume one full-time international rural finance expert and one full-time local financial sector expert, with MADB providing office space, communications, car when necessary, etc.

Funding requirements: Credit line—K 12,000 million;<sup>60</sup> technical assistance grant (12 months)—K 393.8 million.

### **3. Support efforts to strengthen leasing legislation, and to establish moveable and real estate collateral registries**

- The hire purchase business needs to be better supported by appropriate legislation and accompanying regulations, which should allow hire purchase companies to repossess their equipment if clients become delinquent, and simplify the documentation and guarantor requirements for lessees.
- Leasing should be included in the upcoming Banking and Financial Institutions Law.
- The collateral registries initiative is very important, not just for the growth of banking in general, but particularly to help hire purchase to develop more rapidly and safely.
- There is already a project under way to establish collateral registries, and no other funding needs have been identified at this stage
- These initiatives should be among the government's priority areas, given the importance of hire purchase as the only source of funding for equipment, particularly for farmers without registered land or buildings.

Funding requirement: No extra funding required, simply strong government support.

### **4. Continue efforts to improve legal and regulatory framework.**

- The FRD is currently working to build a sustainable microfinance industry and as such is putting reforming its microfinance legal and regulatory framework to enable sustainable expansion of microfinance sector. This includes reforming quantitative and price restrictions on both funding and lending activities of MFIs. Key measures include, among others.
- Allowing MFIs to accept any level of voluntary savings, as well as long-term loans, essential for capital investments.<sup>61</sup>
- Streamlining or waving the requirement for Central Bank of Myanmar (CBM) approval of debt investments in MFIs.

Forecasted cost: None. Existing donor programs are already working on these important issues, they simply need to be strongly and urgently supported by the government of Myanmar.

### **5. Prioritize issuance of a best-practice mobile financial services regulation, and support the rapid establishment of cash-in /cash-out agents**

- This would allow both international and local remittances to reach inhabitants of flood-prone areas, without the risks involved in informal transfers.
- It would facilitate government cash transfers to the affected population rapidly, cheaply, and transparently.
- Work on this initiative is already ongoing, with a draft mobile payment regulation develop.
- This structure is unlikely to be ready in time to assist with most of the initial payments related to this year's floods, but establishing a strong mobile payment system for future natural disasters is important.
- A strong mobile payment system makes expansion into rural areas more appealing and affordable for more MFIs, cooperatives, and banks.

<sup>60</sup> We compared townships (106) where over 1,000 acres of arable land was damaged/destroyed by floods (figures from Myanmar Information Management Unit), and those townships (in that list) where MADB is reporting likely losses (46). We assumed that the difference (60) was those townships impacted by floods but not yet adequately served by MADB. We then assumed that MADB could expand into one-third of those townships (20) in the first year of the program, serving an average of 1,000 clients per township, with an average loan of K 600,000 (6 acres x 100,000).

<sup>61</sup> Currently, MFIs can accept only 5 percent of their loan portfolio as mandatory savings, and another 5 percent as voluntary savings.

- Work on this intervention should be prioritized, but results are not expected before the medium to long term.

Funding requirement: No extra funding required, simply strong government support.

## 6. Upgrade the insurance sector legal and regulatory framework

- The insurance sector legal and regulatory framework is outdated and hampering market development in general, as well as to flood prone areas. The FRD is currently working to revise the insurance law and issue implementing regulations more broadly in line with the core principles of the International Association of Insurance Supervisors (IAIS). Efforts are also underway to upgrade the supervisory framework. Supervision is part of the foundation of effective insurance markets; without it, markets fail to develop and grow.
- Insurance companies can only offer a fixed price for policies, regardless of actual risk levels in different geographical areas, the potential for losses is great. Given that the population's awareness of flood risks has increased after this year's disaster, it is all the more likely that there could be a run on flooding insurance options, and that these would be vastly under-priced; Currently, insurance companies are in a situation where, if clients ask for a policy, e.g. fire & flooding building insurance, they cannot refuse;
- This year, the insurance sector was not significantly affected by the floods, but in future—at least until insurance companies are allowed to price their risk realistically—they should be given the right to refuse clients.

Funding requirement: No extra funding required, simply strong government support

### Long term

#### 1. Continue implementation of the MADB restructuring and expansion program

- The MADB restructuring and expansion program is likely to need at least three years to achieve restructuring of MADB.
- The priorities and approaches remain as described above and will gradually spread to all areas of MADB.
- Funds provided from the medium-term injections should continue revolving and allowing MADB to geographically spread further into flood-prone areas, though at a slower pace.

Forecasted costs of technical assistance program, years 2 and 3: K 787.5 million

An overview of the sector's recovery and reconstruction needs is in Table 19.

## SECTOR ASSESSMENT METHODOLOGY

The assessment team conducted a desk review of reports and other documents on the financial sector in Myanmar (Annex 2), and then held discussions with private sector financial institutions, government bodies, responsible banks, MFIs, insurance companies, donors, and international financial institution representatives, including the AGD Bank, ARDC (Agricultural and Rural Development Consultants), AYA Bank, CB Bank, Financial Regulatory Department (MOF), GIZ (German Agency for International Cooperation), Global Treasure Bank, I-KBZ, International Finance Corporation, International Monetary Fund, KBZ-Bank, LIFT, MADB, Ministry of Co-operatives, MOAI, Myanma Apex Bank, Myanma Economic Bank (MOF), Myanma Foreign Trade Bank, Myanma Insurance, Myanma Investment and Commercial Bank, Myanmar Banks Association, Myanmar Farmer Association, Myanmar Microfinance Bank, Myanmar Oriental Bank Ltd., Myawaddy Bank Ltd., Oriental Leasing Co., PACT Global Microfinance Fund, SMIDB, YOMA Bank, and YOMA Strategic Holdings. During field visits to two remote villages in Magway State,<sup>62</sup> the team met with and interviewed (as a group) large numbers of cooperative members and MADB borrowers. These visits also offered the perspective of a township MADB branch and of a rural agricultural machinery dealer. Data sources have in some cases been verbal numbers given by representatives of financial institutions; in some cases (such as that of MADB) they have been in e-mails and tables sent after our meetings; and in other cases they were from existing reports (both from international financial institutions and from government sources). All calculations are explained in the text or in footnotes.

<sup>62</sup> TengKay village in Pwint Phyu Township, and NaMa village in Sidoktaya Township.

Short term (4 months)			
Subsector	Initiative	Value (million K)	Responsible agency
Agricultural financing	Drawing up MADB Partnership MOU	75	MOAI & MOF
<b>Subtotal</b>		<b>75</b>	
Medium term (12 months)			
Subsector	Initiative	Value (million K)	Responsible agency
Agricultural financing	Restructuring & refinancing MADB bad loans (loan)	28,750	MOAI & MOF
Agricultural financing	Implementing MADB restructuring partnership (technical assistance)	393.8	MOAI & MOF
Agricultural financing	Financing MADB expansion into more flooded areas (loan)	12,000	MOAI & MOF
Microfinance	Enhancing regulation and oversight of microfinance sector	0	MOF
Leasing (hire purchase)	Strengthening hire purchase legislation, and collateral registries	0	MOF
Mobile banking	Prioritizing strong mobile banking law, etc.	0	MOF & CBM
Insurance	Revise legal and regulatory framework to improve line with IAIS principles	0	MOF
<b>Subtotal</b>		<b>41,143.8</b>	
Long term (12 months)			
Subsector	Initiative	Value (million K)	Responsible agency
Agricultural Financing	Continuing implementation of MADB restructuring & expansion	787.5	MOAI & MOF
<b>Subtotal</b>		<b>787.5</b>	
<b>TOTAL</b>		<b>42,006.3</b>	

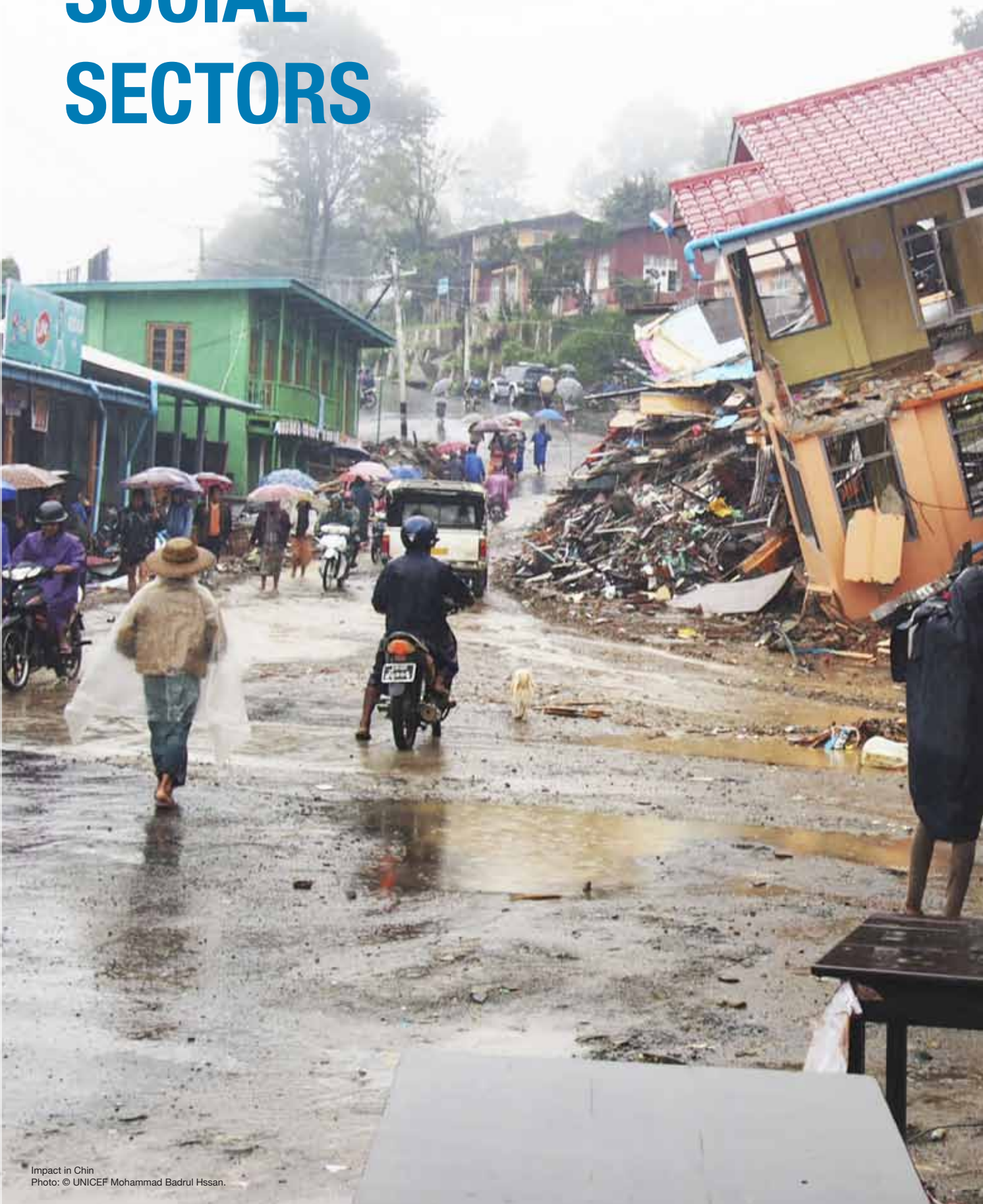
**Table 19.**

Financial sector recovery and reconstruction needs

Source: Assessment team.

Note: The total figure reflects the assessment team's estimation of the capacity for growth of MADB and MFIs—as well as its view that the private sector banks can best be assisted by legislative and regulatory reform, rather than funding. The overall figure represents only a small fraction of the financing needs identified by the assessment team within the agriculture sector, as summarized in the agriculture chapter. Also note that estimations of loans needing refinancing that are used in the agriculture chapter assume a large proportion of loans from informal lenders, which are outside the usual scope of financial sector interventions. Such lending should be replaced rather than be encouraged via further funding.

# SOCIAL SECTORS





## Health

### SUMMARY

**The floods and landslides had a severe impact on the health system and its capacity to deliver essential services.** With over two hundred health facilities destroyed and others needing repair and reconstruct, access to health facilities has been reduced. Effective coordination will be extremely important to ensure that government, United Nations agencies, international donors, national and international NGOs, and the private sector are able to produce effective results for the people of the affected areas.

### PRE-DISASTER CONTEXT

Myanmar suffers from the double burden of infectious diseases and noncommunicable diseases (NCDs). Fifty-nine percent of all deaths in Myanmar are due to NCDs. Communicable, maternal, perinatal, and nutritional conditions account for some 30 percent of deaths.<sup>63</sup> Maternal and under-five mortality rates are still high, at 200 per 100,000 live births and 51 per 1,000 live births, respectively.<sup>64</sup>

Access to and utilization of health services is still inadequate. This is due to geographical, financial, and cultural barriers, especially in the disaster-affected states and regions. For example, the proportion of births attended by skilled health personnel was 74.8 percent for the country in 2014, but only 53.8 percent in Chin State, 54.3 percent in Rakhine, and 67.4 percent in Ayeyarwady. Immunization coverage (three doses of pentavalent vaccine) in 2014 was 84 percent in Chin State, 93 percent in Magway, 70 percent in Rakhine, and 93 percent in Sagaing. In 2015, immunization coverage (pentavalent vaccine) was 38 percent in Chin State as of June, 63 percent in Magway as of August, 35 percent in Rakhine as of June, and 61 percent in Sagaing as of August.<sup>65</sup>

In addition, health awareness and knowledge are inadequate. Community involvement in public health programs, child nutrition, school health, and infectious disease prevention and control programs still needs to be improved. Myanmar women and men have a higher prevalence of raised blood pressure, obesity, and tobacco use than other countries in the region.

Health care in Myanmar is offered by public and private providers, and the Ministry of Health (MOH) is the major provider of comprehensive care. Myanmar's health care system has a pluralistic mix of public and private systems in both financing and provision. MOH provides comprehensive health care services, covering activities for promoting health, preventing diseases, and providing effective treatment and rehabilitation at the grassroots level. Private practitioners, traditional healers, health assistants, midwives, and voluntary health workers, especially axillary midwives, are the main health care providers at the community level. The private for-profit sector provides health care through a large number of clinics and hospitals. The private not-for-profit sector, comprising community-based organizations and religious organizations, provides health care through charity clinics and certain hospitals. Private clinics and hospitals are required to report health statistics to MOH. Health services provided at all levels of government health facilities are generally free of charge.

Myanmar's health services face several challenges. In remote areas, difficulties in access and the attrition of health staff and voluntary health workers, including auxiliary midwives, are significant problems. There is a need to expand health infrastructure in rural areas, strengthen health care delivery systems overall, and deploy and retain qualified health personnel in remote areas. The government has significantly increased the health budget for pharmaceutical and medical supplies throughout the

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<sup>63</sup> WHO 2014, 2015.

<sup>64</sup> WHO 2015.

<sup>65</sup> Note that these were the data available at the time of the assessment.

country as part of health sector reform; but supplying drugs and medical equipment to remote areas remains a challenge, and out-of-pocket payments for health care continue to be high. Many of the barriers to achieving effective coverage of health services lie outside the health sector. These include transportation, mobility of population, insufficient health budgets, lack of modern technology, and weak local governance.

Collaboration and cooperation between various actors in the health and health-related sectors have improved at central level over the past five years. At state and region level, however, cooperation and collaboration still need further improvement. Better information sharing is necessary, especially when a particular state, region, or part of the country is affected by disaster.

There are three main sources of health sector financing: public, external, and private. In Myanmar, public funding includes government revenues channeled through the budgets of the Ministry of Health, other ministries and departments, community-based organizations involved in health services, and the government social security scheme. External funding mostly consists of official development assistance provided by foreign governments and funding provided by NGOs and various charities. Private financing derives largely from out-of-pocket payments and—to a very small extent, given that the country is still developing a health financing system—payment by private insurance schemes.

To address the many challenges mentioned above, the government has been undertaking health reforms since 2011. The aim of these reforms is to achieve universal health coverage: that is, high-quality, affordable health care for all in Myanmar, in line with Myanmar Health Vision 2030. These health sector reforms have led to a dramatic increase in health budget and spending, although health financing continues to be a major challenge. The health budget for the 2015/2016 financial year, at K 753 billion kyats, represents an increase of 8.7 times the 2011/2012 budget.

The increased allocations to public health have resulted in several tangible improvements. First, spending on essential supplies and medical equipment has increased 35 times from that in 2011, to around US\$112 million in 2014. As a consequence, the availability of pharmaceuticals and medical supplies in public health facilities has significantly increased. Second, out-of-pocket payments have decreased from 80 percent in 2011 to 60 percent in 2014. The financing of an essential health care package, currently undergoing development, is expected to reduce out-of-pocket payments further. Third, the increased health budget has led to improved health infrastructure and human resource capacities. From 2011 to June 2015, the total number of hospitals in Myanmar increased by 15 percent, and the number of doctors and nurses increased overall by 25 percent. In the public sector, the number of doctors has increased by nearly three times, and the number of nurses by 37 percent. Nonetheless, the deployment of doctors and nurses is still inequitable.

Achieving universal health coverage will require solutions not only from within the health sector but also from sectors beyond. These solutions include community development, improvements in transport and communication, private sector participation, public education and participation, and public finance and governance, especially at township level.

For disaster risk reduction and response, MOH has a central command system with fully equipped Emergency Operation Center (EOC) in Nay Pyi Taw, which has a network with the Strategic Health Operation Centers at state and regional level. The central command system has shown itself to be effective in damage and loss assessment and in controlling communicable diseases. However, the capacity of EOC at all levels still needs strengthening.

Regarding communicable disease surveillance and control, based on the 2008 Cyclone Nargis experience, MOH has activated the Early Warning Alert and Response System (EWARS), an enhanced surveillance system to detect and respond to outbreaks and unusual events in the post-disaster period. EWARS is sensitive enough to detect outbreaks early and respond in a timely manner.

<sup>66</sup> According to MOH, the calculation does not adjust for inflation over the period in question.

MOH has been running its Field Epidemiology Training Program, which incorporates disaster management. Health staff have found this program useful. Sustainability of the program is important for capacity building. On the other hand, cascade disaster management training is still required to enhance the capacity of the health staff working at all levels.

On-the-job training, continuing medical education, and fulfilling of necessary supports are needed at all levels.

## POST-DISASTER SITUATION

The floods and landslides has affected the health sector in three ways. First, the destruction of and damage to health facilities and roads has disrupted access to and provision of health services, including referral services. Second, the disruption of lives and the various losses have directly affected communities' health-seeking behavior, which in turn has increased health risks. Third, the damage to water and sanitation facilities and the crowding and unsanitary conditions of displaced communities has increased the risk of infectious disease.

The longer-term trends and effects of the disruptions and disaster cannot yet be accurately determined. For example, disruptions in treatment of infectious diseases could have a negative impact in the longer term but cannot be gauged at present. In the short term, however, Health Management Information System (HMIS) data show no change in trends of surveillance diseases. EWARS reports show no significant increase in the burden of communicable diseases in disaster-affected areas over the pre-disaster situation, and the Central Epidemiological Unit reported no significant disease outbreaks. On the other hand, the disaster is expected to exacerbate existing disparities in the availability of health services across geographical areas. Those areas with fewer functioning health facilities would be more vulnerable than other areas to health risks in the aftermath of the disaster.

After the disaster MOH officials and humanitarian agencies undertook concerted efforts to provide life-saving health interventions and to restore essential health services, such as immunization, maternal and child health care, and continuation of treatment and care, including provision of ART (antiretroviral therapy) for HIV patients, in the affected areas. The Ministry of Health immediately mobilized an emergency budget for the deployment of medical teams and rapid response teams and for procurement of emergency medical supplies. The World Health Organization has also been providing support for emergency operational costs and medical supplies in the disaster-affected areas. Other efforts by government, humanitarian agencies, and private sector donors to mitigate the impact of disasters include the provision of health services through mobile clinics and activities to prevent water-borne diseases. The demand for mobile health services was high in the post-disaster period.

Infrastructure and assets and access to services. Twenty-four rural health centers and subcenters have been totally destroyed by the disaster. More than 200 facilities have been partially destroyed, of which 21 are township and station hospitals, and two are public health offices. In addition, access to health services have been disrupted by damages to many roads, bridges, and means of transport; travel to remaining health facilities has thus become difficult and time-consuming. Almost all the destroyed facilities were primary health facilities, including station hospitals and rural health centers and subcenters (which provide essential health care in rural areas). While the value of the damage to these facilities may not be as large as that for hospitals, it has a tremendous impact on the access of the rural population to health services. An overview of the health case status in disaster-affected areas is in Table 20.

Sector governance functions and systems. There are significant health impacts at the village level following the disaster. These include (i) a range of health risks that will require the health system to be vigilant about potential disease outbreaks; and (ii) health needs that require treatment and care



State/Region	Townships (number)	Mobile clinics (number)	Temporary clinics (number)	Deaths (number)	Consultations (number)	Water chlorination (frequency)
Ayeyarwady	17	208	202	12	70,620	14,535
Bago	15	26	203	7	28,619	19,154
Chin	5	9	19	0	6,002	265
Kachin	2	0	15	0	2,547	5,772
Kayin	2	0	12	0	407	662
Magway	9	5	82	4	21,626	11,326
Mandalay	10	8	55	10	4,277	4,522
Mon	3	0	85	0	1,858	1,048
Rakhine	11	35	77	55	49,449	28,935
Sagaing	29	112	349	23	74,434	45,460
Shan (East)	3	0	10	4	1,747	235
Shan (North)	2	0	3	5	0	0
Shan (South)	1	0	0	0	1,034	0
Thanintharyi	2	0	1	1	25	0
Yangon	3	3	33	0	7,016	3,290
<b>Total</b>	<b>114</b>	<b>406</b>	<b>1146</b>	<b>121</b>	<b>26,9661</b>	<b>13,5204</b>

Source: Ministry of Health.

**Table 20.**

Health care status in disaster-affected areas (as of October 1, 2015)

through the health service delivery system. As of October 1, 2015, five primary-level health facilities in Chin State and Sagaing Region, including rural health centers and subcenters, had not yet resumed delivering health services.

Increased risks and vulnerabilities. As of October 1, 2015, 121 people had died in the affected areas as a consequence of the floods and landslides. Six disease outbreaks were reported through EWARS in the disaster and post-disaster phase, but they were controlled by the coordinated efforts of Ministry of Health, related departments, health partners, and the community. Over 150,000 children under the age of five and approximately 62,000 pregnant and lactating women are estimated to have been affected by the floods (based on approximately 1.7 million people affected overall). Damage to crops, roads, housing, and infrastructure is affecting access of families and children to adequate, nutritious food and to safe environments where mothers and other caregivers can continue breastfeeding and feeding their children. There is thus a risk that in the months following the floods, the nutritional status of children may deteriorate, especially in townships with preexisting high levels of malnutrition and chronic vulnerabilities, such as in Magway, Chin, and Rakhine. It is estimated that since July, there has been an increase in the caseload of children suffering from acute malnutrition (wasting). MOH teams detected 3,172 additional cases of children suffering from acute malnutrition in the 21 priority flood-affected townships.

In September the government of Myanmar received initial supply and operational cost support for nutrition-related flood response activities from partners, but the MOH National Nutrition Center has not yet expended its own funds on nutrition flood response. This is in part because of limited earmarked funding in the MOH line budget and in part because other partners were able to cover initial needs. However, a scaling up of nutrition interventions will be required through the health system in upcoming months, when further deterioration of nutritional status is likely.

## ESTIMATED VALUE OF THE EFFECTS AND THE IMPACT OF THE DISASTER ON THE SECTOR

**Table 21.**  
Quantification of damages and losses (million K)

Subsector	Damage (million K)			Change in economic flow/losses (million K)		
	Value	Ownership Public	Private	Value	Ownership Public	Private
Health	6,647.9	6,506.5	141.4	1,536.707	1,537.3	0

Source: Ministry of Health.

Over 200 health facilities in the affected areas were damaged due to the disaster, including some that were totally destroyed. The cost of reconstruction is around K 2,500 million. Medicines, medical equipment, and furniture were also destroyed, and their cost is estimated to be over K 3,000 million. Emergency health care through the mobile medical teams, activities to prevent water-borne diseases and vector-borne diseases, replenishment of damaged cold chain equipment for routine immunization, and nutrition interventions—these all pose additional burdens for the already-stretched human and financial resources of the sector.

Government health services are provided free of charge and so there is no loss in revenue. However, there is additional cost to government (MOH) due to additional caseload. There will be loss in revenue in privately run general practice clinics, but data on these losses are not available.

**Table 22.**  
Damage and losses data (million K)

	Damage (million K)			Change in economic flow/losses (million K)		
	Public	Private	Total	Public	Private	Total
<b>Infrastructures and physical assets</b>						
Structural	2,594.596	32.176	2,626.772	n.a	—	n.a
Furniture	95.600		95.600	n.a	—	n.a
Medical equipment	2,201.770	54.590	2,256.360	n.a	—	n.a
Medical supplies	1,051.770	54.590	1,106.360	n.a	—	n.a
Other assets (water and sanitation facilities)	547.5	—	547.5	n.a	—	n.a
Total cost of infrastructure and physical assets	6,506.5	141.4	6647.89	n.a	—	n.a
<b>Disruption of access to goods and services</b>						
Travel and per diem to mobile teams	n.a	—	n.a	27.870	—	27.870
Medical supplies	n.a	—	n.a	723.840	—	723.840
Revenue loss	n.a	—	n.a	0.000	—	0.000
Treatment of injuries	n.a	—	n.a	16.360	—	16.360
Referral costs	n.a	—	n.a	3.680	—	3.680
Other losses	n.a	—	n.a	21.250	—	21.250
Total cost of disrupted access	n.a	—	n.a	793.001	—	793.001

<b>Disruption of governance and social processes</b>						
Travel and per diem for supervisory visits	n.a	—	n.a	9.170	—	9.170
Operation of EOCs in 3 states and regions	n.a	—	n.a	30.000	—	30.000
Total cost of disrupted governance and social processes	n.a	—	n.a	39.170	—	39.170
Increased risks and vulnerabilities	n.a	—	n.a	n.a	—	n.a
Cost of nutrition intervention	n.a	—	n.a	134.008	—	134.008
Cost of controlling outbreaks	n.a	—	n.a	2.402	—	2.402
Cost of information campaigns	n.a	—	n.a	8.200	—	8.200
Cost of vector control and prevention	n.a	—	n.a	559.926	—	559.926
Total cost of increased risks and vulnerabilities	n.a	—	n.a	704.536	—	704.536
<b>Total</b>	<b>6,506.5</b>	<b>141.356</b>	<b>8,185.2</b>	<b>1,536.707</b>	<b>0.000</b>	<b>1,536.707</b>

Source: Ministry of Health.

Note: — = not available; n.a. = not applicable.

## RECOVERY AND RECONSTRUCTION STRATEGY

Priorities for early recovery include restoring the functionality of the health systems and building the capacity for effective service delivery. When restoring the health functions in the disaster-affected area, opportunities to build back better will be sought, including reconstructing or renovating health infrastructures for resilience to disaster, improving access to health services (compared to pre-disaster access), strengthening disaster risk management capacities of government and communities, and reducing risks and vulnerabilities to future disasters. The reconstruction and restoration of health facilities will need to be based on careful planning and site selection to reduce exposure to flood hazard. For example, in towns such as Mogaung and Kalay, only part of the town is prone to flooding. In addition, care needs to be taken in placement of pharmaceuticals and medical supplies within facilities so they are safe from flooding; second stories (where available) or secure storage facilities at a higher elevation are preferred.

To address immediate needs, essential health services will be provided to the affected population through temporary health service delivery points in relocation sites and mobile clinics; this approach will ensure response to health needs while facilities are being restored and reequipped. Mobile clinics and outreach services will be used and mechanisms put in place to improve access to referral centers.

Given the ongoing risks arising from the impact of the disaster, support to health services should pay particular attention to (i) epidemiological surveillance of the population, (ii) infectious disease prevention and control (including adequate supplies and mobile response capacity), and (iii) health promotion through community outreach among vulnerable groups, especially for vector- and water-borne disease prevention and treatment. To ensure a coordinated approach to the provision of health services, township-level coordination mechanisms will be developed; these will ensure that the different health sector partners agree on the key outcomes expected, and that resources from different institutions are allocated efficiently. Risk insurance needs to be provided for public health facilities and pharmaceutical supplies.

Finally, the health program should also establish a system to track the needs and use of pharmaceutical and medical supplies provided through local donors and international resources.

## RECOVERY AND RECONSTRUCTION PLAN

A summary of the recovery and reconstruction needs and initiatives are included in Table 23.

**The short-term recovery plan of the health sector will target life-saving interventions by curative and preventive approaches.** The central command system at all levels will be enhanced to ensure effective and efficient health care response. Emergency response will be carried out in a coordinated way with other government ministries. This will include interventions to treat severe wasting among children under five, prevent micronutrient deficiencies, and prevent acute undernutrition among children and pregnant and lactating women.

**The medium-term recovery plan will emphasize improving health care access by restoring health facilities, improving manpower, and promoting disaster risk reduction.** A disaster risk management department will be established under the Department of Public Health. Emergency operation centers will be established in all states and regions, and EOC at central level will be enhanced.

**The long-term recovery plan will need to be in line with other development plans at various levels, and should aim to promote ongoing health sector reforms, strengthen health facilities, and strengthen the health information system.** MOH will take this opportunity to review and assess the health system’s response to emergencies and disasters, and identify health system-wide and cross-sectoral improvements. Furthermore, national, regional/state, and township disaster risk management and disaster response plans will be developed. Prevention, mitigation, and coping measures will be integrated in this plan. The capacity of the MOH workforce in disaster risk reduction and disaster risk management will be developed.

**Table 23.**  
Detailed  
recovery and  
reconstruction  
initiatives

Initiative	Cost (million K)	Amount already used (million K)	Remaining needs (million K)
<b>Short term (0–4 months)</b>			
Operation cost for Emergency Operation Center	176.520	0	176.520
Field supervision visit	61.170	21.170	40.000
Provision of emergency health care services	1,292.266	767.266	525.000
Disease prevention and control activities	1,024.382	454.826	569.556
Nutrition screening and nutrition promotion	155.659	134.008	21.651
Treatment of severe acute malnutrition (wasting)	77.325	0	77.325
Prevention of acute malnutrition (wasting)	1,372.519	0	1,372.519
Prevention of micronutrient deficiencies	736.134	0	736.134
Nutrition training	112.121	0	112.121
Early Warning and Response System operation	44.224	4.804	39.420
Preparation and implementation of recovery plan	44.000	0	44.000
Health education activities	31.200	8.200	23.000
Collection of damage and loss data <sup>a</sup>	-	-	-
Immunization in affected locations	105.100	105.100	0
Psychosocial support	100.000	0	10.000

<b>Medium term (0–12 months)</b>			
Reconstruction and repair of damaged health facilities, including furniture	2,608.996	0	2,608.996
Establishment of disaster risk management department in Department of Public Health	73.800	0	73.800
Review and assessment of health system's response to emergencies and disasters; identification of health system-wide and cross-sectoral improvements, followed by development of disaster risk management and disaster response plans	121.600		121.600
Establishment of 14 additional EOCs at state and regional levels	140.000	0	140.000
Meeting of staffing needs in health facilities <sup>b</sup>	-	-	-
Replenishment of medicines and equipment in health facilities, including cold chain equipment	5,556.976	2,176.538	3,380.438
Capacity building training for the health staff	49.000	0	49.000
Improvement of disaster awareness in the community	1.500	0	1.500
Prepositioning of medicines for disaster response	1,242.000	0	1,242.000
Health care provision by traditional medicines	15.560	0	15.560
Building of standard hospitals	2,800.000	0	2,800.000
Psychosocial support	21.600	0	21.600
<b>Long term (&gt; 12 months)</b>			
Reconstruction of damaged health facilities for greater resilience	-	-	-
Replenishment of medicines and equipment in health facilities	12,929.000	0	12,929.0
Capacity building training for the health staff	266.600	0	266.6
Improvement of disaster awareness in the community	7.500	0	7.5
Establishment of stand-by mobile health teams, including patient referral system	145.000	-	145.0
Establishment of computerized health management information system and e-surveillance system	300.000	0	300.0
Capacity promotion for disaster risk reduction and disaster risk management <sup>c</sup>	-	-	-
Establishment of transportation system for medicines, equipment, and staff	734.940	-	734.9
Establishment of field teams practicing traditional medicine <sup>b</sup>	-	-	-
<b>TOTAL</b>	<b>32,346.7</b>	<b>3,671.9</b>	<b>28,584.8</b>

Source: Ministry of Health.

Note:

- The costs, amount already used, and remaining needs are covered under "Field supervision visit" and "Early warning and response system operation."
- The costs, amount already used, and remaining needs cannot be calculated for the time being.
- The costs, amount already used, and remaining needs are covered under "Capacity building training for the health staff" in the long-term plan.

## RECOVERY AND RECONSTRUCTION IMPLEMENTATION

Short-term, medium-term, and long-term recovery programs will all need to be accompanied by strong mechanisms that track aid, coordinate programs, and monitor progress; and existing monitoring and evaluation systems will need to be enhanced at all MOH levels. Effective progress monitoring and aid tracking will be critical for ensuring that the government, international partners, and private sector achieve the sector objectives, and for ensuring regular reporting on progress toward recovery targets, on challenges faced during recovery, and on the impact of assistance provided. Finally, they allow communities to provide feedback on the support provided and adjust priorities according to their needs.

Arrangements for recovery include the following:

- 1) Reconstruction and renovation of damaged health facilities
- 2) Replenishment of medicines and equipment in the health facilities
- 3) Control of communicable diseases
- 4) Improvement in health of mothers, children, adolescents, and elderly
- 5) Improvement of hospital response to disasters
- 6) Strengthening of human resources quantitatively and qualitatively (Field Epidemiology Training, disaster risk reduction, disaster preparedness, and disaster response planning)
- 7) Nutrition promotion and screening
- 8) Treatment of severe acute malnutrition
- 9) Prevention of micronutrient deficiencies
- 10) Prevention of acute malnutrition (wasting)
- 11) Expansion of health care coverage in disaster-affected areas
- 12) Establishment of field teams practicing traditional medicine
- 13) Capacity promotion for disaster risk prevention and disaster risk management
- 14) Provision of psychosocial support
- 15) Enhancement of central command system

## SECTOR ASSESSMENT METHODOLOGY

The scope and depth of the health sector assessment was constrained by the limited time in which it had to be accomplished. The assessment relies on evidence whenever possible; but it also uses the expert judgements of the team to estimate cost. The main source of data for the Post-Flood and -Landslide Needs Assessment (PFLNA) process is secondary data. Reports from MOH are used to develop the baseline or pre-disaster situation. Information from HMIS is used to compare pre- and post-disaster morbidity data. However, it normally takes three months for the HMIS team to produce a comprehensive data set; thus for this PFLNA the team has received and analyzed an incomplete set of HMIS data. As a result, important information—such as gender-disaggregated data and violence-related data—cannot be presented in the assessment report. For post-disaster information on communicable diseases, the EWARS system is sensitive enough to detect outbreaks, and EWARS reports show no increased burden of communicable diseases in the disaster-affected areas, compared with the pre-disaster event-based surveillance system.

During the emergency response, mobile health teams recorded patient data, which supplement the HMIS data in analysis of pre- and post-disaster morbidity, and provide evidence of burden on MOH due to increased patient caseload. Information on severe acute malnutrition, micronutrient deficiencies, and the cost of nutrition-related screening, prevention, and treatment was provided by the National Nutrition Center with support from UNICEF and the World Food Programme.

Health staffs from township and station hospitals, as well as rural health centers and subcenters, provided information about and photographs of damage to health facilities, including damage to structures, medical equipment, medicine, and furniture. Information on occurrence, surveillance and control, and treatment of outbreaks came from the Department of Public Health. The department also

provided information on the prevention of water-borne diseases, vector-borne diseases, and other preventive measures, including information campaigns.

Cost of standard health facilities was provided by the construction unit under the Department of Public Health; this cost was applied for totally destroyed facilities. For partially damaged facilities, the estimates were made by health staff from facilities that submitted damage reports. Other sources of cost estimation were Ministry of Construction, United Nations Population Fund (reproductive health kits), and the procurement department under the Department of Public Health.



A destroyed school in Rakhine.  
Photo: © UNICEF.



## Education

### SUMMARY

**As a result of the floods and landslides, some 4,116 schools were affected in 11 states/regions.<sup>67</sup> Of those, 213 schools were fully destroyed and 430 were structurally damaged.**

Affected schools were closed for less than three weeks on average; because the floods and landslides occurred during the academic year (June–March), these closures affected students' learning. Almost all affected schools resumed education after mud and water were cleaned from the building and immediate repairs were made. Recognition must go to the government of Myanmar for its quick response and provision of resources directly to affected schools, which allowed classes to resume quickly. Although most schools with more extensive damage were able to identify other learning spaces in the community, continued support is required to ensure a minimum-quality educational environment in flood-affected schools.

The Ministry of Education (MOE), in partnership with other line ministries, local government, the community, the private sector, NGOs, and development partners, responded swiftly to the disaster and provided teaching and learning materials (TLMs), classroom furniture, and small amounts of cash for cleaning/repairing. The immediate psychosocial needs of children, teachers, and caregivers are being addressed and supported by the Department of Social Welfare and humanitarian partners, with a focus on Chin, Rakhine, Sagaing, and Magway. This spirit of collaboration and civic support for education ensures that losses in the sector were minimized.

Recovery needs were identified and estimated based on build back better (BBB) principles, which state that all new schools should become more resilient to future disaster and should ensure a better and more inclusive learning environment under ongoing educational reforms. In collaboration with the School Construction Sub-Working Group (SC-SWG) under the Education Thematic Work Group, MOE is developing improved school designs/technical specifications that incorporate BBB principles, and it will coordinate an extensive school-to-school assessment linked with the Education Management Information System. The recovery strategies emphasize an opportunity to improve access to higher-quality education and the importance of mainstreaming disaster risk reduction (DRR) in education (through curriculum, TLMs, teacher education/training, capacity development of education officers at union and local levels, and awareness raising/training of parent-teacher associations [PTAs] and communities). The National Education Sector Plan (NESP) should reflect the recovery strategies and planned budget.

### PRE-DISASTER CONTEXT

In the 2015/2016 school year, the basic education system consists of 45,355 primary and post-primary schools, 13,334 middle schools, and 3,511 high schools. Total enrollment in those basic education schools is 9,152,200 (4,549,575 girls and 4,582,621 boys). About 157,762 children attend monastic schools, which teach the national curriculum and are administered under the Ministry of Religious Affairs. In Rakhine State, more than 35,000 children are attending primary and post-primary learning opportunities in temporary learning spaces in internally displaced person (IDP) camps and host communities. Enrollment in private schools is virtually nonexistent in primary and middle school in affected areas. The numbers of boys and girls who enroll in school is almost equal at national level, although gender disparity exists in some areas. Most children who enroll complete primary school (83 percent of children in recent cohorts), but far fewer (less than half of that 83 percent) complete middle school (Table 24). Even fewer children progress onward. Only around a third of all children of school age are enrolled in secondary education. Children in rural, remote areas, or those from poor families or from minority or vulnerable groups, have less chance of access to good-quality basic

<sup>67</sup> Early childhood development centers or preschool education facilities are not included in the scope of this sectoral report.

education. In addition, children with physical or mental disabilities often face difficulties in accessing school, as many schools and teachers are not prepared to include them in the classroom or support their learning.

**Table 24.**

Pre-disaster enrollment rates for Myanmar

	School level	2009/2010	2010/2011	2011/2012	2012/2013	2013/2014
<b>GER by level (%)</b>	Primary	91.45	89.54	90.00	102.60	n.a.
	Middle	49.46	49.91	50.50	74.70	n.a.
	High	34.35	31.26	33.96	37.74	n.a.
<b>NER by level (%)</b>	Primary	84.13	84.61	84.60	86.37	86.38
	Middle	45.50	47.16	47.47	63.50	52.40
	High	31.6	30.01	31.90	32.08	30.75

Source: Department of Basic Education, MOE (calculated from school administrative data).  
Note: GER = gross enrollment rate; NER = net enrollment rate; n.a. = not available.

Since 2011, MOE has undertaken a wide range of education reforms, including the Comprehensive Education Sector Review and formation of the Education Promotion Implementation Committee. As part of these reforms, the National Education Law was approved in 2014 and amended in 2015. The law provides a clear national framework for progressive, integrated teacher- and student-centered reforms that are still continuing. Major reforms include (i) restructuring the education system to include a kindergarten (KG) year and 12 years of subsequent schooling, (ii) developing basic education curriculum to address 21st-century skills, and (iii) raising teacher salaries and recruiting over 60,000 daily wage teachers to address gaps in teacher supply. The MOE will develop the NESP for the next five years (2016–2021) to continue addressing major challenges relating to equitable access, inclusion, and quality of learning.

## POST-DISASTER SITUATION

Floods and landslides affected 4,116 schools. Of this number, 213 were destroyed and 430 were damaged; the remaining 3,473 schools had limited damage to infrastructure or facilities but did sustain damage to learning materials and equipment, which disrupted teaching and learning.

**Damage to the education sector.** In this section, a detailed breakdown of (i) fully destroyed, (ii) partially damaged, and (iii) affected/flooded facilities is provided by state/region. Of the 213 MOE schools that were fully destroyed, 113 were high schools, 37 were middle or post-primary schools, and 163 were primary schools. In addition, 7 monastic schools reported fully destroyed (Table 25). The most-affected states were Rakhine (66 schools destroyed) and Chin (47 schools destroyed); in Chin, 4 percent of all schools were destroyed, the highest share of schools destroyed.

The 430 partially damaged schools sustained varying degrees of damage to walls, roofing, and other infrastructure and facilities. It was not possible to determine the exact nature of damage in the rapid surveys that were conducted, and more in-depth survey analysis of damaged schools is being planned under the short-term recovery plans. The most-affected states are Ayeyarwady (110) and Rakhine (226). A total of 31 monastic schools were also damaged. In Rakhine State an estimated 126 temporary learning spaces in IDP camps and host communities were partially or severely damaged. No major infrastructural damages to central-level education institutions and administration offices occurred, although at subnational level, some damages to local education offices were reported.

<sup>66</sup> According to MOH, the calculation does not adjust for inflation over the period in question.

Region/ State	Number of schools fully destroyed				Number of school damaged			
	Primary School	Middle School	High School	Total	Primary School	Middle School	High School	Total
Chin	32	11	4	47	13	4	2	19
Sagaing	5	8	1	14	10	8		18
Bago (East)	0	0	0	0	3	1	1	5
Bago (West)	31	3	2	36	9	1	4	14
Magway	10	4	1	15	13	3	3	19
Mandalay	3	0	1	4	0	0	1	1
Mon	0	0	0	0	0	0	2	2
Rakhine	55	7	4	66	142	22	62	226
Yangon	2	0	0	2	11	3	2	16
Shan	3	0	0	3	0	0	0	0
Ayeyarwady	22	4	0	26	81	20	9	110
<b>Total</b>	<b>163</b>	<b>37</b>	<b>13</b>	<b>213</b>	<b>282</b>	<b>62</b>	<b>86</b>	<b>430</b>

Source: Ministry of Education, Monastic Education Development Group.

**Table 25.**

Physical damage to schools

**Service and productivity losses.** Because the floods and landslides occurred during the academic year (June to March), losses occurred to contact hours, which may have an impact on the school calendar. The standard number of school days per year is 175, or 35 weeks. Of the 4,116 affected schools, almost all were closed for less than three weeks (end of July–mid-August), though more than 150 schools in Sagaing and Magway Regions were temporarily closed again for several days in September due to high river water level. For those schools that closed, there will be a need to extend school days to weekends and/or school holidays to accommodate lost teaching hours. This may have an impact on salaries and remuneration of teachers and school staff—who may need to extend their teaching time by several weeks to catch up. Although data are not available, it is probable that parent-teacher associations and school management committees have temporarily ceased to function due to the impact of the floods and landslides on the livelihoods of many families across the affected areas. Similarly, losses related to official documentation—test results, registration, official IDs—may have negative impacts on children’s and teachers’ smooth return to schools and resumption of education activities.

Most of the affected schools resumed education after cleaning and repairing their buildings and facilities and replacing damaged books and furniture. Most schools with more extensive damage were able to identify other temporary learning locations in the community, such as communal or religious facilities, by the end of August. Where alternative learning spaces cannot be used for long periods, temporary learning spaces need to be constructed as resources become available in order to ensure continuity of education.

Even in areas where schools reopened, many affected schools have been using a shift system to host all children in the remaining classrooms, meaning that children are losing effective learning time. In addition, there have been some reports that as of September, a number of children from Rakhine were not back to school—either because they could not adapt to the new schedule or because they had to support their family. While reports indicate that very few students have dropped out to date, the impact of floods and landslides on family incomes, along with increased vulnerability during the coming months, means that the true impact on dropping out has not yet been felt.

The distress caused by the floods and landslides threatens children’s psychosocial well-being across affected areas of Myanmar, and that of their teachers, caregivers, and families. To alleviate their suffering and support recovery, it is critical that the education and social protection sectors collaborate to provide immediate psychosocial support for children in and out of school. Identification of children at risk of dropping out of school is also important in order to reduce longer-term protection risks of flood- and landslide-affected children, such as involvement in trafficking, child labor, early marriage, and gender-based/domestic violence. Children’s vulnerabilities and coping capacities are determined

by many factors, including their age, socioeconomic status, and gender. In many cultural contexts, women and girls are more vulnerable to risks associated with natural hazards, and it is critical that they are equally included in the recovery process and their needs addressed.

In the immediate aftermath of the floods and landslides, the government allocated K 200,000 per school through township education offices for head teachers and members of the local community; these funds were used to hire local labor to clean and repair schools and to buy necessary construction materials, but they also provided much-needed revenue to local communities affected by the flood, mitigating further loss. Humanitarian partners supported the government by conducting joint multi-cluster/sector initial rapid assessments, providing essential teaching and learning materials, and supporting the provision of temporary learning spaces and immediate repair of damaged schools, with a focus on Rakhine, Chin, Sagaing, Magway, and Ayeyarwady.

**Figure 23.**  
Schools in Sagaing (left) and in Ayeyarwady (right) following floods and landslides



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**Figure 24.**  
School affected by landslide in Chin (left) and temporary learning space in IDP camp in Rakhine (right)



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**Figure 25.**

Temporary learning space in monastery near IDP camp (left), and site of a school washed away by floods (right), both in Sagaing



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**Figure 26.**

Students learning in a badly damaged school in Rakhine (left); a Rakhine school that was destroyed (right)

## ESTIMATED VALUE OF THE EFFECTS AND THE IMPACT OF THE DISASTER ON THE SECTOR

The following assumptions were made in estimating the financial costs for the damage incurred. Due to time limitations and the fact that information provided from field level was not verified through field surveys, actual costs for damage are estimates only. As a result, damage costs may be over- or underestimated and can be corrected based upon actual field surveys, which are included under the medium-term recovery strategy.

- If a building is destroyed, the current MOE's school unit cost of K 60 million is applied to reconstruct a new school (approximate cost of 9 meter by 27 meter building).
- If a building is damaged, the cost of damage assumes that 30 percent of the reconstruction cost would be required to rehabilitate the building. It should be noted that approximately 40 percent of damaged schools are assumed to need complete reconstruction/retrofitting under a BBB approach, as they were built with locally available materials (e.g., bamboo and mud) and are not resilient to future disaster.
- If a building is affected with flood water, it is assumed that at least 30 percent of the costs of partial damage would be required to replace classroom furniture and teaching and learning materials.
- If education offices were reported among damages, they are included in the damage list.
- The following are included on the list of damaged schools: religious schools providing basic education (monastic schools under Ministry of Religious Affairs or Christian schools as registered community schools under MOE), training institutions under the Ministry of Border Affairs, branch schools recognized by MOE, and temporary learning centers. Private schools are not included.

The total damage and loss for the education sector in Myanmar is estimated to be K 50,493 million. The highest damage is estimated in Rakhine and amounted to K 13,640 million. In Chin and Sagaing Regions, where landslides occurred and/or whole communities were washed away by floodwater, schools need to be relocated to safer places for reconstruction. The government should clearly articulate its strategy and budget for land acquisition for new school sites, as this is not included in the sector estimation. In Rakhine and many other places, original school buildings were of poor quality and vulnerable to any disaster. BBB principles should be applied to all new schools.

**Table 26.**  
Quantification  
of damages and  
losses  
(million K)

Subsector	Damage			Loss			Total effects		
	Value	Public	Private	Value	Public	Private	Value	Public	Private
Education	48,190	48,190	n.a.	2,302.6	2,302.6	n.a.	50,493	50,493	n.a.

Source: Ministry of Education.  
Note: n.a. = not applicable.

**Figure 27.**  
Geographic  
distribution of  
damage and  
losses state/  
region  
(million K)

State/Region	Damage			Loss			Total effects		
	Value	Public	Private	Value	Public	Private	Value	Public	Private
Ayeyarwady	11,828	11,828	n.a.	609.1	609.1	n.a.	12,437.1	1,2437.1	n.a.
Bago (East)	1,600	1,600	n.a.	115.6	115.6	n.a.	17,15.6	1,715.6	n.a.
Bago (West)	5,515	5,515	n.a.	228.4	228.4	n.a.	5,743.4	5,743.4	n.a.
Chin	4,246	4,246	n.a.	0.5	0.5	n.a.	4,246.5	4,246.5	n.a.
Magway	4,395	4,395	n.a.	242.5	242.5	n.a.	4,637.5	4,637.5	n.a.
Mandalay	830	830	n.a.	42.1	42.1	n.a.	8,72.1	8,72.1	n.a.
Mon	191	191	n.a.	12.4	12.4	n.a.	2,03.4	203.4	n.a.
Rakhine	13,640	13,640	n.a.	624.1	624.1	n.a.	14,264.1	14,264.1	n.a.
Sagaing	3,956	3,956	n.a.	316.7	316.7	n.a.	4,272.7	4,272.7	n.a.
Shan	232	232	n.a.	1.1	1.1	n.a.	233.1	233.1	n.a.
Yangon	1,757	1,757	n.a.	110.7	110.7	n.a.	1,867.7	1,867.7	n.a.
<b>Total</b>	<b>48,190</b>	<b>48,190</b>	<b>n.a.</b>	<b>23,03.2</b>	<b>23,03.2</b>	<b>n.a.</b>	<b>50,493.2</b>	<b>50,493.2</b>	<b>n.a.</b>

Source: Ministry of Education.  
Note: n.a. = not applicable.

## RECOVERY AND RECONSTRUCTION STRATEGY

BBB principles are closely linked to the Comprehensive School Safety framework<sup>68</sup> and should guide recovery and reconstruction. All new schools should (i) be resilient to future disasters in line with appropriate standards (resilient buildings with safe and adequately sized staircases, necessary elevation for schools in delta areas, improved water, sanitation, and hygiene [WASH] facilities, separate toilets for boys and girls, etc.); and (ii) ensure a better learning environment under ongoing educational reforms (additional classrooms for KG in primary schools, additional classrooms for post-primary schools to upgrade to middle schools, teachers' room, teachers' houses for remote areas, good-quality classroom furniture, libraries with age-appropriate books, laboratories, etc.).

<sup>68</sup> The framework focuses on safe learning facilities, school disaster management, and resilience education. It would ensure that all learners and education workers are protected from death, injury, and harm in schools; and would support educational continuity in the face of all types of hazards and threats. It would also safeguard education sector investments—in both physical and human capital—and contribute to increasing the resilience of children and communities to the negative impacts of climate change and disasters in Myanmar. See Global Alliance for Disaster Risk Reduction and Resilience in the Education Sector and Worldwide Initiative for Safe Schools, "Comprehensive School Safety Guidance Note," 2014.

## RECOVERY AND RECONSTRUCTION PLAN

The sector recovery plan should fit into the ongoing education reforms and provide an opportunity to improve access to higher-quality education for all children, including marginalized children such as those with disabilities. As proposed in the BBB principles, the plan should emphasize improved school design with disaster resilience and a better learning environment. Resilient school buildings with improved school designs would involve a 15–30 percent increase in unit cost per school. Better learning environments in the context of the ongoing education reforms would involve a 25–30 percent increase in the total school construction cost.

The recovery plan needs to go beyond infrastructure alone. It should include the mainstreaming of disaster education in the ongoing basic education curriculum reform, and should also include teacher education and trainings; capacity development of education officials at union, regional, and local levels; capacity development of PTAs; and strengthening of school disaster management planning and implementation with children's active participation. It should facilitate the development of a national DRR framework to be clearly featured in and fully mainstreamed into the NESP. Collaboration with social protection plans must be strengthened to ensure that students who drop out or are at risk due to economic hardship or migration (as a result of floods and landslides) are provided incentives, stipends, or other support to continue their education. The specific short-, medium-, and long-term needs are proposed as follows. Table 27 summarizes the needs for the education sector.

### Short-term needs (four months)

- Resume education services (temporary learning spaces and/or cleaning of affected schools)
- Provide textbooks, exercise books, and TLMs
- Provide classroom furniture, drinking water
- Revise minimum standard of basic school designs/specification to reflect BBB principles (e.g., disaster resilience, improved WASH facilities, separate toilets for boys and girls, additional classrooms for KG in primary schools, upgrading of post-primary school to middle school, accessibility for children with disability, teachers' room, etc.)
- Establish a mechanism to coordinate with Ministry of Religious Affairs, Ministry of Border Affairs, and Ministry of Science and Technology (MOST) for future disasters
- Implement affected-school survey/assessment
- Provide life-skills and psychosocial support for students and teachers
- Organize workshop/seminar to raise awareness of DRR and resilience for MOE officials at union and local levels.

### Mid-term needs (one year)

- Reconstruct destroyed schools using BBB principles
- Relocate schools to new/safer locations where required
- Rehabilitate damaged schools and education offices using BBB principles
- Engage PTAs/school committees in reconstruction/rehabilitation work to enhance monitoring
- Incorporate DRR and resilience perspective into ongoing development of the basic education curriculum and textbooks
- Implement teacher trainings on DRR and resilience (including protection issues) and pilot risk mapping for disaster preparedness plans
- Strengthen linkages with Education Management Information System and provide GPS coordinates of damaged/destroyed school sites to Myanmar Information Management Unit linkages.
- Support school surveys that can be used as baseline data in case of future emergencies
- Explore with World Food Programme possibility of providing school feeding with locally cooked meals for affected schoolchildren
- Ensure that NESP reflects medium- and long-term recovery plan strategies and budgets
- Ensure that NESP incorporates DRR

### Long-term needs (beyond one year)

- Reconstruct destroyed schools with BBB principles
- Rehabilitate damaged schools with BBB principles
- Continue to integrate DRR and resilience into the ongoing development of the basic education curriculum and textbooks, including modules to enhance awareness and understanding of global issues such as natural disasters/climate change, which can be integrated into various subjects (e.g., life skills, science, social studies, local curriculum, and others)
- Institutionalize teacher education and training on DRR and resilience (including protection issues)
- Provide school feeding with locally cooked meals to reduce hunger (which affects learning), to enhance awareness of nutrition, and to generate local employment
- Develop school disaster risk map for strengthening disaster preparedness and response at school and community levels with child participation; use Township Education Improvement Plan processes and guidelines to coordinate township preparedness and response plans to township education plans
- Develop capacity of MOE officials at both union and local levels.

**Table 27.**

Recovery and reconstruction needs for education sector (million K)

Short term		Value (million K)	Responsible agency
Resumption of education	- Cleaning of affected schools	2,500	MOE with humanitarian partners
	- Setting up temporary learning spaces		
Basic school designs with BBB principles	- Provision of textbooks and other TLMs, classroom furniture, etc.	2,000	MOE with Disaster Risk Reduction Working Group/SC-SWG, Ministry of Construction
	- Revision of minimum standard of basic school designs/specification with BBB (disaster resilience, better learning environment, and inclusiveness)	Technical assistance	
Affected-school surveys	- Implementation of affected-school surveys/assessments		MOE
DRR and resilience seminars/trainings	- Organize seminars on DRR and resilience in education	100	MOE MSWRR (DSW) UNICEF/QBEP partners UNESCO JICA NGOs (national and international)
	- Provide immediate life-skills and psychosocial support for teachers and students		
Subtotal		4,600	



<b>Medium term</b>			
	<b>Program of activity</b>	<b>Value (million K)</b>	<b>Responsible agency</b>
School reconstruction and rehabilitation with BBB principles	<ul style="list-style-type: none"> <li>- Conduct school-by-school damage assessment</li> <li>- Finalize safe school guideline</li> <li>- Reconstruct destroyed schools</li> <li>- Rehabilitate damaged schools</li> <li>- Improved WASH facilities</li> <li>- Provide necessary materials and equipment (furniture, etc.)</li> <li>- Engage PTAs in monitoring</li> <li>- Add KG classroom space and expand post-primary into middle schools</li> </ul>	50,358	MOE SC-SWG Japan/JICA UNICEF/QBEP Other development partners (SDC) Private sector NGOs (national and international)
Mainstreaming of DRR in curriculum development and teacher education/training	<ul style="list-style-type: none"> <li>- Develop primary education curriculum that mainstreams disaster education</li> <li>- Train teachers, education officers, and PTAs</li> <li>- Pilot risk mapping and preparedness plans</li> </ul>	Technical assistance 6,000	MOE JICA UNICEF/QBEP UNESCO
School feeding	<ul style="list-style-type: none"> <li>- Provide locally cooked meals</li> </ul>		WFP
Capacity development	<ul style="list-style-type: none"> <li>- Offer technical support and training for MOE and for TEO/DEO/SEO</li> </ul>	1,500	MOE UNICEF/QBEP
<b>Subtotal</b>		<b>57,858</b>	
<b>Long term</b>			
	<b>Program of activity</b>	<b>Value (million K)</b>	<b>Responsible agency</b>
School reconstruction & rehabilitation with BBB principles	<ul style="list-style-type: none"> <li>- Complete affected school surveys</li> <li>- Finalize safe school guideline</li> <li>- Reconstruct destroyed schools (at least 70% of the destroyed schools)</li> <li>- Rehabilitate damaged schools (at least 70% of the damaged schools)</li> <li>- Improved WASH facilities</li> <li>- Provide necessary materials and equipment (furniture, etc.)</li> <li>- Engage PTAs in monitoring</li> <li>- Add KG Classroom space and expand Post Primary into Middle Schools</li> </ul>	23,796	MOE with SC-SWG Japan/JICA UNICEF/QBEP SDC development partners Private sector NGOs (national and international)
Mainstreaming of DRR in curriculum development and teacher education	<ul style="list-style-type: none"> <li>- Develop basic education curriculum mainstreaming disaster education</li> <li>- Train teachers, education officers and PTAs</li> </ul>	Technical assistance 6,000	MOE JICA UNICEF UNESCO International NGOs
School feeding	<ul style="list-style-type: none"> <li>- Provide locally cooked meals</li> </ul>		WFP
Capacity development	<ul style="list-style-type: none"> <li>- Develop MOE officials capacity both at Union/local levels on DRR and resilience issues</li> <li>- Develop disaster map for DRR at school/ community levels</li> </ul>	3,000	MOE JICA UNICEF UNESCO development partners NGOs (national and international)
<b>Subtotal</b>		<b>32,796</b>	
<b>TOTAL</b>		<b>95,254</b>	

Source: Ministry of Education, assessment team.

Note: DEO = District Education Office; DSW = Department of Social Welfare; JICA = Japan International Cooperation Agency; MSWRR = Ministry of Social Welfare, Relief and Resettlement; QBEP = Quality Basic Education Programme; SC-SWG = School Construction Sub-Working Group; SDC = Swiss Agency for Development and Cooperation; SEO = State Education Office; TEO = Township Education Office; WFP = World Food Programme.

## RECOVERY AND RECONSTRUCTION IMPLEMENTATION

The strategies and planned budget as identified in the recovery plan will be reflected in the NESP, which will strengthen the management of partnerships and the coordination mechanisms available for recovery. Estimated costs to mainstream BBB principles into school construction have already been costed. By conducting a detailed affected-school survey as part of the short- and medium-term response, a clearer picture of the resource needs will become available. The data collected on schools will be included in the Education Management Information System, with school geographical data shared with Myanmar Information Management Unit and integrated with ongoing school mapping initiatives.

A steering committee for school construction, led by the minister of education, has been proposed for coordination and efficiency purposes. To ensure improved emergency preparedness and mitigate the impact of future natural disasters, the NESP will incorporate DRR and Comprehensive School Safety framework principles; these principles should be mainstreamed into the NESP implementation strategies and into the new MOE departmental structures. A technical committee, headed by the director general of Department of Basic Education, is being proposed to ensure quality and manage day-to-day implementation of the recovery plan.

Excellent partnerships have already been established to support the education sector's response to the floods and landslides. The Myanmar Chamber of Commerce and leading business enterprises have made significant pledges to support school renovation and construction—and have met with MOE to ensure their support is coordinated and follows quality standards. A wide range of civil society, nongovernmental, and faith-based organizations have also been contributing temporary learning spaces, as well as labor, materials, cash, and supplies for their local schools, which are more difficult to quantify and coordinate. The Education Thematic Work Group, which was formed as part of Nargis recovery and comprises civil society and government members, is functioning strongly. The group has expanded its role to include a DRR Working Group, which in turn has established a School Construction Sub-Working Group, co-chaired by Swiss Agency for Development and Cooperation (SDC) and World Vision.

From the MOE, approximately US\$ 3.6 million of additional funds have already been allocated to schools in response to the floods and landslides. Allocation of additional resources from MOE can be expected in the coming fiscal year. The government of Japan has committed US\$40 million for the education sector response, while the Quality Basic Education Programme partners (Australia, Denmark, European Union, Norway, United Kingdom, and UNICEF) have agreed to reallocate at least US\$2 million of existing resources for the flood response in 2015/2016. NGOs and bilateral partners, including SDC, Save the Children, World Vision, PLAN, Japan Platform, and others, have all committed resources and expertise to the flood response and recovery. The Primary Curriculum Reform project, supported by Japan International Cooperation Agency (JICA), is incorporating DRR and emergency preparedness into primary curriculum, textbooks, and teaching materials.

## SECTOR ASSESSMENT METHODOLOGY

Three sets of flood survey data were compiled and analyzed in preparing this report: survey data collected by state/regional governments, survey data managed under the General Administration Department, and survey data collected under state/region and township education offices.

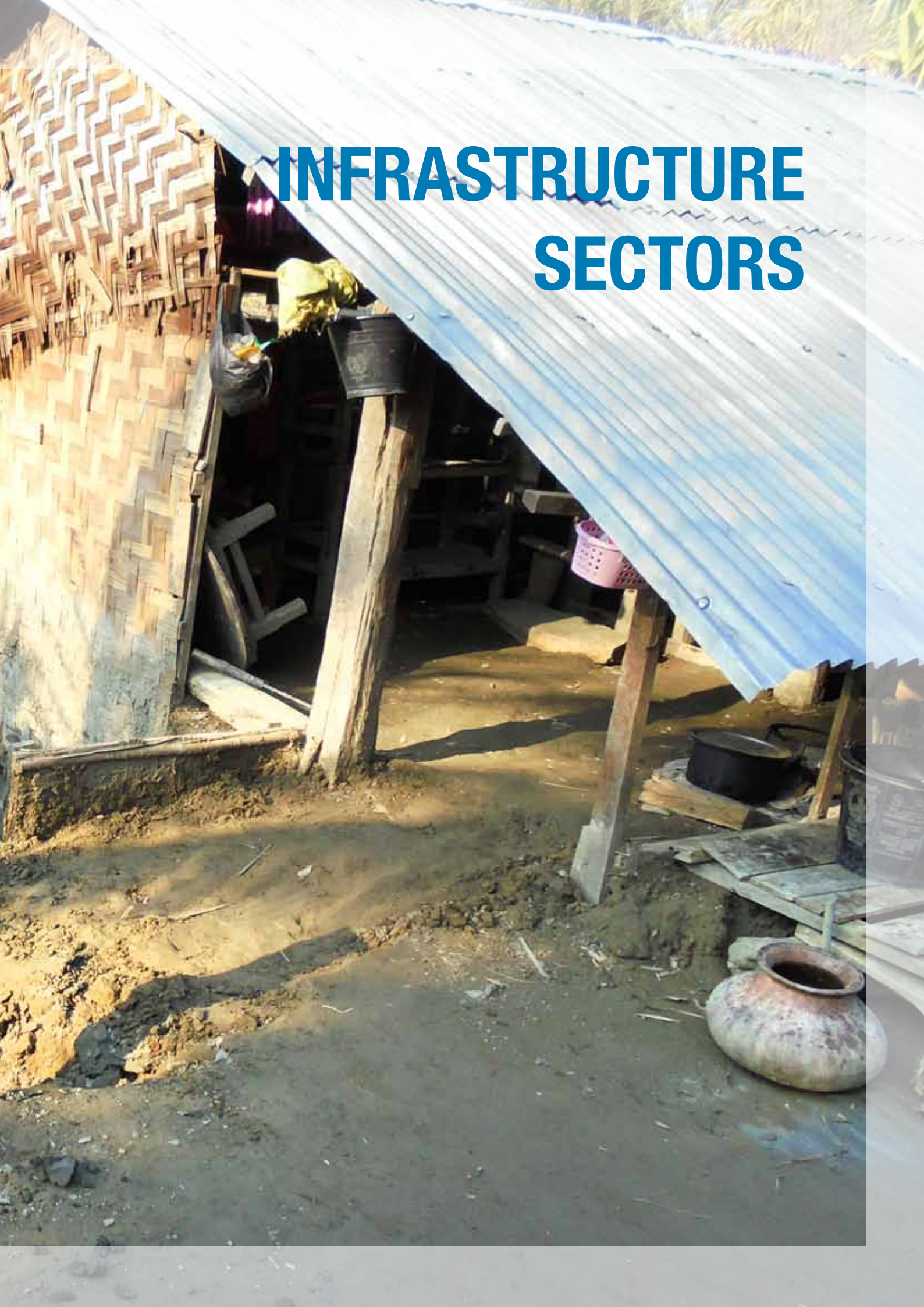
The final review process before preparing this report involved an October 1, 2015, validation workshop held by the MOE in Nay Pyi Taw with state/region education officials from 12 affected states/regions. This workshop reviewed the draft, consolidated data, and provided clarification and correction as required. The workshop and review process were able to feed directly into the Post-Flood and -Landslide Needs Assessment report for education. The MOE was consulted for the recovery strategies and plan, including BBB principles with cost estimation, in an October 5

consultation meeting in Nay Pyi Taw. The MOE and key stakeholders from SC-SWG have analyzed information and discussed proposed recovery strategies with the needs assessment team members (UNICEF, JICA, and World Bank). Information from UNICEF field offices (particularly from Rakhine, Sagaing, Magway, and Chin) and findings from a field trip in Sagaing by the JICA team have been reflected in the report.



Repairing housing.  
Photo: © Enlightened Myanmar Research.

# INFRASTRUCTURE SECTORS



## Housing and Settlements

### SUMMARY

**More than 1.6 million people were displaced by the flooding and landslides in July and August 2015.** While a small number of households remained in shelters by late September, most had returned to their homes. But many of those who returned found that their houses were flooded, damaged, or destroyed. States and regions reported that nearly 525,000 houses were affected by floods, strong winds, and landslides, including nearly 39,000 houses destroyed and more than 485,000 damaged to different degrees. The area with the highest number of affected houses was Ayeyarwady Region, the same region pummeled by Cyclone Nargis in 2008; it had over 19,000 destroyed houses and more than 108,000 damaged. Rakhine State, Sagaing Region, Bago State, Chin State, and Yangon Region were also heavily affected. The impact of these events on the housing stock varies among states and regions, not only in the amount of damage and the relative impact on the overall housing sector, but also in the type of damage experienced. Much of Chin State's damage, for example, was the result of landslides, and not only will relocation be needed, but damage to roads could make reconstruction in this mountainous region expensive for homeowners.

According to local authorities, nearly 3,000 households in Chin State and approximately 1,600 in Sagaing Region will need to be relocated to safer locations during the recovery phase. As is always the case with housing, most of the damage and losses are classified as private (given that housing is a private good). The needs in the housing and settlements sector are associated with the cost of relocation, the repair and reconstruction of housing, the restoration of household water and sanitation services, and the rehabilitation and stabilization of housing sites and settlements.

The recovery strategy outlined envisions government working in collaboration with partners to build on recent policy advances in housing and social protection and on the new provisional Myanmar National Building Code. The housing recovery program will allow government to partially finance and oversee a homeowner-driven repair and reconstruction program that will promote safe building practices. This “building back better” approach will not only contribute to long-term national development objectives for disaster risk reduction, but will ensure that housing recovery contributes to the president's goal: that in recovery there is “no one left behind.”

### PRE-DISASTER CONTEXT

The typology of housing and its distribution across affected areas is shown in Table 28. Types of housing include (i) apartment/condominium, (ii) bungalow/brick house, (iii) semi-pacca house, (iv) wooden house, (v) bamboo house, and (vi) hut. Traditional houses of wood and bamboo are found throughout the country, and are predominant in rural areas, where 90 percent of all houses are traditional, i.e., constructed of wood or bamboo or classified as huts. Even in urban areas, these three categories cover 63 percent of all housing units (67 percent without Yangon) (Figure 28 left). Modern masonry buildings and apartments are found mostly in towns and cities in Myanmar. Traditional houses generally have a multipurpose room, a small bedroom for adults, a shrine, an entrance porch or veranda, and an outdoor kitchen. Traditional housing types are more common in the townships affected by the 2015 floods and landslides than in the country overall: in the former, 89 percent of all housing is built of wood or bamboo or classified as huts, whereas the figure for the latter is 81 percent (see Table 28).

	Apartment/ Condominium	Bungalow/ low/brick house	Semi-pacca house	Wooden house	Bamboo	Hut(2-3 year <sup>a</sup> )	Hut (1 year <sup>a</sup> )	Other	Wood, Bamboo & Hut
Affected townships	1.9%	4.9%	4.7%	44.9%	40.5%	1.9%	1.2%	0.6%	89.2%
All townships	4.5%	6.8%	6.5%	41.2%	37.4%	1.9%	0.9%	0.8%	81.4%

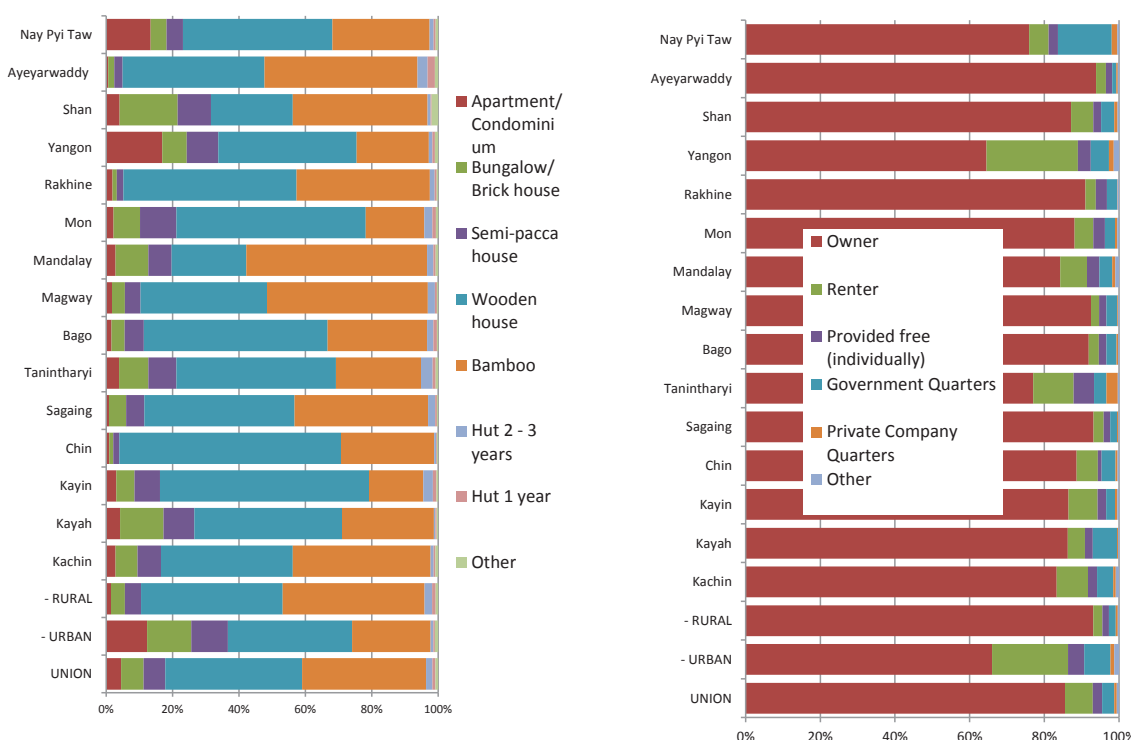
Source: World Bank calculations based on Emergency Operation Center data on affected townships and the 2014 Myanmar National Population and Housing Census.

Note: a. Huts are considered an improvised housing form with low value at first but increase in value after the first year as owners improve and expand them.

**Table 28.** Comparison of housing types in affected townships versus all townships (percent)

Housing is an important family asset in Myanmar, with more than 86 percent of all households owning their own homes (93 percent in rural areas). The largest number and percentage of renters are found in the urban townships of Yangon (31 percent), but significant shares of renters are found in other urban townships as well, including Kayin (28 percent), Tanintharyi (23 percent), Chin (21 percent), and Kachin (16 percent). Less than 4 percent of rural households rent their house in all states and regions except for Yangon and Tanintharyi (see Figure 28 right).

The 2010 household survey found average housing size varied from 396 ft<sup>2</sup> to 688 ft<sup>2</sup> (37 m<sup>2</sup> to 64 m<sup>2</sup>), with one of the smallest averages (422 ft<sup>2</sup>, or 39 m<sup>2</sup>) found in Chin, the mountainous and relatively poor state affected by the landslide, and one of the largest (676 ft<sup>2</sup>, or 63 m<sup>2</sup>) found in the relatively prosperous Yangon Region. Yet housing size correlates more to factors such as climate and culture than income—East Shan, one of the poorest areas of the country, has the largest average floor size (688 ft<sup>2</sup>, or 64 m<sup>2</sup>). These cultural differences in housing size and style must be kept in mind in planning reconstruction.



**Figure 28.** Type of housing units by state/region (left) and households by ownership of housing (right)

Source: 2014 Myanmar National Population and Housing Census.

**Construction materials.** The most common construction materials for walls are *dhani* or *theke* leaves (12 percent), bamboo (56 percent), and wood (21 percent) in rural areas, and bamboo (38 percent), wood (22 percent), and tile, brick, or concrete (34 percent) in urban areas.

The most common material for roofs in almost all states and regions, and in both urban and rural areas, is corrugated metal sheets. Thatch (*dani/theke*/in leaf) is the next most common roofing material; it is used on more than 40 percent of all rural houses, and on more than 10 percent of all urban houses.

**Household water and sanitation.** In rural areas nationally, drinking water is accessed principally by means of tube wells or boreholes (33 percent), springs (28 percent), and standing water sources, rivers, or streams (24 percent). In urban areas, the principal sources are bottled water (31 percent), tube wells (28 percent), piped tap water (16 percent), and springs (13 percent). Only 5 percent of urban households and less than 1 percent of rural households report having flush toilets for sanitation. The vast majority of households use improved pit latrines (87 percent in urban areas and 66 percent in rural areas) or traditional pit latrines (4 percent and 9 percent).

**Land.** Land in Myanmar is classified into categories that include freehold (ancestral) land, grant land, reserved forest land, farmland, grazing land, and religious land, among others. The Constitution establishes that with certain historic exceptions, all land belongs to the union. The current land regime is governed by a combination of new and old laws that are sometimes contradictory, and can lead to tenure insecurity. The land registration system is considered by many to be outdated, and is managed by various government ministries whose maps may not reflect current occupancy and land-use patterns. A number of legal reforms are under way. Given Myanmar's large rural population and the importance of agricultural production to the economy, both the focus of land reforms and the origin of many tenure disputes have been associated with smallholder farmers. Ownership of a house does not necessarily imply ownership of the land on which it is situated or any other land, nor does it ensure security of the family's land tenure situation. Nationally, the highest rates of landlessness are found in Bago (59 percent landowners), Yangon (41 percent landowners), and Ayeyarwady (67 percent landowners), which were all affected by the floods and landslides. However, only in Yangon do the data on homeowners and landowners correspond closely. The National Housing and Population Census reports that homeownership as a share of all types of housing tenure status by state or region is 92 percent in Bago, 64 percent in Yangon, and 94 percent in Ayeyarwady. These figures are even higher in the rural parts of the three regions, at 95 percent, 81 percent, and 96 percent, respectively.

Relocation will be a factor in the post-flood and -landslide recovery in Chin and Sagaing, where government has expressed a commitment to finding new sites for those who will be relocated. Otherwise, most reconstruction will take place in existing sites, which generally gives rise to fewer land tenure issues. Nevertheless, the monitoring system should be designed to detect and flag any land tenure problems that could impede recovery.

**Building practices and building codes.** Rural housing is often built by owners using local craftsmen or is a collaborative effort within the village carried out by several households working together. Construction technology is based on traditional knowledge and skills. In one post-Nargis assessment, concern was expressed that wooden structures, whether traditional or modern, were often not properly secured, and that while both thatched roofs and those made of corrugated galvanized iron and zinc could in principle be built with increased resilience to cyclones, they were in fact often missing proper anticyclone protection, such as bracing and traction-resistant nails. It is safe to assume these deficient practices have continued.

The country's first building code was published in 1947 by the Rangoon Development Trust, which was revised as a national code in 1991 by the Ministry of Border Areas and National Races Development. The destruction caused by Cyclone Nargis in 2008 helped produce a political commitment to developing a national building code.



The country's new building code, Myanmar National Building Code (MNBC-2012), is provisional. It was developed in the past few years under the ambitious Myanmar National Building Code Project, led by the Ministry of Construction.<sup>69</sup> The project's Coordination Committee has overseen working groups of local engineers, architects, and other experts from both the public and private sectors, with support from the Myanmar Engineering Society and United Nations Human Settlements Programme (UN-Habitat).

MNBC-2012 addresses disaster resiliency and environmental sustainability in line with international standards while also considering the local context. MNBC-2012 is further improved by the Green Building Code, which focuses on reductions in energy and water consumption, and the effective use of rainwater. By using these guidelines whenever possible in the reconstruction of damaged buildings, Myanmar can build back better and offer a vision for a sustainable future. While MNBC-2012 is provisional, it is an important first step in full implementation of the code, which will include developing a complete legal and institutional framework, as well as preparing simplified guidelines on topics such as safe construction and disaster risk reduction that should be made available at the township level.

**Building standards for housing.** Like building codes in many countries, the MNBC-2012 applies in general to nonengineered buildings such as homeowner-built housing, but does not provide the same detailed specifications for them as it does for engineered buildings. To improve the safety of structures such as informally built housing, the Ministry of Construction is working through its own training center to promote safer construction practices among carpenters and masons in the context of the National Skills Standards Authority (NSSA) program. To date, approximately 200 tradespeople (mostly carpenters) have been trained under this program.

Even though MNBC-2012 is not fully operational, it should be the standard for the post-flood and landslide reconstruction. Key stakeholders (the government, Myanmar Engineering Society, and both formal and informal sectors of the construction industry) must agree on the degree of application and any limitations, and must widely publicize them. As both the government and the construction industry are aware of the provisional codes, it should at a minimum be feasible to apply them to reconstruction of schools, hospitals, and lifeline facilities such as public buildings, bridges, roads, culvert, etc.

In the case of informal housing, technical assistance will be needed to organize and implement the "build back better" approach described below. This assistance should include mobilizing the newly trained carpenters to lead the house-to-house inspections and to provide training and quality control over homeowner-driven housing reconstruction. The private sector and universities could be enlisted in the training, and the inspectors should receive special certification afterward and understand that they will have the opportunity to be mobilized for future post-disaster inspection processes.

**Existing policies and tools relevant to recovery.** Since late 2014, the government, led by the Ministry of Construction, has been actively involved in developing legal and policy frameworks for affordable housing and for social protection, including post-disaster housing assistance. In developing a new National Housing Policy and Housing Development Law (both in early drafts), the government seeks to (i) establish a balanced and sustainable process for developing new settlements, and (ii) provide adequate housing for all citizens. Given the growth pressure in urban areas, the focus to date is on the system for developing low-cost housing in urban areas. No benchmarks for adequate housing have yet been defined that would guide reconstruction.

In December 2014, the Ministry of Social Welfare, Relief and Resettlement (MSWRR) issued the Myanmar National Social Protection Strategic Plan, which identifies a range of disaster risk management and post-disaster social protection mechanisms, and calls for alignment of post-disaster assistance with the plan.

<sup>69</sup> Myanmar Engineering Society and UN-Habitat, Myanmar National Building Code (provisional), 2012.

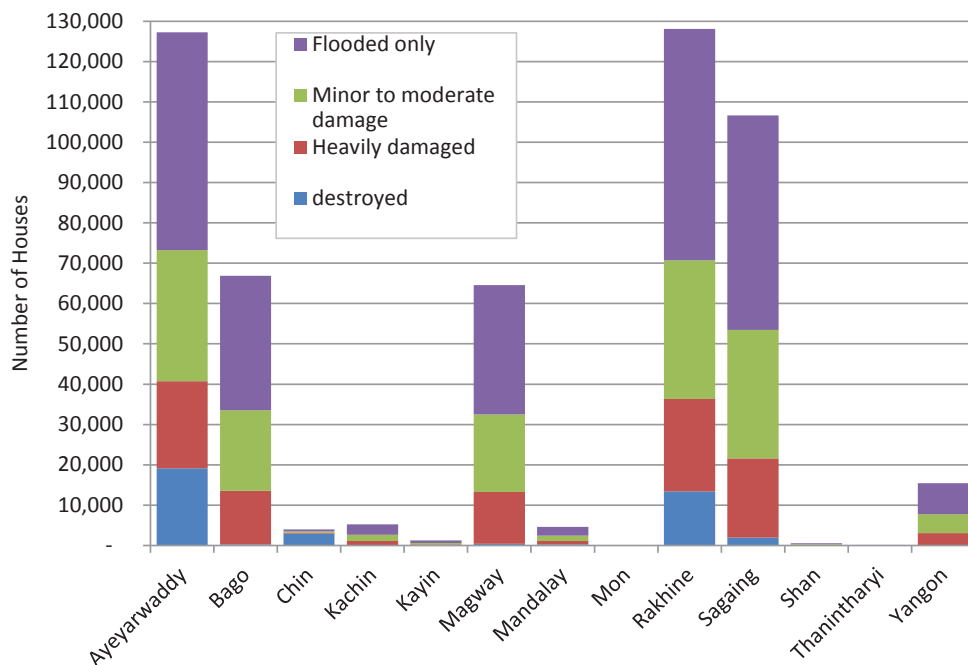
Neither the draft Housing Policy nor the Social Protection Strategic Plan provides ready-made operational approaches for recovery, but they provide an auspicious platform for articulating a well-considered housing recovery strategy, including recommendations on the application of the MNBC and Green Building Code.

Other policy tools that should be incorporated in housing recovery include the MNBC-2012; carpenter training and training guidelines; local planning methodologies being developed and already in use by the Ministry of Construction, Department of Housing and Human Settlements; disaster risk management committees and disaster risk management funds at the state, region, and township levels; and methodologies for community mobilization and project supervision developed in connection with the recently approved Community-Driven Development project. The relevance of these policies and tools will depend on the final design of the housing and settlements recovery strategy (below), which should be developed in a participatory manner.

## POST-DISASTER SITUATION

More than 1.6 million people were displaced by the floods and landslides, but they had largely returned to their homes by September. Many households returned to flooded, damaged, or destroyed houses. States and regions reported that 524,568 houses were affected due to floods, strong winds, and landslides. This includes 38,542 destroyed and 486,026 damaged housing units.<sup>70</sup> The worst-affected area is Ayeyarwady Region, with 19,114 destroyed and 108,165 damaged homes. Rakhine State also suffered severe losses, with 13,392 homes destroyed and 114,666 homes damaged. In Sagaing Region, 1,963 houses were destroyed and 104,641 were damaged. Other areas that experienced significant damage include Bago, Chin, and Yangon. According to local authorities, 2,987 households in Chin State will need to be relocated to safer locations, and approximately 1,600 in Sagaing Region will need to be relocated (see Figure 29).

**Figure 29.**  
Damaged and destroyed housing by state and region



Source: World Bank estimations based on damage data provided by Central Statistical Organization.

Note: In the absence of detailed information, the total damaged house figure was distributed in all states and regions in the following manner: flooded-only houses = 50 percent of all houses characterized as flooded or damaged; minor to moderate damage = 30 percent; major damage = 20 percent. For destroyed houses, the figures used were those provided by states and regions.

<sup>70</sup> These figures were provided by the Central Statistical Organization on September 29, 2015, and are slightly lower than those issued by government on October 6, 2015, in Situation Report 6.

The states or regions with the largest share of affected houses (relative to the number of housing units in the affected townships recorded in the 2014 National Housing and Population Census) are Rakhine State (30 percent of all housing units), Ayeyarwady Region (13 percent), Sagaing Region (12 percent), and Magway Region (11 percent) (Table 29). A high share of housing damage has the potential to raise rents along with land and materials costs in the local market.

Region/State	Flooded only	Minor to moderate damage	Major damage	Destroyed	All damaged and destroyed houses	Share of housing in same in	(Of these) Households requiring relocation
Ayeyarwady	54,083	32,450	21,633	19,114	127,279	13%	0
Bago	33,285	19,971	13,314	269	66,839	9%	0
Chin	527	316	211	2,934	3,987	5%	2,934
Kachin	2,580	1,548	1,032	68	5,228	4%	0
Kayin	629	377	251	1	1,258	1%	0
Magway	32,073	19,244	12,829	414	64,560	11%	0
Mandalay	2,188	1,313	875	256	4,632	1%	0
Mon	-	-	-	0	0	0%	0
Rakhine	57,333	34,400	22,933	13,392	128,058	30%	0
Sagaing	53,121	31,872	19,648	1,963	106,604	12%	1,600
Shan	229	137	91	128	585	0%	0
Tanintharyi	38	23	15	3	79	0%	0
Yangon	7,730	4,638	3,092	0	15,459	7%	0
<b>Total</b>	<b>243,813</b>	<b>146,288</b>	<b>95,925</b>	<b>38,542</b>	<b>524,568</b>	<b>10%</b>	<b>4,534</b>
Percent of all damaged	50%	30%	20%				

**Table 29.** Geographic distribution of damage to housing (estimated based on total damage counts)

Source: World Bank estimations based on damaged housing counts provided by Central Statistical Organization and MSWRR. Information on households requiring relocation is from MSWRR Situation Report number 6.

**Minor damage to water sources; loss of sanitation facilities.** In addition to damage to housing, there has been considerable damage to household sanitation facilities. In rural areas the majority of these are fly-proof latrines, which are simple raised timber or bamboo huts that house a plastic squat toilet pan with a straight offset pipe going into a subsurface soak pit. The pit is usually unlined, making it particularly susceptible to damage during flooding. These structures are extremely vulnerable to flooding, which results not only in physical damage to the asset, but also in the release of fecal sludge into flood waters.

Following the recent floods and landslides, damage to water sources was minor, although there is likely to be an increase in the use of untreated water for cooking and drinking, and this, coupled with poor sanitation conditions, has the potential to increase the spread of vector-borne diseases and further increase the burden of work for women, who are the primary family caregivers.

**Undermining of housing sites and damage to local amenities.** In the landslide areas, severe damage to housing sites is the principal motivation for relocation of households. However, damage to sites and settlements is also a concern in some flooded areas. Impacts on settlements may also include damage to community amenities such as local streets, pathways, and common spaces, including markets, but there may also be damage that undermines the stability of housing plots and settlements, due to erosion and the effects of waterlogging.

Households alone will not be capable of addressing these damages, which are not included in damage estimates. Only the estimated cost of household silt and debris removal was included in housing and settlements loss figures. In some cases, community planning exercises may be needed in order to reconfigure land uses and identify priority investments. It was assumed that states and regions have included some of settlement-related investment needs in their infrastructure damage figures, but the figures could not be confirmed. Alternatively, in the interest of disaster risk reduction, states, regions, and townships could identify and categorize these damages and then budget for them in future local capital budgets.

It is strongly recommended that government conduct a house-to-house damage assessment using trained engineers and/or other building professionals who would inspect the houses and complete a form that standardizes the types of housing damage and site damage. Based on the data collected, a matrix of damage types (“damage typology”) in the affected areas could be produced to systematize common failures and identify needed improvements in construction methods. Such an assessment would also produce valuable data for allocating financial assistance to households, for estimating demands for materials and other inputs, and for monitoring the progress of recovery at the household and township levels. The inspectors could also distribute to households basic information on “build back better” techniques and the housing recovery strategy.

**Figure 30.**  
Damaged  
houses in the  
Chin State



Source: © U Kaung Naing and Dr. Yin Yin Nwe; further permission required for reuse.



**Figure 31.**  
 Damaged houses in  
 Magway Region  
 – mudlines (red  
 arrows) indicate  
 peak flood level

Source: © Martin Albrecht; location: upstream of Kyeoo Kyeewa Dam; further permission required for reuse.



Source: © Michael Bonte-Grapentin; location: Pwint Phyu; further permission required for reuse.

## ESTIMATED VALUE OF THE EFFECTS AND IMPACT OF THE DISASTER ON THE SECTOR

**Housing and settlements damage.** The Post-Flood and -Landslide Needs Assessment (PFLNA) shows housing and settlements to be one of the sectors most affected, with an estimated K 508 billion in damages and K 34 billion in losses. These figures are based on estimates of housing replacement costs by type, with some regional adjustments (Table 30).<sup>71</sup> The vast majority of this damage is private, meaning that it is private household assets that have been lost: whole houses, housing value from damages, and household belongings. The damage figure includes damage estimates for both landslides and flooding, acknowledging that the type of damage is different. Damage to private household water and sanitation facilities is also included in this figure. Due to inconsistencies in housing condition data, and to variations in how housing damage was categorized, the damage and needs figures used here are based on a number of conservative but critical assumptions that will need to be validated for planning purposes. Some of the key assumptions are included in the text.

**Table 30.**

Public and private damage and losses in housing and human settlements by cost category (million K)

Subsector	Damage			Loss			Total effects		
	Value	Public	Private	Value	Public	Private	Value	Public	Private
Housing units destroyed	115,133	0	115,133	0	0	0	115,133	0	115,133
Housing units damaged	280,817	0	280,817	0	0	0	280,817	0	280,817
Household goods lost	76,153	0	76,153	0	0	0	76,153	0	76,153
Household water and sanitation	35,976	0	35,976	0	0	0	35,976	0	35,976
Debris and silt removal	0	0	0	32,786	0	32,786	32,786	0	32,786
Costs of sheltering and relief	0	0	0	200	200	0	200	200	0
Housing rental losses (1 year)	0	0	0	1,168	0	1,168	1,168	0	1,168
<b>Total</b>	<b>508,079</b>	<b>0</b>	<b>508,079</b>	<b>34,153</b>	<b>200</b>	<b>33,953</b>	<b>542,232</b>	<b>200</b>	<b>542,032</b>

Source: World Bank calculations based on various sources, including damage data provided by Central Statistics Office, Integrated Household Living Conditions Survey in Myanmar (2009–2010), and 2014 Myanmar National Population and Housing Census.

**Housing and settlements losses.** Losses in this sector are the result of lost rental income and extraordinary expenses incurred as the result of the disaster. Because housing is a private good, only K 200 million are public sector effects, largely the cost to government to run shelters and provide other emergency food and supplies to families.

Households are still displaced in landslide areas in particular, which has resulted in out-of-pocket costs for government and other providers of short-term shelter facilities. In early September, the MSWRR estimated that 1.6 million individuals were displaced. As of late September, this number was significantly reduced, with only a few thousand individuals estimated to remain in shelters, although there has been no appraisal of the conditions in which previously displaced households are living, which should be an equal concern.

<sup>71</sup> Damage is based on replacement cost per square foot by type of housing and average house size by type. The replacement costs that resulted were checked against reported sales values by state/region and housing type reported in the Integrated Household Living Conditions Survey, and reduced by level of damage.

As noted above, approximately 2,900 households require relocation in Chin State as a result of landslides, and approximately 1,600 households in Sagaing Region require relocation because of severe flooding. For those displaced by landslides, an urgent process to identify sites for reconstruction is well under way. Government will either rebuild for the household in the new site or provide an equivalent subsidy to allow households to reconstruct themselves. A similar process is expected in Sagaing.

While construction takes place, transitional sheltering options are likely to be required to allow families to exit camps and live safely.<sup>72</sup> These options could include hosting, provision of rental subsidies, or transitional shelters at new or existing housing sites. Some of the 38,542 households with completely destroyed housing who can reconstruct on site will also require transitional sheltering arrangements. These arrangements could continue for at least one year. One advantage of transitional housing solutions is that they buy time for government and families to develop durable solutions, but those who receive transitional assistance should not lose any right they may have to relocation and/or assistance with permanent housing.

Due to a lack of information, the loss estimate currently includes only a moderate amount (K 200 million) for transitional sheltering, but costs could reach up to K 20 billion if 50 percent of the households needing to be relocated or with destroyed housing were provided a one-year transitional sheltering option. Building a physical transitional shelter is the most expensive of various transitional options, but if it is built from materials that can be later sold or reused in the permanent reconstruction, this expenditure reduces future reconstruction costs.

Other losses include costs associated with debris and silt removal from housing sites and loss of rental income for owners of rental property that was damaged or destroyed. Using 2014 National Population and Housing Census figures, it is estimated that approximately 4 percent of all damaged housing was generating rental income that owners will lose temporarily. This lost income was estimated at K 1.2 billion during the first year only, assuming landlords would be quick to rebuild.

**The geographic distribution of damage.** An estimate of the geographic distribution of damage and losses is shown Table 31. Ayeyarwady, Rakhine, Bago, Sagaing, Mandalay, and Yangon were the states and regions with the highest level of damage on an absolute basis.

The nature of the damage in each state is different, as are other factors that will affect the state's recovery and the recovery strategy for housing. Chin State's recovery will be especially challenging. Due to the mountainous topography and limited roadway network, construction costs in Chin State are ordinarily around 30 percent higher than in other states, according to government figures. The landslides blocked and destabilized roads. Although roads are being reopened, major reconstruction projects will be required for full recovery of the road network. As shown in the transport sector chapter of this PFLNA, Chin State represents more than 30 percent of all disaster effects in the transport sector.

The time required to carry out transport sector reconstruction will likely result in even higher cost increases for Chin State building materials. Furthermore, buildings in Chin State are often constructed on steep hillsides with timber posts used to support the housing structure on the "downhill" side. Whether this traditional building method needs to be modified to reduce risk and to give households the confidence to rebuild, or whether retrofitting of this style of house is advisable, is a question that will need to be answered during the house-to-house building assessment.

<sup>72</sup> Transitional sheltering offers a housing option that facilitates the transition from displacement to a durable housing solution, and provides privacy and (ideally) proximity to the site where reconstruction will occur. It may or may not involve a physical solution such as construction of a structure. Hosting (temporary residence of the displaced household with friends, family, or others) and temporary rental are effective transitional approaches that can be supported with modest subsidies. Where transitional sheltering entails provision of a structure, it should be safe, low cost, and easy to construct rapidly with local labor, and to the extent possible should use local materials that can be reused in permanent construction. See Shelter Centre (2012).

**Table 31.**

Geographic distribution of public and private damage and losses in housing and human settlements (million K)

State/Region	Damage			Loss			Total effects		
	Value	Public	Private	Value	Public	Private	Value	Public	Private
Ayeyarwady Region	139,052	0	139,052	8,210	51	8,158	147,262	51	147,211
Bago Region	57,435	0	57,435	4,332	25	4,306	61,767	25	61,741
Chin State	14,175	0	14,175	326	9	317	14,501	9	14,492
Kachin State	5,662	0	5,662	356	2	354	6,018	2	6,016
Kayin State	1,247	0	1,247	106	23	83	1,353	23	1,330
Magway Region	47,360	0	47,360	4,153	14	4,139	51,513	14	51,499
Mandalay Region	13,678	0	13,678	311	3	309	13,989	3	13,986
Mon State <sup>a</sup>	138	0	138	2	2	-	140	2	138
Rakhine State	101,522	0	101,522	8,296	25	8,271	109,819	25	109,794
Sagaing Region	98,104	0	98,104	6,892	13	6,879	104,996	13	104,983
Shan State	5,954	0	5,954	71	27	43	6,025	27	5,997
Tanintharyi Region	183	0	183	6	0	6	189	0	189
Yangon Region	23,569	0	23,569	1,093	5	1,088	24,662	5	24,656
<b>Total</b>	<b>508,079</b>	<b>0</b>	<b>508,079</b>	<b>34,153</b>	<b>200</b>	<b>33,953</b>	<b>542,232</b>	<b>200</b>	<b>542,032</b>

Source: World Bank calculations based on various sources, including damage data provided by Central Statistical Organization, Integrated Household Living Conditions Survey in Myanmar (2009–2010), and 2014 Myanmar National Population and Housing Census.  
Note: a. Mon State data reflect damage only to household water and sanitation, and minimal lost rental income.

## RECOVERY AND RECONSTRUCTION STRATEGY

**No one left behind.** Even though housing is a private good, the negative social and economic impact of a large poorly housed population that cannot rebuild on its own is such that governments often provide some form of housing assistance, at least for the most vulnerable segments of the population. But even where many households will rebuild on their own without government financial assistance, recovery presents an opportunity to improve the quality and safety of housing, as major expenditures are made in the sector over the next two years. To take advantage of this opportunity, the main players in housing recovery—the households—must be engaged immediately and encouraged to build back better.

The overarching goal of housing recovery should be to improve and restore housing with a focus on disaster risk reduction (building back better) for all. Building back better in recovery means that housing is repaired and reconstructed in such a way that vulnerability to disaster risks is reduced to acceptable levels.

Understandably, government’s current focus is on the most-affected population, including those displaced by the landslides in Chin and those needing to be relocated due to the flooding in Sagaing. Another high-priority group is those throughout the flood zone with fully destroyed housing.

The restoration of potable water and sanitation facilities is also an urgent need in order to save lives, prevent the spread of diseases, reduce the burden of work for women and girls, and prevent an increase in gender-based violence. Women have a strong incentive to acquire and maintain improved, conveniently located water facilities, as they and their families benefit most when water quality and quantity improves. Given their long-established and active role in water management, women should play a key role in identifying long-term measures and solutions related to access to and use of water sanitation services.

Yet households requiring relocation and with fully destroyed housing represent less than 10 percent of all affected households. The housing recovery strategy must also focus on the other 90 percent of households. Experience worldwide shows that in most cases governments can neither raise sufficient funds nor establish the delivery capacity to physically build or repair all destroyed and damaged



houses following a large-scale disaster. Households generally raise the funds on their own and take responsibility for construction and repairs. But government can effectively support the efforts of these households with targeted subsidies and technical assistance, and can improve recovery outcomes by defining a broad-based housing recovery strategy.

## RECOVERY AND RECONSTRUCTION PLAN

Housing sector recovery will be guided by the following principles:

- Government support to housing recovery should be cost-effective, built on local capacity, and capable of being replicated in future disasters.
- Owner-driven housing recovery should be utilized, in order to promote and enable building back better in housing and settlements.
- Government (union and state) shall provide financial and technical assistance.
- Government financial support shall be uniform for a given type of affected household (destroyed, damaged).
- Housing assistance shall be provided on a cost-sharing basis between the homeowner and government. Government will help mobilize the match funding for vulnerable households from private donors through a solidarity program.
- A coordination structure should be established at union and state/regional levels for housing recovery.
- Union and state/regional coordinating bodies will be assisted by a lead technical assistance provider and civil society organization (CSOs) on the ground. CSOs and households must receive training to participate in the program.
- The financial package shall be paid out on the basis of progress on construction that conforms to standard guidelines reflecting “build back better” principles.
- In urban areas, homeowners will have access to soft loans and be required to purchase homeowners insurance.

**Outline of recovery framework for housing.** The proposed approach to managing housing recovery requires government (in collaboration with partners) to establish or strengthen communication, coordination, planning, and quality control capacities aimed specifically at overseeing the large number of households that will be repairing and reconstructing housing over the next two to three years on their own. Such a system needs to be put in place relatively quickly.

Experience shows that after a period of about two years, most households will have recovered to a point where they will neither seek nor take advantage of any support provided by the government. Opportunities will still exist to assist households with retrofitting and to improve settlement, but the bulk of the investment in housing recovery will have already taken place after two years, and the chance to encourage risk reduction in recovery will be largely lost.

A proposed set of activities and associated costs that would allow implementation of a recovery process oriented toward enabling homeowner self-recovery is given in Table 32. The activities are divided into three time periods: Short term (and transitional) (2015), medium term (2016), and long term (2016–2017). See Table 33 for cost assistance assumptions used to calculate the housing recovery needs.

A critical early activity should be development of the Housing and Settlements Recovery Plan, which will make explicit overall goals, define roles and responsibilities, establish financing requirements, and make clear who is eligible for what forms of financial and technical assistance.

The proposed recovery approach includes two subsets of activities, as described briefly below. Each of the proposed activities is described in Table 32.

- **Housing and settlements recovery coordination.** Recovery coordination includes activities that would be carried out at the national, state, and regional levels to ensure the necessary resources and the smooth implementation of the overall housing and settlements recovery program. These activities include planning, monitoring, housing inspection, design and dissemination of guidance on building back better for homeowners, fundraising, community planning, and (in the longer timer) policy design.
- **Housing and settlements recovery assistance.** Recovery assistance includes activities that would be carried out to provide direct support to homeowners, and to improve settlement and housing sites, including (i) provision of technical support to homeowners through training, on-site supervision, and establishment of information centers; (ii) provision of financial support to homeowners; and (iii) settlement improvements for disaster risk reduction.

The cost of fully financing and implementing housing recovery in this manner is estimated to be K 632 billion. This figure includes K 6.4 billion for housing and settlements recovery coordination and K 626 billion for the cost of housing recovery, which includes K 11.9 billion for technical support to ensure safe reconstruction, K 593 billion for financing, and K 20.8 billion in settlement-related risk reduction investments, as shown in Table 32.

The housing recovery cost is based on estimates of household expenditures required to build back better.<sup>73</sup> It is not assumed that these costs would be fully subsidized by government. Households generally contribute a significant amount to housing recovery, and government should structure the support it provides to encourage (or require from those who can afford it) a significant household contribution. However, government, donors, or NGOs would finance housing recovery coordination, technical assistance to households, and settlement improvements.

For government support, priorities will likely have to be set among different groups and households, with funding provided first to those considered the most deserving and vulnerable. Vulnerable households are best identified at the township level by respected community members. Certain households may belong to more vulnerable classes (such as female-headed households), but in fact have support available for recovery (e.g., remittances) that others do not. Local knowledge is therefore an important input for setting priorities if this is necessary.

The Housing and Settlements Recovery Plan that will need to be developed and the National Social Protection Strategic Plan should also be used as a framework for setting priorities if funding is limited.

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<sup>73</sup> Base costs for housing recovery include: debris and silt removal; replacement of house contents; and repair and reconstruction of house and household water and sanitation systems. A provision is also included for temporary sheltering arrangements. Housing repair and reconstruction costs were based on validated estimates of replacement value per square foot by type of housing and average house size by type. The resulting replacement costs were checked against reported sales values by State/Region and housing type reported in the Integrated Household Living Conditions Survey in Myanmar (2009–2010). A factor of just under 20% was added for improvement of housing and risk reduction, to ensure a “build back better” approach.

Recovery need	Program of activities	Short term (2015)	Medium term (2016)	Long term (2017–2018)	Total cost (million K)
<b>I. Housing and settlements recovery coordination</b>					
Housing recovery planning and monitoring	<ul style="list-style-type: none"> <li>Designate government lead agency to coordinate overall housing recovery at national level and develop Housing and Settlements Recovery Plan.</li> <li>Support state and region coordination centers in housing sector coordination.</li> <li>Establish a core group composed of (i) the government lead ministry, (ii) a development partner coordinating the technical assistance effort, (iii) financial institutions and/or donors providing financial support, (iv) Myanmar Society of Engineers advising on building standards, and (v) international partners collaborating with states, regions, and local civil society organizations (CSOs) in delivery of training, supervision, and financial assistance on the ground.</li> <li>Define recovery goals for housing sector and establish independent recovery monitoring function.</li> </ul>				
<b>Cost   Monitor housing recovery</b>		0	775	775	1,550
Housing and housing sites inspection	<ul style="list-style-type: none"> <li>Mobilize and train engineers to conduct house-to-house damage and site condition inspection.</li> <li>Develop housing and site-related damage typologies, based on assessment results.</li> <li>Prepare housing repair and reconstruction training guidelines based on assessment results.</li> </ul>				
<b>Cost   Housing and sites inspection</b>		0	1,825	0	1,825
Develop settlement improvement plans	<ul style="list-style-type: none"> <li>Prepare state and region investment plans for housing site-related risk reduction (part of normal state/region budget process).</li> </ul>				
<b>Cost   Settlements improvement plans</b>		25	500	500	1,025
Design/adapt and disseminate building back better (BBB) guidance to homeowners	<ul style="list-style-type: none"> <li>Develop guidance and/or use existing guidance on safe repair and reconstruction (building back better).</li> <li>Develop and disseminate BBB guidance to homeowners.</li> <li>Include messages on improved sanitation in communications.</li> </ul>				
<b>Cost   Building back better</b>		50	250	200	500
Facilitate private sector role	<ul style="list-style-type: none"> <li>Enlist local suppliers to stock and explain the use of materials required to implement BBB guidance.</li> <li>Train carpenters, other building trades, and homeowners on BBB.</li> <li>Provide trained oversight of homeowner repair/ reconstruction projects.</li> </ul>				
<b>Cost   Private sector facilitation</b>		50	125	125	300

**Table 32.**

Proposed housing and settlements recovery needs, activities, and budget (million K)

Recovery need	Program of activities	Short term (2015)	Medium term (2016)	Long term (2017–2018)	Total cost (million K)
<b>I. Housing and settlements recovery coordination</b>					
Mobilize and channel financial assistance for housing recovery	<ul style="list-style-type: none"> <li>Develop and maintain list of priority households to be assisted by state/region and township.</li> <li>Design and publicize financial assistance policy.</li> <li>Conduct ongoing solidarity appeals for support for housing recovery (national and state/region), led by the national Aid Coordination and Management Unit under the Recovery Coordination Committee.</li> <li>Direct NGO and donor interventions to assist priority households.</li> </ul>				
	<b>Cost   Mobilization of financial support</b>	50	150	125	325
Community planning	<ul style="list-style-type: none"> <li>Establish risk-sensitive community planning capacity in states and regions.</li> </ul>	0	250	375	625
Develop national recovery policy for housing sector	<ul style="list-style-type: none"> <li>Institutionalize national post-disaster housing recovery policy and operational arrangements (operationalize disaster component of social protection strategy).</li> </ul>	0	125	125	250
	<b>Subtotal: Housing and settlements recovery coordination</b>	<b>175</b>	<b>4,000</b>	<b>2,225</b>	<b>6,400</b>
<b>II. Housing and settlements recovery assistance</b>					
Technical support (TS) to homeowners	<ul style="list-style-type: none"> <li>Use state and region coordination centers to address household inquiries, and to coordinate assessments, engineering inputs, coordination support, oversight of local CSOs, supervision, and monitoring mechanism to support the government with housing recovery efforts. <ul style="list-style-type: none"> <li>Provide relocation TS</li> <li>Provide reconstruction TS</li> <li>Provide repair TS</li> <li>Provide household water and sanitation recovery TS</li> <li>Establish grievance redress mechanisms</li> </ul> </li> </ul>				
	<b>Cost   Delivery of technical support</b>	200	3,600	8,100	11,900
Cost of housing recovery (See Table 27)	<ul style="list-style-type: none"> <li>To deliver assistance, government will require mechanisms to transfer financial resources to communities and households.</li> <li>Relocation and reconstruction costs (@K 6 million per household)</li> <li>Reconstruction costs (@ K 5 million per household)</li> <li>Repair costs (@ average K 2 million per household)</li> <li>Transitional sheltering costs (@ average K 0.625 million per household)</li> </ul>				
	<b>Cost   Housing recovery</b>	600	178,032	414,808	593,440
Cost of settlement improvements for disaster risk reduction	Public investment is needed in settlement-specific risk reduction (slope stabilization, retrofitting of community facilities, etc.).				
	<b>Cost   Neighborhood risk reduction</b>	1,250	6,200	13,350	20,800
	<b>Subtotal: Housing and settlements recovery costs</b>	<b>2,050</b>	<b>187,832</b>	<b>436,258</b>	<b>626,140</b>
	<b>TOTAL</b>	<b>2,225</b>	<b>191,832</b>	<b>438,483</b>	<b>632,540</b>

Source: Assessment team calculations based on various sources, including damage data calculations and Instructions of the President of Myanmar for Rehabilitation Process.

Type of unit assisted	Number of unit/ households	Cost per units/ household (million K)	Total cost (million K)
Housing units destroyed/reconstruction cost (a)	34,008	3.73	126,986
Households requiring relocation (b)	4,534	5.28	23,940
Housing units heavily damaged/repair cost (c)	95,925	1.72	164,704
Housing units with minor to moderate damage/repair cost (d)	146,287	0.83	120,834
Housing units flooded only (e)	243,813	0	0
<b>All damaged (c-e)</b>	486,026	n.a.	n.a.
<b>All damaged and destroyed (a-e)</b>	524,568	n.a.	n.a.
Debris and silt removal	524,568	0.06	32,786
Temporary sheltering (50% of a + b)	19,300	0.63	12,063
Household water and sanitation rehabilitation (a + c)	129,933	0.28	35,976
Replacement of household goods (a-e)	524,568	0.15	76,153
<b>Total household financial need</b>			<b>593,440</b>

Source: Assessment team estimations based on damage data provided by Central Statistics Office and estimated repair, reconstruction, and sheltering costs.

**Table 33.**  
Cost assistance assumptions used to calculate housing recovery needs

## RECOVERY AND RECONSTRUCTION IMPLEMENTATION

**Principal responsibility in states and regions.** Responsibility for town and housing development, as well as for local plans, is assigned in Myanmar's Constitution to the governments of the states and regions. In the 2015 post-flood and -landslide recovery period, the main responsibility for housing rehabilitation and reconstruction will rest with the state and regional governments, while in the Chin State, notably Hakha, the capital, the Ministry of Environmental Conservation and Forestry has been given the mandate to work in cooperation with the Chin State government to coordinate recovery.

State and regional governments, led by the General Administration Departments (the Secretariats of each state/region) and supported by the townships, will plan, coordinate, and oversee implementation of housing construction. The state and region recovery coordination centers will also play a key role.

For government- or other agency-built housing, the roles of states and regions will include coordinating with agencies, issuing and managing construction contracts, and ensuring provision of basic services, including electricity, water, sanitation, etc., as appropriate.

For homeowner-managed repair and reconstruction, states and regions will oversee the delivery of training along with technical and financial assistance, supported by township engineers, township administrators, local CSOs, and international NGOs. States and regions will also work with private suppliers, if the local situation requires, to ensure that appropriate and adequate quantities of construction materials are available for households, and they may subsidize transport or materials if necessary.

**Union ministries support for states and regions.** Various ministries and government agencies, particularly the Ministry of Construction, will provide targeted support to the states and regions with housing sector construction and reconstruction. The Ministry of Construction, working through the Recovery Coordination Committee (RCC) and its own departments, including the Department of Planning and Department of Housing, is expected carry out a number of the functions listed under "Housing and settlements recovery coordination" (Table 32) in support of states and regions.

Once the Housing and Settlements Recovery Plan is developed, and roles and responsibilities are clearly defined, the RCC will develop a plan of activities and procedures, and design an operational strategy that will allow assistance to be delivered to the field in a timely manner. It may also need

to assist the most heavily affected states and regions to develop their own operational plans and strategies. These arrangements should be in place within 60 to 90 days from finalization of the plan.

**Protecting vulnerable individuals.** Displacement causes a range of social and economic effects on displaced families, including loss of income, loss of privacy, and exposure to a range of risks such as communicable diseases, domestic violence, and gender-based harassment and violence, particularly for young girls. The elderly, handicapped, and those less able to recover on their own or advocate for their own interests typically suffer economically and slip into a state of increased vulnerability. Whether special measures to assist these individuals are necessary depends on the cultural practices and level of community solidarity. Where there is any doubt, committees should be established or designated at the local level to follow and advocate for the most vulnerable of the displaced population to ensure they are properly cared for and rehoused.

As discussed in the gender sector chapter of this report, households headed by females are overrepresented in the affected states and regions at 25 percent of all households. These households have lower incomes and inferior-quality housing, suggesting that they may have sustained more extensive damage than male-headed households. These households will need targeted support to recover their housing. The house-to-house assessment should investigate carefully the needs and preferences for assistance of this subset of owners of damaged houses.

Key partners to government in carrying out the housing reconstruction strategy will include the private sector, which is already contributing generous amounts of cash and in-kind support to the housing recovery process; CSOs and religious institutions; and local and international NGOs.

With respect to international organizations, UN-Habitat has worked closely with the Ministry of Construction in developing carpenter training, construction guidelines and standards, and the building codes, all of which should be deployed in organizing the program. UN-Habitat, in collaboration with the Myanmar Engineering Society, should support the Ministry of Construction to fully equip and prepare the lead housing agency and establish the coordination body (the Key Stakeholders group mentioned earlier).

Developing local CSO capacity to assist states, regions, and townships in overseeing owner-driven, community-based housing recovery is an explicit objective of this approach. This CSO capacity, built over time, will form the basis for a national capacity to promote better building practices and will support similar housing construction efforts in future disasters.

Government should ensure that international NGOs, bilateral institutions, and other agencies that wish to contribute to the recovery process align their efforts with the objectives and priorities of the Housing and Settlements Recovery Plan. Much of this coordination will take place at the local level, but it is also recommended the coordination body support the lead agency in mobilizing, directing, and aligning these outside contributions.

## SECTOR ASSESSMENT METHODOLOGY

This assessment and proposal was developed following consultations with the Ministry of Construction; General Administration Department; Ministry of Social Welfare, Relief and Resettlement; Ministry of Livestock, Fisheries and Rural Development; Ministry of Agriculture and Irrigation; and advisors to government. Also consulted, among others, were the Shelter Cluster, the Early Recovery Working Group, UNHCR, UN-Habitat, and UNICEF. Financial calculations are based on data collected by the Central Statistical Organization and MSWRR from states and regions and other government data; the 2014 Myanmar National Population and Housing Census; the Integrated Household Living Conditions Survey in Myanmar (2009–2010); and research from various sources regarding housing construction costs, including various assessments conducted following Cyclone Nargis. Other information was gathered from interviews with key government officials and other local experts, and review of publications related to the issues covered in this section.



Damage in the electricity sector.  
Photo: © MOEP.

3

## Electricity

### SUMMARY

**Damages to the electricity sector, which occurred in six states/regions, are relatively small compared with damages to other economic sectors.** Total damages are estimated to be K 6,282.3 million, and losses are estimated to be K 623.7 million. Damages and losses in the distribution subsector were mainly caused by faults, collapsed poles in distribution lines, and power cutoffs in the flooded areas. Damages in the transmission subsector were caused by the collapse of electric towers and poles as a result of erosion of their foundations. In the generation subsector, damages and losses were caused by damage to small and “mini” hydropower stations. According to the Chin Committee for Emergency Relief and Rehabilitation, Chin State incurred damage to 15 mini-hydropower stations, ranging in size from 5 to 30 kilowatts (kW) and having a total capacity of 150 kW. A further—and indirect—impact on the sector is the delay of the National Electrification Program, since the resources that would have been used to connect villages to the electricity grid will now likely be spent on recovery to housing and other more crucial assets.

The electricity sector acted very quickly to restore systems and reconnect consumers to the grid. Many households were reconnected within the same day, and the longest service interruption was one month. The damages were relatively small, and were distributed among three utilities: Electricity Supply Enterprise (ESE), responsible for distribution in the impacted areas; Hydropower Generation Enterprise (HPGE), responsible for generation; and Myanmar Electric Power Enterprise (MEPE), responsible for transmission. Most of the recovery works for the short term—up to four months—have been completed, and the sector has restored the damaged facilities to basic operating conditions. The medium-term recovery—up to three years—will fully restore the damaged systems and facilities and make them more resilient. Total funds required for the repair of damaged equipment and facilities are estimated to be K 6,864.244 million. This includes about K 1,875 million for reconstructing the Line Bon small hydropower station, which was totally washed away and which will need to be relocated.

The Myanmar Ministry of Electric Power (MOEP) has compiled a damage inventory and prepared a recovery plan. We present below analyses of damage and losses in the electricity sector, along with a recovery plan. From the total of K 6,864.244 million, about K 1,019.5 million will come from utilities' own sources and will be used for the short-term recovery; the remaining of K 5,844.744 million will be used for the medium- and long-term recovery. It is suggested that the funds for medium- and long-term recovery can come from component 4 of the National Electrification Project, financed by IDA. Since Myanmar is endowed with large hydropower potential, and due to the climate changes, dams, particularly dam for hydropower station of small and medium scale, are more and more vulnerable to the natural risks. Therefor it is strongly suggested to conduct a dam safety program, as mentioned in the Recommendation for resilient and recovery and reconstruction part.

### PRE-DISASTER CONTEXT

**Despite fast growth in recent years, Myanmar's electricity sector remains weak in comparison with that of other Asian countries.** It is characterized by low electricity consumption per capita, a low rate of access to electricity, and a shortage of capacity during the dry season (due to the high share of hydropower in the generation mix). Myanmar's per capita electricity consumption is among the lowest in the world. Its average annual consumption per capita of around 160 kilowatt-hours (kWh) is 20 times lower than the world average. About 70 percent of the population, and 84 percent of rural households, lacked access to the electricity grid in 2014. The electricity access rate by Myanmar state and region of Myanmar is given in Table 82 in Annex 3.



Electricity consumption has grown rapidly in recent years—an average of 14 percent per year over the past five years<sup>74</sup>—and peak load demand reached 2,100 megawatts (MW) in 2014. During the period from 2010 to 2015, electricity sales grew about 17.6 percent per year, from 4,993 terawatt-hours (TWh) in FY2010 to 11,255 TWh in FY2015. Energy balance for the last five years is given in Table 83 in Annex 3.

As a share of total installed capacity (4,600 MW) on the grid, hydropower in Myanmar currently accounts for around 67.3 percent (3,151 MW),<sup>75</sup> natural gas generation accounts for 30.1 percent (1,411 MW), and a small coal-fired power plant accounts for the remaining 2.6 percent (120 MW). Small off-grid diesel and mini-hydropower units dispersed across the country have an estimated total installed capacity of about 114 MW.<sup>76</sup> Because the country relies heavily on extremely seasonal hydropower with low firm capacity, the existing power generation system cannot meet the peak demand during the dry season. Fuel-wise generation position of Myanmar as of 2015 is given in Table 84 in Annex 3.

In 2014, the country's transmission system comprised 1,907.18 miles of 230 kilovolt (kV) transmission lines, 1,350.35 miles of 132 kV transmission lines, and 1,866.49 miles of 66 kV transmission lines. The power distribution network in Myanmar comprised about 15,500 miles of medium-voltage (33/11/6 kV) lines, 14,000 miles of low-voltage (0.4 kV) lines, and 30,308 distribution transformers with a combined capacity of 7,452 mega-volt-amperes (MVA).

Accumulated delays in investments in power infrastructure, overreliance on seasonal hydropower, and a rapid increase in electricity demand (which tripled over the last decade) have resulted in large electricity shortages; these peaked at about 30 percent of power demand in 2012–2013. There has been a significant recent increase in gas-fired power generation (about 400 MW was commissioned in 2014), but load shedding and blackouts are common, and in general the reliability of the power supply is low.

Myanmar's electricity sector is under MOEP. The generation subsector comprises HPGE and independent power producers. The transmission subsector is managed by MEPE, which also acts as the single buyer. The distribution subsector is managed by three distribution companies: Yangon Electricity Supply Corporation (YESC), Mandalay Electricity Supply Corporation (MESC), and ESE (which covers the states/regions other than Yangon and Mandalay).

As the single buyer, MEPE buys energy from HPGE at the price of K 20/kWh, from independent power producers at K 70/kWh, and from a Joint Venture Company (JV) at Y 0.189/kWh. MEPE sells electricity to YESC at K 40/kWh and to ESE at K 37/kWh. In their turn, ESE, YESC, and MESC sell electricity to final users at a national uniform tariff. The tariff structure for end users effective from April 2014 provides three tariff blocks for residential use, which range from K 35/kWh to K 50/kWh; tariffs for industrial and large commercial use range from K 75/kWh to K 150/kWh. The details of the tariff are given in Table 85 in Annex 3. During FY2013/2014, the selling tariff of YESC averaged K 57/kWh, while total expenses averaged K 54/kWh, resulting in a net profit margin of 3.8 percent. During FY2014, the selling tariff of ESE averaged K 49.8/kWh, while total expenses averaged K 49.4/kWh, resulting in a net profit margin of 2 percent.

<sup>74</sup> Peak load demand is estimated at about 2,400 MW, but due to load shedding the realized peak is 2,100 MW.

<sup>75</sup> This figure includes joint venture hydropower projects that exported about 2 TWh to China in 2013–2014.

<sup>76</sup> MOEP Presentation to Greater Mekong Subregion Regional Power Trade Coordination Committee, June 9, 2015.

## POST-DISASTER SITUATION

According to MOEP, floods and landslides caused damages to the electricity sector in the four worst-damaged states and regions—Chin, Rakhine, Magway, and Sagaing—and disrupted the power supply in Ayeyarwady and Bago. Heavy rains, landslides, and high water caused damages to small hydropower stations; there were reports of landslides on dams' slopes, blocked waterways at hydropower stations, and washed-away earth dams, water canals, and weir penstocks. Some transmission towers (both 230 kV and 66 kV) collapsed, and poles (both 11kV and 0.4 kV) were broken. Some substations, including control rooms, were deeply submerged. High water speed washed away roads and fences, and caused damages to the staff houses as well as the engine buildings. A summary of the damage types and values, as well as estimates of the recovery costs, is given for each state and region in Table 34.

**Table 34.**

Type of damages in four worst-affected states and regions

Chin State	Rakhine State	Sagaing Region	Magway Region
Small hydropower stations (public and private)	Engine building	Engine building	Equipment in Gyi Ohn Gyi Wa hydropower plant
66 kV tower	230 kV electric tower	66 kV and 33 kV power lines	
11kV, 0.4 kV lines	66 kV electric supply building	11/0.4 kV transformer	66 kV electric power line
11/0.4 kV transformer	11 kV and 400 V power line tower	66/22 kV, 20 MVA electric supply building	11 kV, 400 V concrete poles
	230 kV 46 tower wall		11/0.4 kV, transformers
	Staff house	Staff house	Staff house, storage, road
	Other damages	Other damage	Other damages

Source: MOEP.

**Figure 32.**

Typical damages to electricity sector caused by the recent flood and landslide.



Dams, water canal, and weir damaged by floods.



Collapsed towers and poles.



Submerged substations and control rooms in deep water.

Photos: © MOEP. Reproduced with permission; further permission required for reuse.

## ESTIMATED VALUE OF THE EFFECTS AND THE IMPACT OF THE DISASTER ON THE SECTOR

**Damages.** MOEP reported that the recent flood damaged eight small hydropower stations owned by ESE, with total capacity of 4 MW, all in Chin State. Some 230 kV and 66 kV transmission lines were collapsed, concrete poles of distribution lines were broken, and transformers were damaged. The Chin Committee for Emergency Relief and Rehabilitation reported damage to 15 private sector mini-hydropower stations with capacity ranging from 5 kW to 30 kW. The value of these damaged mini-hydropower stations was not clearly stated, so the assessment assumes that the value is equal to the recovery value for a mini-hydropower station in Myanmar, which is US\$3,000 per kW installed. This assumption seems reasonable because in practice, all mini-stations of capacity less than 50 kW will be totally washed away when such a disaster occurs. The most significant damage happened to the Line Bon small hydropower station, with the installed capacity of 500 kW; it was totally washed away and will not be repaired. The list of the damaged equipment and properties in four states and regions is given in Table 35 below.

State	Types of damages	Value (million K)
<b>Chin</b>	Small hydro powerplant	
	Lai Va	5.000
	Dung Va	8.000
	Ngalsip Va	6.000
	Zalui	1.500
	Line Bon (totally damaged, cannot be recovered)	1,875.000
	Tui Saung	100.000
	Che Chaung	1.500
	Nam Layung Chang	4.000
	Private mini-hydro	563.000
	66 kV power tower ( 1)	n.a
	11 kV and 400 V power line (45)	165.500
	11/0.4 kV transformer (2)	17.200
	<b>Subtotal</b>	<b>2,746.200</b>
<b>Rakhine</b>	Staff house (8)	17.771
	230 kV electric tower (3)	68.075
	11 kV and 400 V power line tower ( 194)	116.850
	Other	697.591
<b>Subtotal</b>	<b>914.287</b>	
<b>Sagaing</b>	Staff house ( 7)	19.400
	Engine building (1)	6.500
	66 kV and 33 kV power line (4)	5.728
	11/0.4 kV transformer (6)	93.340
	66/22 kV, 20 MVA electric supply building	1,181.202
	Other	712.280
<b>Subtotal</b>	<b>2,018.450</b>	
<b>Magway</b>	Staff house in Mhone power plant (30);, storage (4); road	545.807
	Equipment at Gyi Ohn Gyi Wa hydropower plant	2.860
	Staff house in Pwint Phyu (1)	12.000
	66 kV power line	
	Of 11 kV, 400 V concrete poles (77)	32.917
	11/0.4 kV transformers	8.100
	Other	1.641
<b>Subtotal</b>	<b>603.325</b>	
<b>Total</b>	<b>6,282.262</b>	

**Table 35.**

Value of damage by state and region

Source: MOEP.

Note: Not applicable = n.a.

**Losses.** Losses are defined as the changes in the economic flow arising from the disaster. In this case the losses derive from both suppliers and customers of the electricity sector. Suppliers’ losses are due to discontinuation of generation, reduction of sales, higher cost of production, or increase in the system losses. Customers’ losses are calculated as losses of income from productive activities due to interruption of the electricity or use of a higher-cost substitute. Losses for residential (i.e., nonproductive) customers are due to their use of higher-cost fuels for the domestic purposes (such as lighting, cooking, or water pumping).

The most direct loss for suppliers is interruption of ESE’s eight small hydropower stations (total installed capacity of 4.0 MW) and the 15 private sector mini-hydropower stations (150 kW), all in Chin State. Five of ESE’s eight stations, with total capacity of 2.5 MW, have already been repaired and are in operation; the other two are being repaired and will likely be operational by the end of 2016. Restoration of the 15 mini-hydropower stations is expected to take one year. Total losses associated with these power stations are estimated to be K 24.2 million. Line Bon Station totally washed away and will not be restored. The total generation loss for all stations is estimated to be about 8,518 MWh. The calculation shows that if ESE buys the power from MEPE for K 52/kWh, then ESE may lose about K 249.9 million.

The second type of loss is the reduction in sales. Given the larger number of impacted households and public buildings, it is worth examining the loss of sales due to interruption of power supply to these customers. Based on MOEP’s list of customers disconnected from the grid and the duration of the disconnection (see Annex 3), the total reduced sales are estimated at 2.18 million kWh. All of the damaged households are in ESE’s service area, and given that ESE’s FY2014 net profit margin was K 0.4/kWh, the total losses due to reduction of sales to ESE are calculated to be K 0.871 million—in other words, marginal.

Transmission and distribution damages are small, about K 1,716 million, and confined to some collapsed transmission towers and distribution poles, distribution lines, and transformers. Most of them were quickly repaired after the disaster, so the losses due to higher production costs and higher system losses are minimal, and for the sake of simplicity will not be calculated in this assessment.

Because the number of houses disconnected was huge, the assessment does look at losses to residential consumers. Data limitations allow estimating only those losses due to using candles for lighting. This estimation is based on information about how many customers were disconnected and for how long, and it makes the following assumptions: (i) each connected household uses 15 kWh/month for lighting at the tariff of K 35/kWh, so one household would spend K 525 a month for lighting by electricity, and (ii) a household disconnected from grid would use candles for lighting at an average monthly cost of K 13,400 per household. This means one connected household would lose about K 12,875 per month. This is a conservative estimate as other types of losses might have occurred, such as lost income of the productive users, or possible elevated system losses, which are not included in this analysis. Thus consumers’ losses are estimated to be about K 348.9 million. Total losses are estimated to be K 612.326 million, as shown in Table 36.

**Table 36.**  
Estimated  
losses  
(million K)

Type of loss	Public	Private	Total
Loss due to sales reduction	0.87		0.87
Loss of hydropower generation	249.89	24.2	274.07
Loss to consumers		337.38	337.38
<b>Total losses</b>	<b>250.764</b>	<b>361.562</b>	<b>612.326</b>

Source: Assessment team.

State/Region	Damages			Losses			Total Damages and Losses		
	Public	Private	Public & Private	Public	Private	Public & Private	Public	Private	Public & Private
<b>Generation</b>									
Chin	2,001.0	562.50	2,563.5	249.89	24.00	274.07	2,250.9	586.7	2,837.6
Rakhine	31.8	n.a	31.8	n.a	n.a	n.a	31.8	0.0	31.8
Sagaing	6.5	n.a	6.5	n.a	n.a	n.a	6.5	0.0	6.5
Magway	560.7	n.a	560.7	n.a	n.a	n.a	560.7	0.0	560.7
<b>Transmission</b>									
Chin	165.5	n.a	165.5	n.a	n.a	n.a	165.5	0.0	165.5
Rakhine	68.1	n.a	68.1	n.a	n.a	n.a	68.1	0.0	68.1
Sagaing	1,206.3	n.a	1,206.3	n.a	n.a	n.a	1,206.3	0.0	1,206.3
Magway	1.6	n.a	1.6	n.a	n.a	n.a	1.6	0.0	1.6
<b>Distribution</b>									
Chin	17.2	n.a	17.2	n.a	n.a	n.a	17.2	0.0	17.2
Rakhine	814.4	n.a	814.4	n.a	n.a	n.a	814.4	0.0	814.4
Sagaing	805.6	n.a	805.6	n.a	n.a	n.a	805.6	0.0	805.6
Magway	41.0	n.a	41.0	n.a	n.a	n.a	41.0	0.0	41.0
<b>Losses by reduction of sale</b>									
Chin	n.a	n.a	n.a	0.04	n.a	0.04	0.0	0.0	0.0
Rakhine	n.a	n.a	n.a	0.39	n.a	0.39	0.4	0.0	0.4
Sagaing	n.a	n.a	n.a	0.13	n.a	0.13	0.1	0.0	0.1
Magway	n.a	n.a	n.a	0.29	n.a	0.29	0.3	0.0	0.3
Ayeyarwady	n.a	n.a	n.a	0.00	n.a	0.00	0.0	0.0	0.0
Bago	n.a	n.a	n.a	0.01	n.a	0.01	0.0	0.0	0.0
<b>Losses to electricity user</b>									
Chin	n.a	n.a	n.a	n.a	37	36.55	0.0	36.6	36.6
Rakhine	n.a	n.a	n.a	n.a	131	130.91	0.0	130.9	130.9
Sagaing	n.a	n.a	n.a	n.a	25	25.18	0.0	25.2	25.2
Magway	n.a	n.a	n.a	n.a	123	122.83	0.0	122.8	122.8
Ayeyarwady	n.a	n.a	n.a	n.a	4	4.27	0.0	4.3	4.3
Bago	n.a	n.a	n.a	n.a	17.64	17.64	0.0	17.64	17.64
<b>Total</b>	<b>5,719.8</b>	<b>562.5</b>	<b>6,282.3</b>	<b>250.8</b>	<b>361.56</b>	<b>612.3</b>	<b>7,412.1</b>	<b>924.1</b>	<b>6,894.6</b>

Source: Assessment team.  
Note: n.a. = not applicable.

**Table 37.**

Summary of damages and losses by state, region, and subsector (million K)

## RECOVERY AND RECONSTRUCTION STRATEGY

As the scope of works is relatively small for each utility, an implementation strategy does not need to be developed. For the private sector, we recommend that the local banks provide the owners of the damaged mini-hydropower units access to borrowings. We also note here that the electricity sector started the inventory and recovery works immediately after the disaster, thanks in part to the experiences gained from Cyclone Nargis in May 2008. To prepare for future events, it is suggested to focus on building resilience through measures indicated under long-term actions. For the private sector, the most serious constraint in recovery and reconstruction are the needed financial resources.

## RECOVERY AND RECONSTRUCTION PLAN

Total funds required for recovering damaged equipment and facilities are estimated at K 6,864.244 million. This includes replacement cost of the Line Bon small hydropower station, estimated at K 1,875 million. The recovery costs for ESE, MEPE, HPE, and the private sector are given in Table 38. Most of the short-term works (taking up to four months) have been finished. Almost all electricity facilities and equipment will be repaired and put back in operation in the medium term (within one year after the disaster). The works will be continued beyond one year to make the system more resilient. As for the private sector, the damaged facilities are of very small capacity and can be reconstructed quickly, assuming the owners have the financial capacity themselves or they can borrow from local banks.

### Short term

- Restore the distribution networks as fast as possible to enable customers to resume their business and to provide energy for residential uses. Timely restoration helps reduce losses for both utilities and customers.
- Inspect the submerged distribution systems, lines, and substations to determine any safety issues, and fix them.
- Replace the submerged meters, and place the new ones in a safe place, above the level of the recent flood.
- Ensure that effective cooking stoves and lighting solutions are provided in the relief package.
- Provide solar lighting solutions in shelters, schools, and WASH (water, sanitation, and hygiene) facilities to help reduce security-related risks.

### Medium term

- Ensure all the impacted customers are reconnected, and check all impacted in-house connection and in-house wiring.
- Ensure all the affected facilities are completely restored with better disaster resilience capacity.
- Develop a guideline/manual for the electricity sector that (i) accounts for risks from geophysical, metrological, hydrological, and climatological hazards to different types of generation, transmission lines, substations, and ancillary equipment; (ii) includes countermeasures for each type of disaster for each subsector; and (iii) includes a plan and resources for recovery.
- Conduct a dam safety program.
- For residential uses, promote the use of one-phase transformers, which could be placed on the top of the poles to minimize the possibility of submerging.
- Strengthen women's participation in the village electricity committees. This will ensure that women have access to information, will involve them in making decisions, and allow them to monitor the implementation of recovery plans at the village level. Consult with women's groups for restoration of energy services.
- Coordinate with international and domestic NGOs in the areas to support village renewable energy programs for affordable solar energy and clean stoves.

### Long term

- Relocate the existing substations to, and construct new substation in, places where ground level is higher than the design flood level.
- Develop electric systems, including all type of generations, transmission lines, substations, and ancillary equipment, with specifications of higher standard for disaster resilience.

Utility	Activity	Short term	Medium	Long term	Total cost (million K)
		(up to 4 months) Cost (million K)	term (up to 12 months) Cost (million K)	(1–3 years) Cost (million K)	
ESE	Reconstruct 11 kV line (12.7 miles)	185.84	n.a	n.a	185.84
	Reconstruct 400 V line (4 miles)	128	n.a	n.a	128
	Reconstruct 11/04 kV substation	10	n.a	n.a	10
	Repair small hydropower stations	17.203	516.002	1.875	2,408.205
	Repair diesel sets	405.084	n.a	n.a	405.084
	Repair office, residential buildings	40.607	31.8	307.68	380.087
	<b>Total required fund for ESE</b>	<b>786.734</b>	<b>547.802</b>	<b>307.675</b>	<b>3,517.216</b>
HPGE	Repair buildings and stores	22.19	282.61	1025	1329.8
	11/0.4 kV lines and transformers	n.a	42.98	87.126	130.106
	Repair diesel set	n.a	10	n.a	10
	Repair peed board	n.a	0.5	n.a	0.5
	Water supply	n.a	73.5	n.a	73.5
	Repair roads	n.a	220.18	209	429.18
	Repair fences	n.a	6.789	15.841	22.63
<b>Total required fund for HPGE</b>	<b>22.19</b>	<b>636.559</b>	<b>1,337</b>	<b>1,995.72</b>	
MEPE	Repair 230 kV towers Ann-Myaukoo-Ponnyagun (3)	175.592	n.a	n.a	175.592
	Repair 230 kV 5 towers Belin-Ohantaw		—	—	—
	Repair 66 kV transmission line	15	n.a	n.a	15
	Repair 66 kV concrete poles (14)	20	n.a	n.a	20
	Repair fencing wall at 230 kV substation	n.a	578.22	n.a	578.22
	Repair 66/11 kV substation equipment/accessories	—	—	—	—
	<b>Total fund required for MEPE</b>	<b>210.592</b>	<b>578.22</b>		<b>788.812</b>
<b>Private mini-hydro</b>	<b>—</b>	<b>—</b>	<b>562.5</b>	<b>562.500</b>	
<b>Grand total required</b>	<b>1,019.516</b>	<b>1,762.581</b>	<b>2,207.175</b>	<b>6,864.244</b>	

**Table 38.**  
Recovery and reconstruction plan for the electricity sector

Source: MOEP.

Note: — = not available ; n.a = not applicable.

## RECOVERY AND RECONSTRUCTION IMPLEMENTATION

Implementation arrangements: Recovery and reconstruction of the damages will be implemented by three entities of the electricity sector, namely the ESE, HPGE, and MEPE. Based on the nature of the damages and the speed of reconnection of the customers, it seems that these three entities have the technical and institutional capacity to recover the damages. Financial capacity of these entities may cause delays in the reconstruction process.

**Gender considerations.** Without access to electricity, the majority of vulnerable households especially women-headed households are still dependent on solid fuels for cooking, and on diesel, candle and kerosene for heating and lighting. The health of women and girls, who are responsible for food preparation, suffers when households without electricity rely on firewood and traditional stoves for cooking. Floods have imposed a heavy burden on women and girls who have less time for

productive activities such as employment, study, and participation in village management because they are responsible for collecting needed firewood and for recharging home solar batteries (which some rural communities have begun to make use of). Women and girls in camps and shelters may also be at increased risk of gender-based violence if limited electricity results in poor lighting. Affordable renewable energy would not only provide a more sustainable source of fuel and help preserve the environment, it would benefit women and girls by guarding against gender-based violence and allowing women and girls to spend more time on productive activities. But renewable energy sources can be introduced only through village development committees—from which women are often excluded.

## **SECTOR ASSESSMENT METHODOLOGY**

Assessment of the damages is based on the actual inventory of damages. The losses are estimated based on actual data, along with certain assumptions.





Women at water pond in Rakhine.  
Photo: © Enlightened Myanmar Research.

## Water and Sanitation

### SUMMARY

**The disaster affected 12 of the 14 states and regions and impacted water, sanitation, and hygiene (WASH) infrastructure, both public and private households.** WASH infrastructure in education and health facilities were also affected. Total disaster effects, including both damages and changes in economic flows, have been estimated at K 58,268 million. The total damage to public water supply infrastructure was K 15,742 million, and damage to vulnerable household sanitation was estimated at K 35,976 million. Damage to WASH in education facilities was estimated at approximately K 6,000 million, and damage to WASH in health facilities was estimated at approximately K 550 million.

For the public water infrastructure, the total needs for recovery and reconstruction incorporating the principles of “build back better” (BBB) and disaster risk management (DRM) are estimated at only K 25,653 million. Although there was considerable loss to public infrastructure, there was more damage to private household water and sanitation infrastructure, and the analysis shows that access to safe water supply and sanitation has been reduced. In order to respond appropriately, the recovery and reconstruction plan will consider the following: improved coordination; information management and enterprise resource planning systems; robust finance mechanisms; best practices in the planning, delivery, and maintenance of infrastructure and services; additional government operational resources; opportunities for South-South learning on subsector implementation and approaches; gender sensitivity and social equitability of service delivery (i.e., a human rights-based approach to ensure all are served).

The WASH sector has recently been restructured and is also in urgent need of comprehensive policies, standards, and regulations. Although recovery activities should be undertaken as soon as practical, this program of work will need to be undertaken over a number of years. The government will need to prioritize acute measures in order to meet interim recovery needs while also developing long-term policies, standards and regulations.

### PRE-DISASTER CONTEXT

Myanmar is administratively divided into seven states, seven regions, and the union territory of Nay Pyi Taw. States and regions are constitutionally equal and are composed of districts, which in turn are composed of townships. Townships comprise urban wards and village tracts (clusters of villages) and play an increasingly important role in public administration, including the coordination and delivery of basic services such as water supply, sanitation, and hygiene promotion.

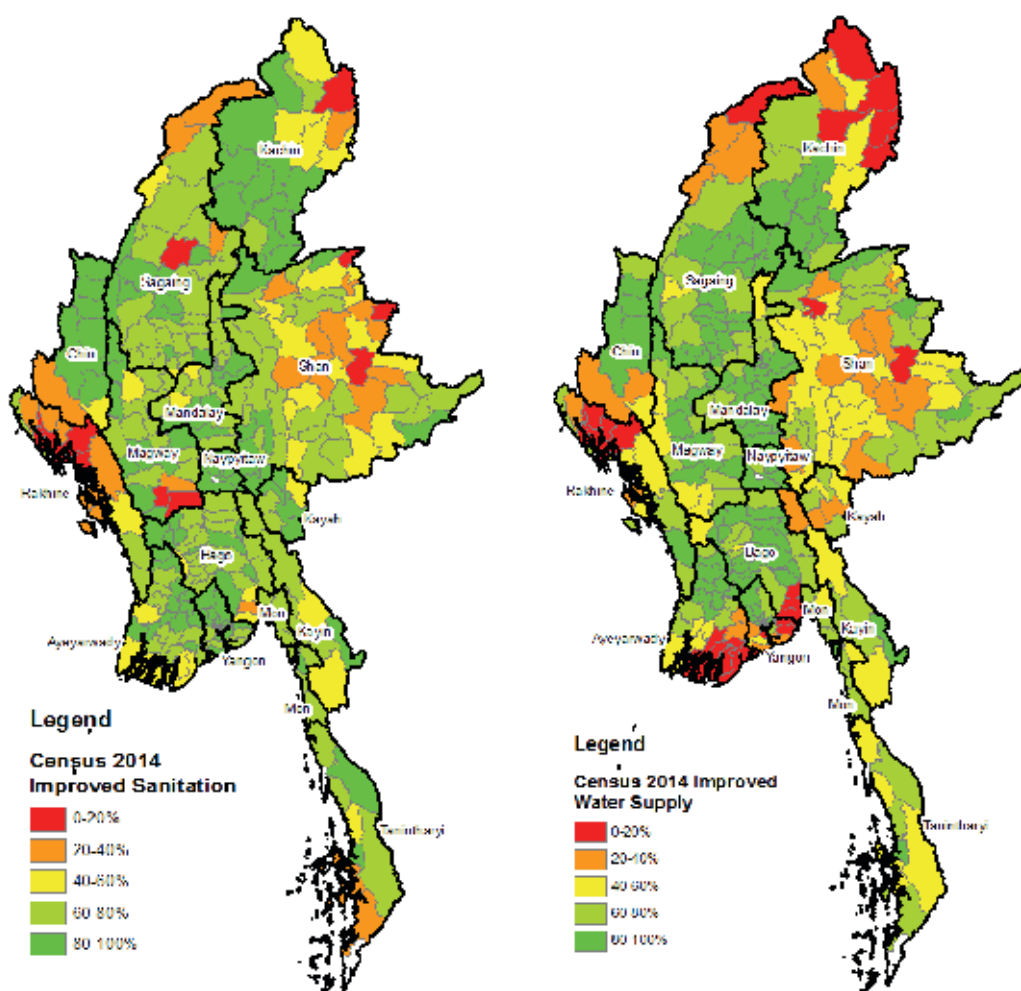
There are many stakeholders involved in the delivery of rural and urban water, sanitation, and solid waste management services in Myanmar. The Township Municipal Committee under the District Municipal Authority (DMA) has a wide range of tasks, duties, powers, and authorities. It oversees and carries out a range of urban infrastructure projects (planning, water, sanitation, drainage, solid waste management, power supply, roads and bridges, etc.). The Department of Rural Development (DRD) under the Ministry of Livestock, Fisheries and Rural Development is the union-level department responsible for rural water supply. The department was newly structured as part of the government of Myanmar’s decentralization reform. In the short term, staffing remains a concern for newly established DRD offices in townships, where a large number of vacancies exist.<sup>77</sup> The Department of Public Health (DPH) under the Ministry of Health is responsible for sanitation and hygiene promotion in both rural and urban areas, although in urban areas the extent of efforts is unclear. Staffing within the DPH is generally increasing in all states and regions. The Department of Basic Education (DBE) and the DPH are responsible for WASH at education facilities and health facilities respectively. The Relief and

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<sup>77</sup> Source data from Worldpop 2015.

Resettlement Department (RRD) under the Ministry of Social Welfare is also relevant to the WASH sector, and although it does not provide direct services, it oversees emergency and humanitarian response activities and NGO coordination.

**Baseline development indicators.** According to the Joint Monitoring Programme (JMP) of UNICEF/WHO, Myanmar has met the Millennium Development Goal targets for both water supply and sanitation (see Figure 33). The launch of the United Nation Global Goals for Sustainable Development in September 2015 has introduced new targets, notably Goal 6, which is to “ensure availability and sustainable management of water and sanitation for all.” The focus shifts from ensuring basic access to providing increasing levels of service through climbing the drinking water and sanitation ladders. Currently there is little information on the functionality of water or sanitation systems throughout the country. Discussions with government counterparts suggested, however, that functionality of systems was low, and that continuity of supply was an issue during the dry season for some shallow well aquifers in the dry zone and some surface water ponds in Rakhine.



**Figure 33.** Township-level baseline development indicators

Source: DOP 2015.

Diarrhea and dysentery are among the six leading causes of mortality and morbidity in Myanmar.<sup>78</sup> The diarrhea morbidity rate in 2011 was 668 per 100,000 population, with mortality of 0.51 per 100,000 population (total deaths 244). In most villages and townships visited during the WASH sector review in 2014, diarrhea was listed as the top one or two causes of morbidity, after acute respiratory infection or snake bite.<sup>79</sup> The Multiple Indicator Cluster Survey found that overall, 6.7 percent of children under five had diarrhea in the two weeks preceding the survey, with the highest prevalence—13.1 percent—in Chin State.

<sup>78</sup> DHP 2013; MOH 2011.

<sup>79</sup> WSP 2015.

Myanmar currently has no national policy specific to water supply or sanitation. However, the country does have an overarching National Water Policy approved by the Cabinet and the National Water Resources Committee (NWRC) chaired by Vice President. In addition there have been a number of recent initiatives in the WASH sector at the policy level. For example, water was included among the high-priority subjects to be addressed by the Framework for Economic and Social Reform and National Comprehensive Development Plan<sup>80</sup> and a national rural WASH strategy and investment plan is now being developed for completion in March 2016. The Myanmar National Water Framework Directive has been drafted with public consultations held between 2014 and 2015 to pave the way for the National Water Law, which is being drafted by the Advisory Group of NWRC with the support of the World Bank and the IFC.

Chronic underinvestment in urban and rural infrastructure for water storage, supply, sanitation, drainage, wastewater, pollution control, and solid waste management has resulted in seriously deficient services throughout Myanmar. This problem has been identified by a number of recent reports, including *Myanmar: Urban Development and Water Sector Assessment, Strategy and Road Map*,<sup>81</sup> *Myanmar Water, Sanitation and Hygiene Sector Situation Analysis Final Report*,<sup>82</sup> and the Myanmar Integrated Water Resources Management Strategy. The Ayeyarwady Integrated River Basin Development Project will identify the immediate-, medium-, and long-term investment opportunities. The national rural WASH strategy and investment plan will aim to identify what capital and recurrent investment is required to meet development targets.

## POST-DISASTER SITUATION

**Infrastructure and assets.** The cyclone, flood, and landslide disaster has had a range of impacts across the 12 affected states and regions. A number of factors, such as different types of infrastructure found in the states and regions and the preexisting levels of access (shown in Table 39), account for the differing impacts. Ayeyarwady and Rakhine mainly rely on surface water ponds, Chin State uses gravity piped water systems, and the drier regions (Magway, Mandalay, Sagaing, and Bago) have a higher percentage of tube wells. Other differences include the various topographic and geologic catchment characteristics, and the duration and intensity of rainfall.

**Table 39.**

Union-level access to sanitation and water supply (percentage)

	Access to sanitation			Access to water supply				
	Urban improved	Rural improved	National improved	National open defecation	Urban total improved	Urban piped on premises	Rural improved	National improved
1990	-	-	-		80	17	48	56
2000	79	54	61	12	85	18	60	67
2010	83	74	77	6	91	18	72	78
2015	84	77	80	4	93	19	74	81

Source: JMP 2015.

Gravity piped water supplies in Chin State experienced localized destruction from substantial landslides. In Rakhine and Ayeyarwady, open surface water collection ponds were contaminated by turbid and pathogen-loaded flood waters. In Rakhine State, storm surges caused saline inundation. The remaining states and regions saw a range of impacts depending on the flood severity. In some high-flow areas, headworks of tube wells were completely destroyed, and unprotected wells were inundated and filled with sediment and debris. Other locations saw steadier floodwater rise and less

<sup>80</sup> MNPED 2014.

<sup>81</sup> ADB 2013.

<sup>82</sup> WSP 2015.

physical damage, although poorly sealed tube wells, some protected wells, many unprotected wells, and both protected and unprotected ponds suffered inundation, resulting in both contamination and sedimentation.

Over 500,000 sanitation facilities were severely affected across the states and regions. Most facilities in rural areas are fly-proof latrines, which are simple raised timber or bamboo huts that have a plastic squat-toilet pan with a straight offset pipe draining into a subsurface soak pit. The pit is usually unlined, making it particularly susceptible to damage during flooding. These latrines are extremely vulnerable to flooding, which not only causes physical damage to the asset but also releases fecal sludge into floodwaters.

**Effects on production/delivery of goods and services and access to services.** The emergency response saw DRD and DPH mobilize quickly and carry out additional operational works, such as dewatering ponds, cleaning and sanitizing wells, and distributing chlorination tablets. These additional activities required an increase in operational expenditure and also caused a few projects to be put on hold. The Township Municipal Committee collects revenue in urban areas through licensing from buildings, street vendors, and slaughterhouses, and from taxes on (for example) water supply, waste and sanitation, and public sanitation tax. In Magway Region, total revenue per capita was estimated in 2015–2016 to be K 12,000 (US\$12).<sup>83</sup> Discussions with the General Administration Department (GAD) at the union level suggested that reduced revenue would be insignificant. It was not possible to collect all the information on lost revenue within the time frame of the assessment, and the government chose to focus on rural WASH.

**Effects on government's functions and systems.** Although the disaster did not have a significant direct impact on government offices and equipment, it did substantially impact government resources. Staff had to leave their daily operations and focus fully on humanitarian response and relief. Both DRD and DPH have invested significant time in coordination meetings with local civil society organizations and the international community to help minimize overlaps and ensure common response activities. This activity is expected to taper off and then end around the start of November 2015.

**Increased risks and vulnerabilities.** Traditionally, women are the main users, and managers of water in households, as well as the guardians of household hygiene. Thus they are the most affected when water systems break down. Compared with urban communities, rural communities are less likely to have convenient access to water supply, so that men and women may spend several hours per day collecting water on foot or with a bullock cart. Water collection comes at the expense of productive activities and contributes to poverty. Poor rural women are least likely to have a convenient toilet facility to use. Note that while women are primarily the water collectors (67 percent), men are nearly universally responsible for latrine maintenance (92 percent).<sup>84</sup>

The combination of flood-affected latrines and increase in open defecation aggravates the risk of diarrheal diseases. Given the destruction of so many sanitation facilities across the 12 affected states and regions, the number of people using the few remaining sanitation facilities has risen. So has the number of those without access to facilities. Inadequate access to safe, hygienic, and private sanitation facilities is a source of shame, physical discomfort, and insecurity for women and girls, particularly those menstruating, pregnant, or lactating. Defunct sanitation systems mean that women and girls have to walk further distances for ablution privacy, thereby putting themselves at increased risk of sexual and gender-based violence. The use of untreated water for cooking and drinking has also increased, and given the poor sanitation conditions, this practice has the potential to increase the spread of vector-borne diseases and further increase the burden of work for women, who are the primary family caregivers.<sup>85</sup>

<sup>83</sup> UNDP 2015.

<sup>84</sup> UNICEF 2011.

<sup>85</sup> Personal communication with UNWOMEN staff, 2015.

The restoration of potable water and sanitation facilities is urgently needed to save lives, prevent the spread of diseases, reduce the burden of work for communities, and lower the risk of gender-based violence. Women have a strong incentive to acquire and maintain improved, conveniently located water facilities, as they and their families benefit most when water quality and quantity improves. Given their long-established and active role in water management, women should play a key role in identifying long-term measures and solutions related to access and use of water sanitation services. Women currently are strongly represented on local water committees, and support for this participation should continue alongside training for women in maintenance and operation of water and sanitation infrastructure.

Pond rehabilitation practices carried out in the aftermath of Cyclone Nargis involved initial pumping out ponds to remove saline water and other contamination. This practice was used following the current disaster but may have resulted in the pumping of water ponds that were not saline or contaminated. With little time left in the wet season to refill ponds, there may be significant delayed effects in February or March due to El Niño–exacerbated drought conditions. Rakhine State has a high percentage of affected ponds and will be particularly vulnerable to these effects.

## ESTIMATED VALUE OF THE EFFECTS AND THE IMPACT OF THE DISASTER ON THE SECTOR

Summary of damages and losses. The assessment separates damage to public community water systems, such as tube wells, protected wells, and ponds, from damage to private latrines and household hand-dug wells. The higher number of sanitation facility damaged is partly due to their higher prevalence (when compared to water sourced as listed above) but also to their increased vulnerability. There was also damage to WASH facilities at over 4,000 education facilities, including severe damage at 213. WASH facilities at 24 medical facilities were also severely damaged (see report chapters on education and health). The total public damages and losses are estimated at K 14,805 million, and K 937 million respective, totaling K 15,742 million (Table 40).

**Table 40.**  
Quantification  
of damages  
and losses  
(million K)

Subsector	Damage			Loss			Total effects		
	Total	Public	Private	Total	Public	Private	Total	Public	Private
Water	14,805	14,805	-	937	937	-	15,742	15,742	-

Source: GAD, Central Statistical Organization, DRD, DPH, UNICEF, Department of Basic Education (DBE).

Note: There were no private damages and losses recorded.

There was significant damage in the Ayeyarwady Region, due predominantly to the large population (see Figure 34) and the vulnerability of communities living on the floodplain delta. Rakhine was also hard hit; given its low baseline of water and sanitation coverage, it accounts for a significant percentage of damage and reduction in access to water and sanitation services. The geographic breakdown of damages and losses is included in Table 41.

**Figure 34.**

Population density of Myanmar in 2015



Source: Worldpop 2015. Licensed under the Creative Commons Attribution 4.0 International License <https://creativecommons.org/licenses/by/4.0/>.

**Impact on sector development goals.** Estimates based on the GAD damage assessments show a significant decrease in access to improved water and sanitation in a number of states and regions (Table 42). It is important to understand the context of the percentage decrease in pre and post-access levels to water and sanitation infrastructure. For example, even though Rakhine registered only 8 percent reduction in access to safe sanitation, the low pre-disaster access level (34 percent) means this state is potentially more vulnerable than another region, such as Bago region, which saw a higher damage but within a relatively high levels of access post flood. At the same time, Ayeyarwady shows similar damage percentage to Bago but higher actual sanitation facility damage. Overall, Rakhine suffered significantly with low baseline access before the disaster, and its internally displaced persons (IDPs) are the most vulnerable segment of the population. Temporary water supply, sanitation and hygiene facilities within IDP camps have been significantly damaged by cyclonic winds, increasing vulnerability and exposing the population to further risks.

**Table 41.**

Geographic distribution of damage and losses (million K)

State/Region	Damage			Loss			Damage and losses		
	Total	Public	Private	Total	Public	Private	Total	Public	Private
Ayeyarwady	4,370	4,370	-	-	-	-	4,370	4,370	-
Bago	2,418	2,418	-	17	17	-	2,435	2,435	-
Chin	517	517	-	98	98	-	614	614	-
Kachin	54	54	-	-	-	-	54	54	-
Kayah	-	-	-	-	-	-	-	-	-
Kayin	3	3	-	-	-	-	3	3	-
Magway	1,784	1,784	-	17	17	-	1,801	1,801	-
Mandalay	55	55	-	24	24	-	80	80	-
Mon	8	8	-	-	-	-	8	8	-
Nay Pyi Taw	-	-	-	-	-	-	-	-	-
Rakhine	4,042	4,042	-	585	585	-	4,627	4,627	-
Sagaing	1,290	1,290	-	196	196	-	1,486	1,486	-
Shan	7	7	-	-	-	-	7	7	-
Tanintharyi	-	-	-	-	-	-	-	-	-
Yangon	258	258	-	-	-	-	258	258	-
<b>Grand total</b>	<b>14,805</b>	<b>14,805</b>	<b>-</b>	<b>937</b>	<b>937</b>	<b>-</b>	<b>15,742</b>	<b>15,742</b>	<b>-</b>

Sources: GAD, Central Statistical Organization, DRD, DPH, UNICEF, DBE.

Note: There were no private damages and losses recorded. Geographic distribution does not include WASH in the health, education, and housing sectors; for that information, please refer to respective chapters of this report.

**Table 42.**

Change in access levels to improved water and sanitation in the affected townships

State/Region	Households in affected townships	Baseline improved sanitation	Estimated post-disaster improved sanitation	Estimated percentage reduction	Estimated affected households	Baseline improved water	Estimated post-disaster improved water	Estimated percentage reduction	Estimated affected households
Rakhine	346,713	34%	26%	8%	28,801	40%	33%	7%	25,882
Bago	630,849	73%	51%	22%	140,010	74%	56%	18%	113,520
Magway	570,287	68%	52%	16%	90,066	75%	60%	15%	85,218
Ayeyarwady	1,091,730	79%	58%	21%	224,906	65%	45%	20%	214,945
Shan	81,779	62%	61%	1%	1,248	58%	57%	0%	545
Chin	81,339	77%	63%	14%	11,644	69%	57%	13%	10,469
Sagaing	694,146	74%	64%	11%	73,322	79%	69%	9%	65,462
Mandalay	269,586	69%	68%	1%	2,292	74%	73%	1%	2,614
Kayin	148,819	69%	69%	0%	273	62%	61%	0%	259
Mon	125,603	74%	73%	1%	1,092	58%	57%	1%	715
Yangon	170,397	90%	81%	8%	14,446	89%	82%	8%	13,122
Kachin	125,313	91%	89%	1%	1,748	81%	80%	1%	1,276

Sources: GAD, Department of Population, UNICEF.

## RECOVERY AND RECONSTRUCTION STRATEGY

The current WASH sector is relatively new; DRD was formed in late 2013, and DPH and DBE were formed in 2015 after considerable restructuring of their respected ministries. Currently, the roles, responsibilities, and accountabilities in the WASH sector are poorly understood. There is evidence of duplication of activities in some areas, and gaps in others. This need for **improved coordination**, which existed before the disaster, can be addressed by using recovery and reconstruction efforts as a catalyst to change. RRD is the focal lead for emergencies, although in practice there has yet to be coordination between the ministries. We advise that the current WASH sector reform being undertaken by the government consider emergency response alongside broader reform objectives. RRD's lead role in emergency response should be reinforced and appropriate mechanisms established so that



RRD can operationalize its new responsibilities under the disaster management law (in effect as of July 2015).

In an emergency, the quality and availability of information are very important for decision making and coordinated response. Existing **information management and enterprise resource planning systems** need to be modernized so they can collect, manage, and analyze WASH sector data. There are many reliable software packages available that can provide this functionality in one unified system. Improving information management will not only increase institutional capacity for emergency response and recovery but will also support the planning, delivery, and evaluation of the WASH program.

A key observation during the disaster response concerns the inadequacy of the financial system to quickly disperse funds. Although emergency funds were available to be released for emergency relief, the current system could not get the funds to the state and township level for a number of weeks or (in the case of DPH) even months. A **robust finance mechanism** that allows for prepositioning of funds and rapid reallocation should be investigated.

It is clear that **best practices in the planning, delivery, and maintenance of infrastructure and services** have not been identified and taken to scale. This failure will impact on recovery and rehabilitation response; existing systems are struggling to manage the required work inflow. Preexisting human resource constraints impede management of current development programs within the government. These constraints mean that recovery and rehabilitation programs will require **additional government operational resources** to ensure that normal development objectives are not significantly affected.

The region also provides many **opportunities for South-South learning on subsector implementation and approaches**. A range of learning methods is available, including benchmarking with other countries in the region, study tours, workshops, and twinning arrangements.

Finally, this recommended recovery and reconstruction **strategy should be reviewed and evaluated** against the current work being done on the national rural WASH strategy and investment plan. Consideration should also be given to how this crisis can feed into the long-term development of comprehensive policies, standards, regulations, and governance.

## RECOVERY AND RECONSTRUCTION PLAN

The recovery and reconstruction needs presented here are for the public water supply systems only. The needs for sanitation have been included in the housing sector. However, this plan allows for the review of sanitation programming and for scaling up implementation in line with the housing recovery. WASH needs for education and health have been included in their respective sections. Coordination and long-term WASH sector development that incorporates WASH in institutions and sanitation programming have been included in Table 43.

**Short term.** Immediate humanitarian relief activities were carried out swiftly by government departments from July to October. These activities ensured dignified access to safe and appropriate WASH services to the most-affected communities. The government and partners have cleaned and chlorinated some 137,188 water sources and distributed 19,700 latrine pans to the most affected.<sup>86</sup> There has been limited increase in diarrheal disease. These activities are now coming to a close and the focus is moving to medium-term activities.

<sup>86</sup> Government of Myanmar 2015.

**Table 43.**

Recovery and reconstruction needs (million K)

Sector	Activity	Value	Outcomes	Responsible agency
<b>Short term ( financial year 2016)</b>				
Humanitarian relief	Provide the most vulnerable displaced and disaster-affected women, girls, men, and boys with timely and dignified access to safe and appropriate WASH services, including for schools and health centers	1,069	<ul style="list-style-type: none"> <li>Number of households regaining access to sanitation, water supply, and handwashing facilities</li> <li>Number of institutions regaining access to sanitation, water supply, and handwashing facilities</li> <li>No observed increase in diarrheal disease</li> </ul>	DRD, DPH, DMA, RRD
Subtotal		1,069		
<b>Medium term (financial year 2017 and beyond)</b>				
Water supply	Rehabilitate damaged water systems in communities using a BBB approach to reduce disaster risk	16,679	<ul style="list-style-type: none"> <li>Number of households with access to water supply systems</li> </ul>	DRD,DPH, DBE, DMA
Sanitation	Review the sustainability of rural sanitation programming and consider the implications of going to scale in line with housing recovery	625	<ul style="list-style-type: none"> <li>Number of households with access to sanitation and hand washing facilities</li> <li>National sanitation program adopted by all stakeholders</li> </ul>	DPH lead
Water quality	Ensure that water-safety planning approaches are integrated into development of new and rehabilitated water supplies	250	<ul style="list-style-type: none"> <li>Number of communities with water safety plans</li> </ul>	DPH lead
DRM, sector development	Build comprehensive policies, standards, and regulations for water and sanitation services	5,000	<ul style="list-style-type: none"> <li>National Rural WASH policy adopted (2018)</li> <li>Biannual governance report</li> </ul>	DRD,DPH, DMA, DBE, RRD, DPH
Governance	Develop and ensure establishment of robust compliance monitoring systems	2,000		
<b>Subtotal</b>		<b>24,554</b>		
<b>TOTAL</b>		<b>25,623</b>		

Sources: DRD, DPH, DBE, UNICEF.

**Medium and long term.** The WASH sector in Myanmar has recently undergone major changes, including the recent creation of DRD and DPH. The sector is undertaking a rural WASH strategy and investment planning process (October–March 2016) that aims to address many of the needs identified above. The sector is beginning to plan for mid-term recovery and rehabilitation activities, but there is currently a **limited budget** for the mid-term recovery and rehabilitation activities identified. This funding gap has resulted in planning priorities shifting back to normal annual work plans which already have allocated budgets.

## RECOVERY AND RECONSTRUCTION IMPLEMENTATION

The implications of budget constraints on recovery efforts should be further evaluated. One possibility is to reallocate some of the yearly budget to the worst-hit townships, re-prioritizing the annual plans. How the budget would be reallocated and prioritized is unclear, however, given the absence of clear policies in place historically. The WASH sector will need to address this issue in order to ensure that the president's directive—"no one left behind"—is realized.

Moving forward, two options for planning and governance are possible. One option would be for RRD to lead the WASH sector recovery and rehabilitation, although in this role it would need to increase its financial capacity and boost its human resources and convening power. The second option would involve forming a committee that included the WASH sector partners—representatives from RRD, DPH, DBE, DRD and potentially DMA. The committee would be responsible for recovery and rehabilitation and provide high-level oversight. The government will need to decide on the appropriate mechanism for sector leadership. The Government and the development partners will need to take into account the need to gradually mainstream recovery activities into ongoing reforms and development work. In line with this, too many separate structures are not advisable especially where there is no clear cut demarcation between recovery and development.

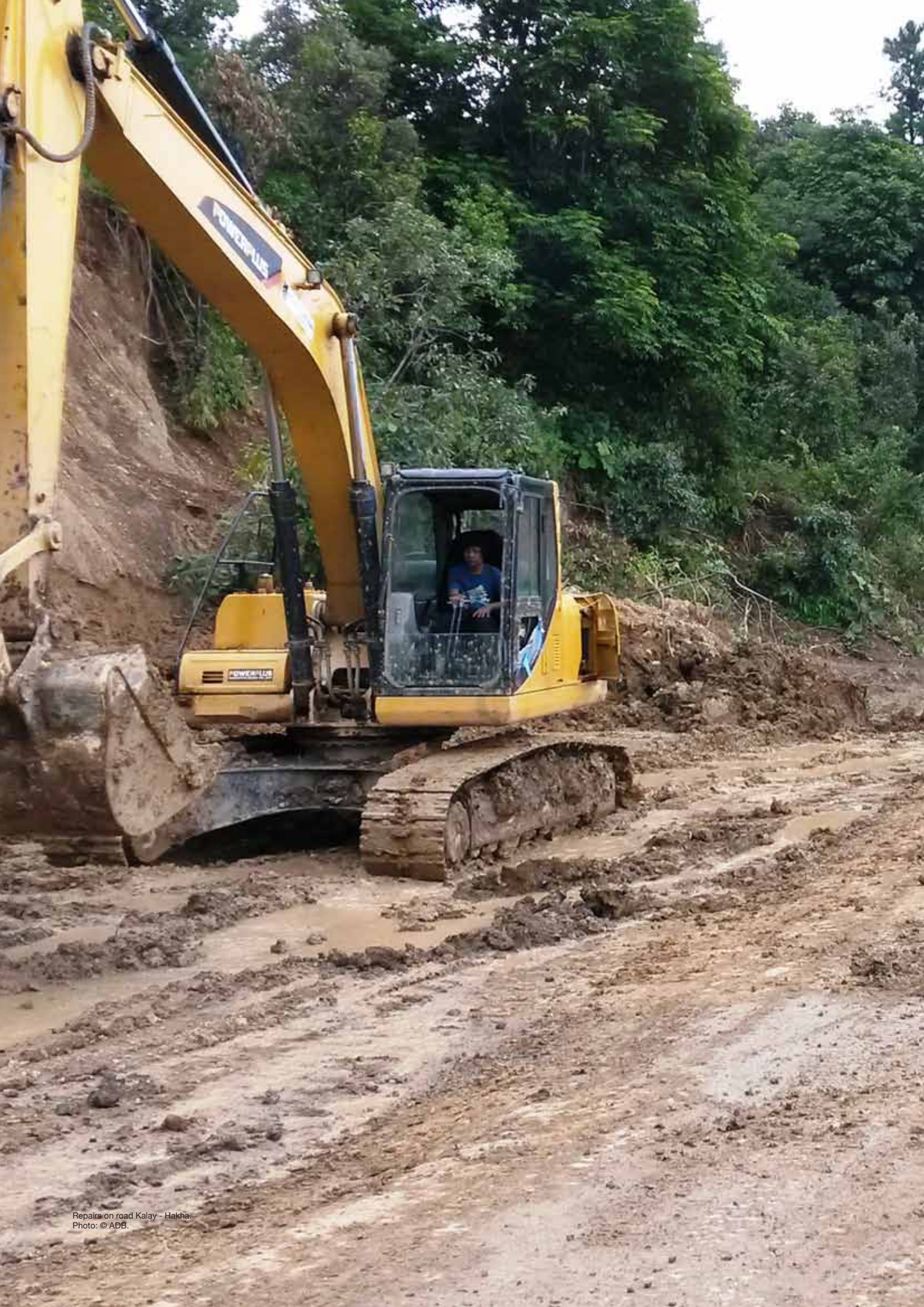
There also needs to be a decision about who will provide the technical oversight for implementation across the WASH sector. Currently DRD is responsible for water supply infrastructure, DPH is responsible for sanitation and hygiene and for WASH facilities in health institutions, and DBE is responsible for WASH facilities in education institutions. We recommend adopting a standard approach to implementation across the sectors. Risk reduction should be pursued through "building back better" and following disaster/climate resilience principles, which includes undertaking risk assessments, using resilient infrastructure, and mainstreaming disaster risk reduction in WASH policies and plans. Roles, responsibilities, and leadership related to technical oversight across the sector partners will need to be clarified. Clarification is also needed to determine who will provide the monitoring and evaluation of recovery and relief efforts.

The newly structured WASH sector is in urgent need of comprehensive policies, standards, and regulations. These recovery activities should be undertaken as soon as practical, although this program of work will need to be undertaken over a number of years. The government will need to prioritize acute measures in order to meet interim recovery needs while also developing long-term policies.

## SECTOR ASSESSMENT METHODOLOGY

To ensure compliance with the assessment methodology, including recognition of sectoral boundaries as defined in the national accounts, the summary tables of WASH damage and losses refer only to water supply infrastructure. WASH damages and losses in housing units are referred to in the housing sector chapter; WASH damages and losses in education facilities are referred to in the education sector chapter; and WASH damages and losses in health facilities are referred to in the health sector chapter.

Assessment data were received from multiple sources, including GAD, DRD, DPH, UNICEF, DBE, Department of Population, and UN Women. These data were used to extrapolate damage to assets listed in the census, based on household distribution ratios agreed on in consultation with DRD and DPH. An agreed unit cost was then applied to each unit in proportion to its damage (for destroyed, 100 percent of unit cost; for damaged, 30 percent of unit cost; and for flooded, 10 percent of unit cost). Losses reflect actual reported additional operational expenditures. Needs reflect actual damages and losses and include allowance for building back better and more resilient materials and technology. Needs also include the soft program inputs that promote best practices in disaster risk reduction.



Repairs on road Kalay - Hakha.  
Photo: © ADB.

## Transport

### SUMMARY

Transport infrastructure throughout Myanmar suffered extensive physical damage as a result of the July 2015 flooding and landslides. Total damage and losses in the transport sector constitute 3 percent of the effects suffered across all sectors. The majority of damage occurred in the west of the country, particularly Chin, Sagaing, Rakhine, Bago, and Magway States. Immediate effects in the transport sector included the following: (i) severance of road and rail transportation links, (ii) disruption of market access, particularly between the south and north of the country, and (iii) loss of access in urban and especially rural communities to social facilities such as health and education. The most common damages were flooded pavement, failure or blockage of road formations due to landslides, damage to railway embankments, and destruction of bridge and culvert structures, including approaches. Losses in the sector resulted from increased travel distance required due to loss of highway connections, as well as lost passenger revenue on the rail network. With the exception of damage to a small number of private boats, no damage and losses were reported in the maritime and aviation subsectors. Reconstruction efforts will involve completing temporary repairs to damaged infrastructure over the short term. Permanent repairs will be completed over the medium term, with long-term recovery involving a program of upgrading key routes to improve resilience, particularly in Chin state. Where possible, works will be informed by more resilient design and construction standards.

### PRE-DISASTER CONTEXT

Given the current poor state of access and mobility in Myanmar, the transport sector is of critical importance to the country's economic and social development. Currently, 40 percent of Myanmar's population (some 20 million people) live in villages without access to the most basic of transport links: an all-season road. This isolation means limited access to markets and employment opportunities. Without transportation links, agricultural productivity remains low, while access to health and education services is limited. Poor access also has effects on traders and market sellers (both men and women).

The passenger and freight volumes carried by road, railway, river, and air are provided in Table 44. The vast majority of freight and passengers are carried by road. Railway, river, and air carry far fewer people, but they still play an important part in Myanmar's multimodal network (Table 44).

Transport mode	Freight (million ton-km)	Passengers (million passenger-km)
Road	69.7	59.9
Railway	4.8	13.5
River	6.0	1.3
Air	Negligible	2.2

Source: MOT 2014.

**Table 44.**

Summary of annual domestic passenger and freight volumes by transport mode, 2013

Myanmar's public road network comprises 157,059 km across 14 states, with 34,724 km (22 percent) paved. Road access is highest in Yangon, Mandalay, and Magway, where a mere 3 percent of rural residents are without access, while in Rakhine and Kayin, 59 percent of rural residents are not connected. The network includes 39,702 km of highways, expressways, state roads, and regional roads administered by the Ministry of Construction (MOC). A further 18,499 km of urban roads are managed by city and township development committees, while 83,665 km of rural roads fall under the responsibility of the Department of Rural Development (DRD) under the Ministry of Livestock, Fisheries and Rural Development and the Ministry of Border Affairs (MBA). Myanmar is also rapidly motorizing; it had 4.9 million road vehicles in 2014, compared to 1 million in 2004.

The rail network in Myanmar consists of 5,934 km of track, with 83 km of the network in urban areas. Operated by Myanmar Railways (MR) under the Ministry of Rail Transportation (MORT), the most trafficked lines are Yangon-Mandalay and Mandalay-Myitkyina, which together carry 20 percent of the passenger traffic. Rolling stock consists of 231 operational locomotives, 1,349 passenger coaches, and 3,377 freight wagons.

River transport is a vital link for the communities adjacent to the Ayeyarwady River, which flows from the north of Myanmar to the Andaman Sea in the south. Inland Waterway Transport owns 413 ships, including 255 powered vessels, 148 nonpowered vessels, and 39 stationed pontoons.

Air transportation also plays an important role in Myanmar, especially in providing access to remote communities not well served by other modes. There are international airports in Yangon, Nay Pyi Taw, and Mandalay, as well as 30 domestic airports throughout the country. Nine airlines using a combined fleet of 42 aircraft provide service for passengers and meet a small air-freight demand.

## POST-DISASTER SITUATION

### **Myanmar's transport infrastructure was extensively damaged by the flooding and landslides.**

Access to essential services in large towns and state capitals was cut off as a result of the flooding and landslides, with destroyed bridges blocking access to even the most basic mode of transport—foot traffic. Some highways were closed for more than 50 days, and the accessibility that was restored remains very vulnerable to future heavy rain or earthquakes. The lack of access on the rural road network also restricts the delivery of emergency supplies, and will continue to hamper recovery efforts for the most-affected communities. While all main road and rail links are now operational, disruptions to rail and road transport will likely continue because of network limitations, such as weight limits on damaged bridges and poor surface condition of roads. These disruptions will remain until short-term recovery works can be completed, ideally prior to the start of the next monsoon season in May 2016.

**Increased risk and vulnerability.** Road and rail infrastructure will remain vulnerable to further damage and total failure until permanent repair works can be completed. The Chin State road links of Hakha-Gangaw and Kalay-Hakha (Figure 35) as well as Kalewa-Monywa and Kawlin-Kyunhla in Sagaing all remain particularly vulnerable. While there is no immediate threat from the monsoon rainfalls, further storms could re-sever links on the vulnerable road and rail network. Saturated soils in hilly areas are also vulnerable to earthquake-induced slope failures, so seismic risks to transport infrastructure are elevated until permanent repairs can be made. The development and implementation of revised design and construction standards as part of the recovery plan will address some of these risks.

## ESTIMATED VALUE OF THE EFFECTS AND THE IMPACT OF THE DISASTER ON THE SECTOR

Table 45 summarizes the cost of damages to transport infrastructure by subsector, as well as the value of losses incurred by flooding and landslides (as of October 5, 2015). Table 46 provides the distribution of damage and losses by state. Chin is the most affected state, with K 27.5 billion of total effects.

**Damages to the transport sector.** Damage to roads resulted from inundated pavements and washouts of bridges and culverts, including approaches. Thirty-two key highway links were temporarily severed in seven states, though all highway connections had been repaired (with commendable speed) by late September. Most damage occurred in the western state of Chin, where numerous landslides destroyed the formation of roads passing through this states' hilly terrain (Figure 35). Railway line embankments were also severely eroded by floodwaters (Figure 36). Bridge piers, abutments, approaches, and superstructures were destroyed by high water levels on floodplains (Figure 37). Delayed effects of this inundation will likely include the premature failure of saturated road pavements. Table 45 and Table 46 capture transport infrastructure managed by MOC and DRD and include estimates for MBA. Replacement costs assume force account is used for the replacement works by MOC, with contracting out by DRD, MR, and MBA.<sup>87</sup> The damages determined are very low by international standards, in part because of the low unit rates inherent in Myanmar, and in part because of the low standards of construction. Construction standards will be improved as part of the proposed reconstruction strategy.



**Figure 35.**  
Road formation failure on Kalay-Falam-Hakha road in the Chin State

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<sup>87</sup> The damage to the rural road network managed by MBA was estimated by taking the ratio of damaged roads to total network for DRD roads and applying it to MBA's assumed network for the border states in which it operates.

**Figure 36.**  
Embankment  
failure on  
Pinwae-Mawlu  
line



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**Figure 37.**  
Bridge failure  
on Hmantaw-  
Sedaw line



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**Losses to the transport sector.** The losses in the transport sector are also summarized in Table 45 and Table 46. Using the best available information, the loss assessment was limited to the higher user costs associated with detours and poor condition of roads, as well as the lost profit on the affected Myanmar Railway lines. Losses for roads were calculated by considering the additional vehicle operating costs across 16 key highway links assuming these costs were borne by private vehicle operators. Calculations included costs resulting from the extra distance required to follow detours during initial closure, as well as marginal costs due rougher road condition on the original route after temporary (and prior to permanent) repair. Rail losses were estimated from the lost passenger profit



on Myanmar Railway lines, with the bulk of the losses coming on the Mandalay-Myitkyina line. These losses were minor compared with those in the road sector, being equivalent to approximately 1 percent of road losses.

Sector	Damage			Loss			Total effects		
	Value	Public	Private	Value	Public	Private	Value	Public	Private
Road	69,823	69,741	82	8,433	0	8,433	78,256	69,741	8,515
Rail	6,302	6,302	0	80	80	0	6,382	6,382	0
River	50	0	50	0	0	0	50	0	50
<b>Total</b>	<b>76,175</b>	<b>76,043</b>	<b>132</b>	<b>8,513</b>	<b>80</b>	<b>8,433</b>	<b>84,688</b>	<b>76,123</b>	<b>8,565</b>
Yangon	258	258	-	-	-	-	258	258	-

Source: MOC, MORT, DRD, Asian Development Bank.

**Table 45.**

Quantification of damages and losses in transport sector (million K)

State/Region	Damage			Loss			Total effects		
	Value	Public	Private	Value	Public	Private	Value	Public	Private
Ayeyarwady	2,043	1,980	63	4	4	0	2,047	1,984	63
Bago	2,870	2,870	0	3,553	0	3,552	6,423	2,870	3,552
Chin	26,369	26,369	0	1,093	2	1,092	27,462	26,370	1,092
Kachin	3,436	3,436	0	0	0	0	3,436	3,436	0
Karen	243	243	0	0	0	0	243	243	0
Kayin	41	41	0	0	0	0	41	41	0
Magway	5,446	5,425	21	2,711	0	2,711	8,158	5,425	2,732
Mandalay	1,710	1,710	0	0	0	0	1,710	1,710	0
Mon	220	220	0	0	0	0	220	220	0
Rakhine	9,721	9,721	0	260	0	260	9,981	9,721	260
Sagaing	19,740	19,740	0	890	73	817	20,630	19,813	817
Shan	3,894	3,846	48	1	1	0	3,894	3,846	48
Tanintharyi	100	100	0	0	0	0	100	100	0
Yangon	342	342	0	0	0	0	342	342	0
<b>Total</b>	<b>76,175</b>	<b>76,043</b>	<b>132</b>	<b>8,513</b>	<b>80</b>	<b>8,433</b>	<b>84,688</b>	<b>76,123</b>	<b>8,565</b>

Source: MOC, MORT, DRD, Asian Development Bank.

**Table 46.**

Distribution of damage and loss in transport sector (million K)

## RECOVERY AND RECONSTRUCTION STRATEGY

**The government's recovery priority for the transport sector is to complete repairs on highway roads and bridges and to restore rural accessibility through repair of roads and bridges.** The disaster has worsened the normally poor accessibility in rural areas and has resulted in even longer travel times for vulnerable rural populations. Restoration of connectivity to essential services (such as hospitals, schools, and markets) and to the main commercial centers will benefit the entire population but particularly those in isolated rural communities.

**Impact on sector development objectives.** According to the National Transport Development Plan, the strategic goal of Myanmar's transport sector is to create a sustainable, economical, and efficient sector that ensures the easy flow of goods and services while attracting new commerce and industry. Although the effects of the flooding and landslides are a setback for the sector, the damage to key transport routes, including the central north-south route, has been minimal. With some of the most damaged networks spreading across underdeveloped or proposed corridors, especially in the west, the reconstruction presents an opportunity to improve the standard of these links and prioritize them as suggested in the National Transport Development Plan.

## RECOVERY AND RECONSTRUCTION PLAN

Table 47 shows short-, medium-, and long-term recovery needs in the transport sector, and provides an overview of recovery initiatives, the time frames involved, and estimated costs. In addition to discussions with the government, the recovery planning was informed by the Asian Development Bank (ADB) based on its comprehensive understanding of the sector. ADB transport team's estimates of need were used as a basis for the below recovery plan.

**Short-term recovery needs.** The immediate needs include the completion of temporary repairs to the highway roads and bridges and railways. These repairs are likely to be government funded, and are well under way. The MOC has already made temporary repairs to 96 of the 98 damaged highway bridges. While the works by DRD and MBA on rural roads are also under way, these entities do not have the in-house capacity for repairs and depend on contractors to carry out works. These works will therefore take longer to procure and will require additional resources compared with the force account of MOC. Despite these difficulties, the government plans to complete these permanent repairs to the rural network within the medium term.

**Medium-term recovery needs.** Medium-term needs involve completion of the permanent infrastructure repairs for highways, rural roads, railways and bridges. These needs are partially covered by the current government budgets, with unfinanced permanent repair works as a priority for donor assistance.

**Long-term recovery needs.** Long-term needs include a program of upgrading key routes to improve network resilience and address weakness which emerged during landslides and flooding. In some places this may be limited to providing additional cross drainage, while in others more comprehensive improvements will be required. Based on the recovery plans discussed with the government, several larger initiatives have been proposed in Chin State including upgrading the Hakha-Gangaw, Kalay-Falam-Hakha and Kalewa-Tamu roads. No comprehensive feasibility studies have been undertaken for these initiatives and hence the scope of investment should be subject to a viability analysis. Any works will also need to be considered as part of the broader sector development strategy which goes beyond the scope of this report. Current government budgets cannot fund the standard of infrastructure proposed so that donor support will need to be explored. Any works should be reconstructed to highly resilient standards, for example, slope protection works and retaining walls for mountainous roads, high-level reinforced concrete bridges in place of wooden and bailey structures, and armoring of embankments and approaches to prevent undermining in future flood events.

The need to incorporate more resilience in the design—taking a “build back better” approach—means that reconstruction needs over the medium and long term are significantly higher than they would be otherwise, with permanent repair estimates including an allowance of 30 percent to reflect this approach. Additional funding will therefore be required beyond that already provided if the government is to adopt a build back better approach to recovery.

Given Myanmar's exposure to significant disaster risk, replacement transport infrastructure should use sound engineering design that will enhance resilience to natural hazards. Updated design and construction standards are required for various purposes. For example, they will provide guidance on soil-retaining structures; ensure more extensive drainage; add armoring to embankments, bridge abutments, and approaches; and increase design levels and freeboard for bridges. Preparation of updated design and construction standards should therefore be undertaken as part of the government's disaster response.

The losses incurred by private vehicle operators due to higher operating costs, which could stretch some business or individuals financially, and are considered part of the broader economic impact of the disaster. The losses incurred by Myanmar Railways are unlikely to be recovered through normal operations, and the enterprise may need supplementary budget support.

<b>Short term: Recovery</b>			
<b>Subsector</b>	<b>Program of activity</b>	<b>Value</b>	<b>Agency</b>
Highways, state/ regional roads and bridges	Temporary repairs	5,489	MOC
Railways	Temporary repairs of bridges, embankments and buildings	1,064	MR/MOT
Subtotal		6,553	
<b>Medium term: Improvement of resilience</b>			
Subsector	Program of activity	Estimated value	Agency
Highways, state/ regional roads and bridges	Permanent repairs to replacement standards	33,030	MOC
Rural roads and bridges	Permanent repairs to replacement standards	40,616	DRD/MBA
Railways	Permanent repairs to replacement standards	6,809	MR/MOT
Subtotal		80,456	
<b>Long term: Improvement of resilience</b>			
Subsector	Program of activity	Estimated value	Agency
Highways, state/ regional roads and bridges	Upgrading of affected network to resilient engineered standards	25,764	MOC
Rural roads and bridges	Upgrading of affected network to resilient engineered standards	31,680	DRD/MBA
Railways	Upgrading of affected network to resilient engineered standards	5,311	MR/MOT
Subtotal		62,755	
<b>Total</b>		<b>149,764.0</b>	

**Table 47.**

Recovery and reconstruction needs for transport sector (million K)

Source: Assessment team.

## RECOVERY AND RECONSTRUCTION IMPLEMENTATION

Each responsible ministry and department (Rail Transportation, Construction, Border Affairs, and Department of Rural Development) will lead the implementation of the recovery across its own subsectors. MOC will play a coordinating role and provide technical advice and support where required, given its depth in construction and project management. One expected challenge will be the ability of MR, DRD, and MBA to mobilize the private contractors needed to implement their recovery strategy, in the short, medium, and long term. Where possible these bodies should call upon support from MOC to ensure recovery targets are met.

Gender and community considerations for recovery strategy. Where possible, recovery works through either force account or private contractors will make use of local labor. Labor-based methods are the industry standard for civil construction works across Myanmar, and this practice should continue for the recovery. With the loss of income from agriculture during floods, cash for work programs can mobilize labor from local communities to rehabilitate or rebuild infrastructure and provide opportunities to earn much-needed income.

Reconstruction of transport infrastructure should consider the safety of local communities, especially for women and vulnerable groups such as the elderly, disabled, and children. Wherever possible, road safety features (such as signage, footpaths, pedestrian crossings, and lighting) should be incorporated. Currently, employment in civil works projects is common for women, particularly in rural areas during the farm off-season. For any reconstruction works, the government should consider the following:

- Organizing consultations with local communities to understand their needs
- Including safety features where possible, especially for women and vulnerable groups
- Using community-based labor to provide much-needed employment for affected populations
- Ensuring that employment processes offer women the same opportunity as men to receive information about hiring, and that equal pay for equal work is provided
- Where relevant, encouraging private contractors to hire labor from local communities, and ensuring that equal pay for equal work is provided

## SECTOR ASSESSMENT METHODOLOGY

The cost of damage was considered as the replacement cost of infrastructure (that is, the cost of bringing infrastructure to pre-disaster levels). Data for this assessment of damage, loss, and needs were compiled from a range of sources. Given ADB engagement in the transport sector, we relied heavily on its flood damage assessment for trunk and rural roads and bridges as well as railways. We also called on ADB's sector specialists to verify assessments and provide guidance on country context. ADB's figures were checked against damage reports from government ministries and were found to be the most accurate. A challenge which remains is to link the damage costs indicated with physical quantities, including kilometers of road (if possible by type, whether highway or rural road), as well as length in meters, number, and type of bridges. While some of this information is available, a detailed understanding of quantities for the transport sector is incomplete at the time of this report. The Ministry of Construction was consulted for the recovery plan and helped determine estimates of needs for more resilient infrastructure. Due to time limitations, no field visits could be conducted. Assessment of transport sector damage and losses was coordinated with other sectors, including water resources and agriculture, to ensure against double counting.

## Communications

### SUMMARY

Myanmar's communications sector faced significant damage—most notably to telecommunication networks, postal services, and government offices—in the regions affected by the floods and landslides. The total damage and losses in economic flows are estimated at K 1,246.85 million and K 1,243.97 million, respectively. The estimated cost of recovery and reconstruction is estimated at K 106,287.68 million. In the near term, communications infrastructure in the affected states and regions will be rehabilitated as quickly as possible using available financial resources. Efforts will be financed by the operators and coordinated by the Ministry of Communications and Information Technology (MCIT) and its Post and Telecommunications Department (PTD) in close cooperation with Myanmar Posts and Telecommunications (MPT), private operators, and Myanmar Posts. The long-term recovery goal for the communications sector is to rebuild and establish a future-proof communications infrastructure and services sector that will serve the needs of a digital Myanmar. In line with this vision, the approach to reconstruction should ensure increased investments in the telecommunications sector and the establishment of a resilient public service broadcast sector. In this way, Myanmar will be able to take advantage of the opportunities provided by technological developments in the information and communication technology (ICT) sector.

### PRE-DISASTER CONTEXT

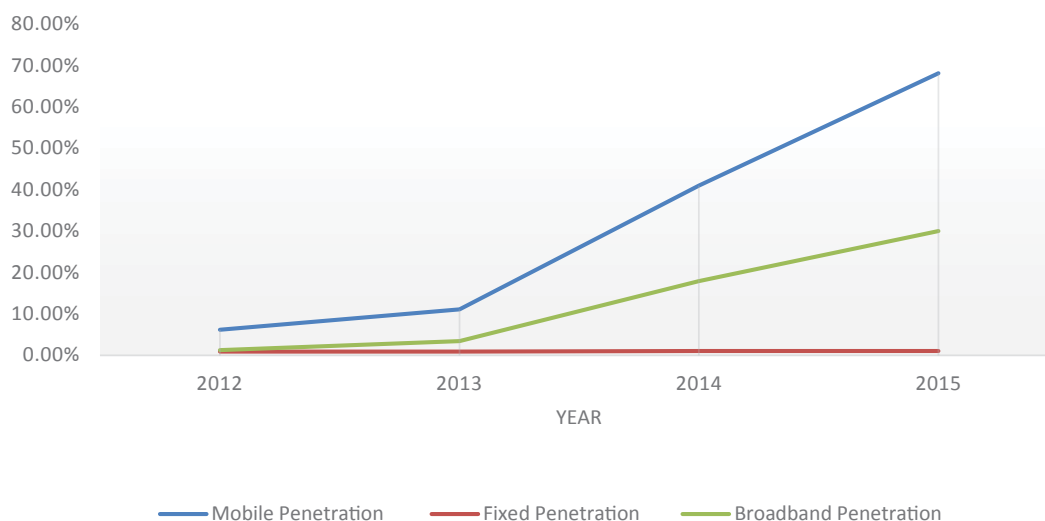
Myanmar's communications sector before the floods and landslides was characterized by competition (introduced in 2014) and fast growth in network coverage and service uptake. Mobile penetration increased from under 10 percent in 2012 to over 60 percent in September 2015, and prices for SIM cards fell from US\$250 to under US\$1.50 in the same period. The broadcast and print media sectors have grown significantly in the last few years. The public sector radio and television broadcasters have nationwide coverage. The postal network extends to every township across the country. Table 48 provides a summary of the communications sector and market structure prior to the floods and landslides.

Policymaker	MCIT
Telecommunications regulator and spectrum manager	PTD (MCIT)
MCIT	Accredits journalists; licenses broadcast media operators; is responsible for Myanmar Radio and Television
operators and estimated market share	MPT (vertically integrated government owned operator): 56% Ooredoo Myanmar (mobile operator): 13% Telenor Myanmar: 31%
Telecom sector statistics (end August 2015)	Fixed penetration: 1.02% Mobile penetration: 64.33%
Television broadcasters	1 state-owned television broadcaster
Postal services	Government-owned Myanmar Post with presence in every state and region across Myanmar at township level Multiple private courier service providers
Internet service providers	33 licensed private operators; all telecommunication operators also provide Internet services

**Table 48.**  
Communications sector and market structure in Myanmar

Myanmar’s telecommunication’s market comprises three major operators. With liberalization of the telecommunications sector in 2014, mobile services dominate the market. Figure 38 indicates growth in access (percentage of population with access to various services) over the last few years.

**Figure 38.**  
Communica-  
tions market  
access



	2012	2013	2014	2015 (through September)
Mobile penetration	6.14%	11.10%	40.96%	64.33%
Fixed penetration	0.87%	0.87%	1.02%	1.02%
Broadband penetration	1.23%	3.42%	18%	30%

Source: PTD, end August 2015.

Telecommunications is one of the major infrastructure sectors that have seen significant foreign direct investment. Sector reforms undertaken in 2013 have resulted in a competitive market for telecommunications services. Since 2013, teledensity has increased in Myanmar, from around 10 percent to over 60 percent; there has been foreign investment of over US\$3 billion; and a large number of direct and indirect jobs have been created.

Before the disaster, the telecommunications sector faced a number of policy and regulatory challenges:

- An evolving policy and regulatory framework that did not always keep pace with the significant developments in the sector
- Lack of an emergency and disaster communications strategy, plan, and network infrastructure
- Significant delays in getting rights-of-way and site clearances for infrastructure rollout, particularly fiber-optic backbone networks and tower infrastructure
- Inadequate radio spectrum for microwave networks
- Limited mobile value-added services and applications designed to serve economic and social sectors—in particular mobile financial services, which lack a clear regulatory framework for mobile network operators.

Despite these challenges, there is a huge demand for services, and ICTs are being rapidly adopted across the Myanmar public and private sectors.

## POST-DISASTER SITUATION

The communications sector faced significant damage in the regions affected by the floods and landslides.

Telecommunication networks were affected in a number of ways. Floods affected mobile base transceiver stations (BTSes), and power disruptions and lack of fuel supply affected service provision. All operators reported damage to some of their BTS sites. The state-owned incumbent, MPT, faced significant damage to its office and equipment buildings in affected areas. This damage resulted in network downtime in the immediate aftermath (a week or longer) of floods in July and August 2015.

While the international gateways, which enable international communications, were not affected, network backhaul infrastructure (particularly aerially installed fiber-optic cables and some microwave sites) was damaged in a number of areas. The fixed-line network sustained limited damage, largely to its outside plant. In low-lying areas, floods caused damage to power supply infrastructure, particularly battery banks and rectifiers. Network outages occurred when landslides impacted poles on which fiber-optic cables had been strung. The lack of redundant ring backhaul networks impacted service provision, and operators found repairing their backhaul networks extremely challenging. Microwave links were quickly deployed, and fiber cables were repaired on an emergency basis.

To cope with power outages brought about by the floods and landslides, and to support operators' efforts to ensure network and service availability, diesel fuel was made available to operators. Operators provided free voice, data, and SMS services for a period of time, and they also broadcast mass SMS messages on the flood situation. At this time, services are largely restored. Mobile communication services are available in even the worst-hit regions, although the quality is affected by the unreliable power supply and some dead spots in the network. All operators faced revenue losses when network disruption rendered service unavailable. MPT was able to deploy satellite terminals as a short-term measure to provide backhaul connectivity between affected sites.

*Internet services* were not significantly disrupted.

*Postal services* continue to be provided, albeit with delays due to road blockages among other things. Post office buildings were damaged in 19 locations. Myanmar Posts has also faced revenue losses due to service disruption.

*Broadcast media* faced some challenges, but Myanmar Radio and Television (MRTV), the state-owned broadcaster, continued its broadcasts on a 24/7 basis. It also lost revenues from advertising and time-slot sales.

*Government agencies* experienced some damages. Office buildings belonging to MPT were damaged, as were staff accommodations belonging to the government.

*Sector investments may be affected by the floods and landslides.* While government, MCIT, and PTD provided all regulatory support to service providers, future investments in the telecommunications sectors rollout may suffer. The cost of insurance for private operators and their third-party suppliers is likely to increase.

*Government functions and systems* were not impeded, in part because networks were quickly restored. The communications sector is key to ensuring that government can communicate and manage its disaster response, relief, and rehabilitation efforts. While initial network congestion and lack of coverage were experienced, communication sector damages did not appear to harm governance and decision-making processes at key government levels. However, in the event that the networks had failed for longer periods, the government would have been very adversely affected, and the situation in country would likely have been chaotic. As the government seeks to make cash transfers to severely affected constituencies and individuals in the aftermath of the floods and landslides, the

importance of mobile financial services is clear: they allow cash (both public and private support for affected communities) to be effectively transferred in a timely manner during a crisis situation, which is especially significant since the banking network and ATM machines are limited in rural Myanmar.

**Effects on risks and vulnerabilities.** As Myanmar does not have a national emergency telecommunications plan, the communications sector faces an increased vulnerability to network downtime. A lack of power supply and damage to road networks following the disaster suggest that operators need to rely on back-up power solutions, such as diesel generators and solar power, for their rural networks. This vulnerability increases the risk of network downtime, as it is challenging to get fuel to remote sites. Further, communication towers and poles located in landslide-prone areas are at risk of collapse.

**Gender assessment.** People living in remote areas reportedly received early warnings of the flood from various sources, including phone, radio, TV, and even letters sent by authorities. “Word of mouth” remains a key source of information in remote areas, but the increasing availability of mobile phones has begun to transform the gender dimensions of information dissemination. The LIRNEAsia 2015 Baseline Survey of ICT and Knowledge Access reveals a high level of access to mobile phones in rural households: 80 percent of rural households now have access to a mobile phone inside their homes, and that access is fairly equal among men and women. Most of the rural females surveyed (57 percent) indicated that they intend to buy a new phone this year. Rural residents rank weather information the second-most important type of information they need (this is mainly for agriculture-related purposes). These are positive signs of an increasing use of technology for spreading information. During disasters and the immediate recovery period, ICT can play an especially important role in providing information, and ensuring transparency and safety, for vulnerable people—men, women, boys, and girls alike. Communities and population in camps and shelters should be able to access information as well as be able to also share timely reports and complaints based on monitoring of key issues.

## ESTIMATED VALUE OF THE EFFECTS AND THE IMPACT OF THE DISASTER ON THE SECTOR

The overall cost of damage and loss in the communications sector is estimated at K 1,246.85 million and K 1,243.97 million, respectively, as summarized in Table 49. Networks outages caused by the floods and landslides meant that operators bore significant revenue losses. Operators also bore losses associated with provision of free services (e.g., airtime, SMS). MRTV, the state-owned media broadcaster, accumulated revenue losses due to the noncarriage of commercial advertising and time slots.

**Table 49.**  
Summary of estimated damage and losses in the communications sector (million K)

Subsector	Type	Estimated damages			Estimated Losses		
		Total	Public	Private	Total	Public	Private
Telecommunications operators	Buildings	144.33	144.33	–	–	–	–
	Equipment	1,068.23	574.30	493.93	1,243.24	285.36	957.88
Postal sector	Buildings	34.30	34.30	–	0.74	0.74	–
<b>TOTAL</b>		<b>1,246.86</b>	<b>718.63</b>	<b>493.93</b>	<b>1,243.98</b>	<b>286.10</b>	<b>957.88</b>

Source: operators.  
Note: Not available —.



**Impact analysis of sector development goals.** Approximately 1.69 million people have been displaced by the floods and landslides. Most of them are in remote rural communities, facing challenges in accessing social and economic services. An almost nonexistent mobile money ecosystem has impacted access to finance. An underdeveloped broadband ecosystem has impacted access to public services. The lack of a digital national identification system is likely to hamper public service delivery, given that many affected people have lost their paper-based citizenship identification. The challenges faced as government agencies and people sought to communicate and receive information following the disaster demonstrated the need for a very robust and resilient communications infrastructure in Myanmar. Before the floods, operators had been in the process of increasing coverage of mobile broadband networks, but in the short term, their focus will be on restoring coverage to pre-disaster status and expanding coverage to unserved areas. As a result of the disaster, it is likely that the rollout of services across Myanmar will see some delays.

**Cross-sector linkages.** ICT and telecommunications in particular constitute a crucial economic infrastructure, and their early recovery and restoration is important to support economic and public service delivery in Myanmar. Post-disaster relief efforts have relied heavily on telecommunications, Internet, and broadcast media.

The government has invested in a national data center and is in the process of developing a Myanmar national portal. The adoption and mainstreaming of these efforts across all government agencies will enable faster and cheaper deployment of ICT solutions and applications across government; and it will also reduce the cost of providing public services using ICT.

Once developed, the government's disaster risk reduction strategy would make use of monitoring and early warning systems, many of which rely on telecommunications networks. Further, geo-mapping activities (e.g., OpenStreetMap, GoogleMaps) rely on Internet access.

Telecommunication networks depend upon the availability of power supply. During the most recent disaster, lack of reliable power and insufficient fuel for diesel generators caused significant network downtime. Lack of power also left many mobile subscribers unable to charge their mobile phones or use their computers. As telecommunication and Internet providers start using optical-fiber ground wire (OPGW) on power transmission networks, the linkage between the ICT and the power sector will only become stronger.

Fiber-optic cables for network backhaul that were ducted and buried were not adversely affected—unlike aerial cables. The communication sector should coordinate with the Ministry of Construction and urban authorities to facilitate the development of underground ducts for burying fiber networks.

## RECOVERY AND RECONSTRUCTION STRATEGY

**In the communications sector, reconstructions needs resulting directly from the disaster are estimated at K 29,940.80 million over a 24-month period.** As recovery and reconstruction proceed, the government should seek to develop a future-ready communications infrastructure and service industry that meet the country's long-term development objectives and that are inclusive, equitable, and sustainable within a well-functioning digital economy.

In order to build back better, MCIT and operators should consider a telecommunications network that includes the following measures:

- **Burying cables.** Underground cabling in ducts for fiber-optic cables (rather than aerial cables) would strengthen the resilience of telecommunication infrastructure.
- **Ensuring multiple route redundancies for the backhaul network, both domestic and regional.** One way to achieve these redundancies would be to allow infrastructure providers (including other utility providers such as the power transmission company and

Myanmar Railways) to lease fiber-optic capacity to operators. In addition, facilitating the rapid clearance of sites and approval of rights-of-way would allow operators to build out towers and transmission networks much faster than they can under the current pace of rollout. Facilitating multiple routes for cross-border international connectivity would help to ensure that Myanmar's telecommunications and Internet connectivity is not compromised in the future.

- **Improving the resilience of BTSes.** This could be done by (i) making provisions for vehicles with microwave transceivers combined with the function of a base station as well as a satellite ground station, to be shared between operators; (ii) adjusting the output power and reconfiguring base station antennas to cover more ground so they serve low-population-density and low-network-traffic areas better; and (iii) increasing backup power at base stations and all other communication facilities to counter electricity outages. BTSes have been identified as crucial within the sector and therefore to be earmarked to also receive reliable fuel supply.
- **Increasing backup power at the base stations and all other communication facilities.** This step would counter electricity outages by deploying more optical fiber on power transmission networks (OPGW and ADSS) and building redundant routes; and it could widen existing coverage by using of techniques such as large-zone base stations.
- **Ensuring creation and usage of hazard maps.** These should be created by local authorities, including the disaster management agency, and so that necessary safety precautions can be taken while building communications infrastructure.
- **Taking measures to mitigate traffic congestion on the network.** This can be done by call restriction, call prioritization, and appropriate disclosure of network capacity by operators through a predetermined process.
- **Building critical tower infrastructure in key strategic locations nationwide.** This step should be taken in conjunction with enabling infrastructure sharing for all operators and potentially for broadcast media providers.

While it is expected that telecommunications coverage will eventually be restored to pre-disaster status, the ability of operators to provide broadband Internet access across the country will be limited by certain factors, such as the following:

- Lack of access to affordable backhaul networks (including fiber-optic networks)
- Delayed clearances for rights-of-way and site acquisition
- Inadequate access to radio spectrum resources, particularly for microwave backbones

It is important to note that these factors impact the total cost of ownership and usage for consumers. Populations in severely affected areas will likely have less disposable income to spend on communication services (both voice and Internet). If certain policy decisions and regulatory actions are made a priority, Myanmar is likely to fall behind in connecting its population—particularly its rural population—to the Internet.

Television and radio broadcasters (particularly those with MRTV) were instrumental in keeping people fully informed about the disaster. Given broadcasters' critical public service role, it is important to ensure their resilience for the future. This could include developing backup production studios and broadcasting information in ethnic languages and dialects.

ICT is a cross-cutting sector, and key infrastructure—such as shared data centers, the government cloud, and the national identification infrastructure—are also crucial for other sectors. The build back better strategy should therefore address this infrastructure. Overall, given every country's reliance on ICT in general, Myanmar should also give priority to developing a government data center for disaster recovery. Government could also plan on a cloud strategy for the hosting of government data, applications, and services.

To enable government to better provide public services and to target beneficiaries of social protection and other support, both in the post-disaster period and over the long term, government must be able to assess and plan for the implementation of a digital national identification program.

Finally, given the challenge of poor accessing banking and financial services, government should consider the early approval of regulations that will allow extended mobile operator networks to reach the financially excluded.

## RECOVERY AND RECONSTRUCTION PLAN

While recovery costs (for telecommunications in particular) have been borne by the service providers who have had to restore services, short-term reconstruction needs do exist. Table 50 shows the reconstruction needs of the communications sector based on information provided by operators and service providers. In addition, there is an urgent need for building back better access (cellular and Internet services), backbone networks, and eGovernment infrastructure platforms (including an integrated government data center for disaster recovery and national ID infrastructure).

Subsector	FY2015/ 2016	FY2016/ 2017	FY2017/ 2018	FY2019/ 2020	Total estimated reconstruction
Telecommunication operators	1,299.5	144.39			1,443.9
Postal sector	56.3	6.25			62.5
Build back better (access)	9,478.13	18,956.25	33,173.44	33,173.44	94,781.3
Build back better (e-government)	1,000.00	2,500.0	2,000.00	4,500.0	10,000.0
<b>TOTAL</b>	<b>11,833.91</b>	<b>21,606.89</b>	<b>35,173.44</b>	<b>37,673.44</b>	<b>106,287.68</b>

**Table 50.**  
Estimated recovery and reconstruction costs over a 4-year period (million K)

Source: Source: Operators and assessment team estimates.

Note: Not available —. The effects of the recent floods and landslides highlighted the sector developmental need for improved access to connectivity. As this need goes beyond repairs and improvements to the existing network damaged by the disaster it is not listed in Table 4.

## RECOVERY AND RECONSTRUCTION IMPLEMENTATION

Implementation strategy. The proposed strategy revolves around a two-phase intervention: short/immediate term, medium/long term. Table 51 summarizes key immediate priorities, related both to restoring basic communications services and to using ICTs in broader cross-sectoral relief and recovery operations. Those bullet points that are considered crucial and highest priority are rank-ordered. Medium/long term ICT requirements related to building the country's resilience to natural shocks and promoting overall economic competitiveness are identified in Table 52. The overall estimated cost to implement these high-priority actions is approximately K 106,287.68 million (Table 50).

**Table 51.**

Short-term actions

Area	Immediate need	Specific action
<b>Restoring MPT's local network for priority customers</b>	<ul style="list-style-type: none"> <li>• Repair local access networks in affected townships for priority customers (government, hospitals, schools)</li> <li>• Provide emergency power generators</li> </ul>	<ul style="list-style-type: none"> <li>• Confirm locations and cost of repairing access network for priority customers</li> <li>• Pool requests for power generators across sectors</li> </ul>
<b>Cellular and Internet services</b>	<ul style="list-style-type: none"> <li>• Restore cellular service by repairing fallen/damaged sites</li> <li>• Allow rental of government land where available for operators to build towers</li> </ul>	<ul style="list-style-type: none"> <li>• Support with priority access to diesel and sharing of rights-of-way</li> <li>• Approve the national fiber policy and allow for sharing of infrastructure; in collaboration with operators, MCIT and PTD to identify sites for leasing from government</li> </ul>
<b>Postal service</b>	<ul style="list-style-type: none"> <li>• Immediately restore postal service for official (government and diplomatic) correspondence</li> </ul>	<ul style="list-style-type: none"> <li>• Repair and rebuild 19 damaged post office buildings</li> </ul>
<b>Public service broadcasters</b>	<ul style="list-style-type: none"> <li>• Strengthen public service broadcasting agencies</li> </ul>	<ul style="list-style-type: none"> <li>• Build emergency public service studio infrastructure as needed</li> </ul>
<b>Public finance and mobile payments and solutions</b>	<ul style="list-style-type: none"> <li>• Use mobile money for transfer of benefit payments</li> <li>• Use mobile applications for service delivery</li> </ul>	<ul style="list-style-type: none"> <li>• Myanmar Central Bank to approve mobile financial service regulations and allow mobile operators to participate in service provision</li> <li>• MCIT and PTD to lead the mobile service delivery agenda in partnership with stakeholders</li> <li>• Use ICT solutions to identify and verify beneficiaries of cash transfer and other relief benefits</li> </ul>
<b>Displaced Persons</b>	<ul style="list-style-type: none"> <li>• Provide Internet access and community telecenters at displaced person camps</li> <li>• To help disseminate information and raise disaster awareness among vulnerable groups, ensure that women are included in community and camp management and are part of community-based disaster risk reduction and ICT training</li> </ul>	<ul style="list-style-type: none"> <li>• Work with operators to finance this initiative as a priority</li> </ul>
<b>eGovernment platforms</b>	<ul style="list-style-type: none"> <li>• Ensure continuity of government integrated data center</li> <li>• Deploy national identification system</li> </ul>	<ul style="list-style-type: none"> <li>• Current government data center to be operationalized immediately and disaster recovery center to be built</li> <li>• Conduct an assessment and plan to deploy a digital national ID system.</li> </ul>
<b>Creation of a favorable environment for good sectoral governance</b>	<ul style="list-style-type: none"> <li>• Approve and implement the telecommunications and eGovernment master plans</li> <li>• Develop a spectrum road map</li> </ul>	<ul style="list-style-type: none"> <li>• Approve, adopt and implement the telecom and eGovernment master plan.</li> <li>• PTD to develop the spectrum road map</li> </ul>

Source: Assessment team.

	Medium-term need	Specific action
<b>Resilience in international and national communications</b>	<ol style="list-style-type: none"> <li>1. Establish redundancy for international gateways at China, Thailand, and India</li> <li>2. Deploy national backbone network with open access (e.g., by including it in the rebuilt electricity network)</li> <li>3. Install additional towers in rural areas to provide increased coverage and ensure tower sharing</li> <li>4. Install and operationalize the emergency communications network</li> <li>5. Implement standard operating procedures (SOPs) for disaster recovery telecommunications</li> <li>6. Develop and raise citizen awareness of telecommunications and ICT services and applications for use during disasters</li> <li>7. MCIT or the disaster agency to maintain a pool of satellite phones and broadband global area network (BGAN) terminals for use in disasters</li> </ol>	<ol style="list-style-type: none"> <li>1. Allow operators to establish international gateways</li> <li>2. PTD to support redundant network build-outs, with infrastructure sharing mandated</li> <li>3. Adopt a policy, legal, and regulatory framework for infrastructure sharing across utilities and sectors (roads, railways, urban, power) and easier right-of-way access</li> <li>4. Identify critical network points and implement early warning systems in coordination with other agencies that have existing systems</li> <li>5. Develop SOPs for disaster recovery in the telecommunications sector</li> <li>6. Work with Phandeeyar to develop mobile applications for both smart and feature phones that can send messages from a customer to preselected numbers</li> <li>7. Raise awareness among consumers about using telecommunications and ICT services during disasters in order to prevent network congestion</li> <li>8. Procure alternate connectivity tools such as satellite phones and BGAN terminals for use in disasters</li> </ol>
<b>Postal service</b>	<ol style="list-style-type: none"> <li>1. Postal network resilience improved</li> </ol>	<ol style="list-style-type: none"> <li>1. Complete restoration of postal service network</li> </ol>
<b>Media broadcast sector</b>	<ol style="list-style-type: none"> <li>1. Digital switchover completed</li> <li>2. Digitalize public broadcasters and national news agency's information</li> </ol>	<ol style="list-style-type: none"> <li>1. Ministry of Information and MCIT to work on digital switchover by 2017</li> <li>2. MRTV to procure portable broadcasting equipment; MRTV to archive all production materials in a digital format</li> </ol>
<b>Resilience against loss of critical data across sectors</b>	<ol style="list-style-type: none"> <li>1. Create system of redundant repositories of data for critical government information systems</li> </ol>	<ol style="list-style-type: none"> <li>1. Establish government disaster recovery data centers</li> <li>2. Pilot and adopt the concept of "cloud computing"</li> </ol>
<b>Urban planning and transport</b>	<ol style="list-style-type: none"> <li>1. Integrate ICT into urban planning in Yangon and Mandalay and into road construction</li> </ol>	<ol style="list-style-type: none"> <li>1. Integrate deployment of fiber-optic networks into the reconstruction of the main cities' urban infrastructure</li> <li>2. Include ducts for telecom infrastructure in roads, as well as in buildings (both new and rebuilt)</li> </ol>

**Table 52.**

Medium-term needs and actions

Source: Assessment team.

## SECTOR ASSESSMENT METHODOLOGY

The communications sector assessment covers the strategic public and private telecommunications networks (both fixed and mobile), Internet service providers, and postal services. It also includes the MCIT, which is responsible for the telecommunications and postal sectors, and its associated agencies: MPT, Myanmar Posts, and PTD. The MCIT and PTD have policy and regulatory oversight of the sector.

Damage costs are estimated based on initial assessments by MCIT and PTD, in turn based on information provided by the three telecommunications operators and Myanmar Posts.<sup>88</sup> These estimates have not been verified through detailed engineering assessments. Further, the damage and losses faced by some of the third-party suppliers to the telecommunication operators have not been captured. The loss figures mainly consist of damage to physical premises, network equipment, and additional maintenance costs (largely for fuel supply for sites where commercial power is unavailable and/or erratic) and immediate rehabilitation/reconstruction works. The damage, loss, and recovery assessments are highly dependent on data provided to MCIT and PTD by operators, service providers, and government agencies.

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<sup>88</sup> Note that information provided is preliminary and subject to more detailed on-the-ground assessment (including engineering and technical verification) by providers of the information.

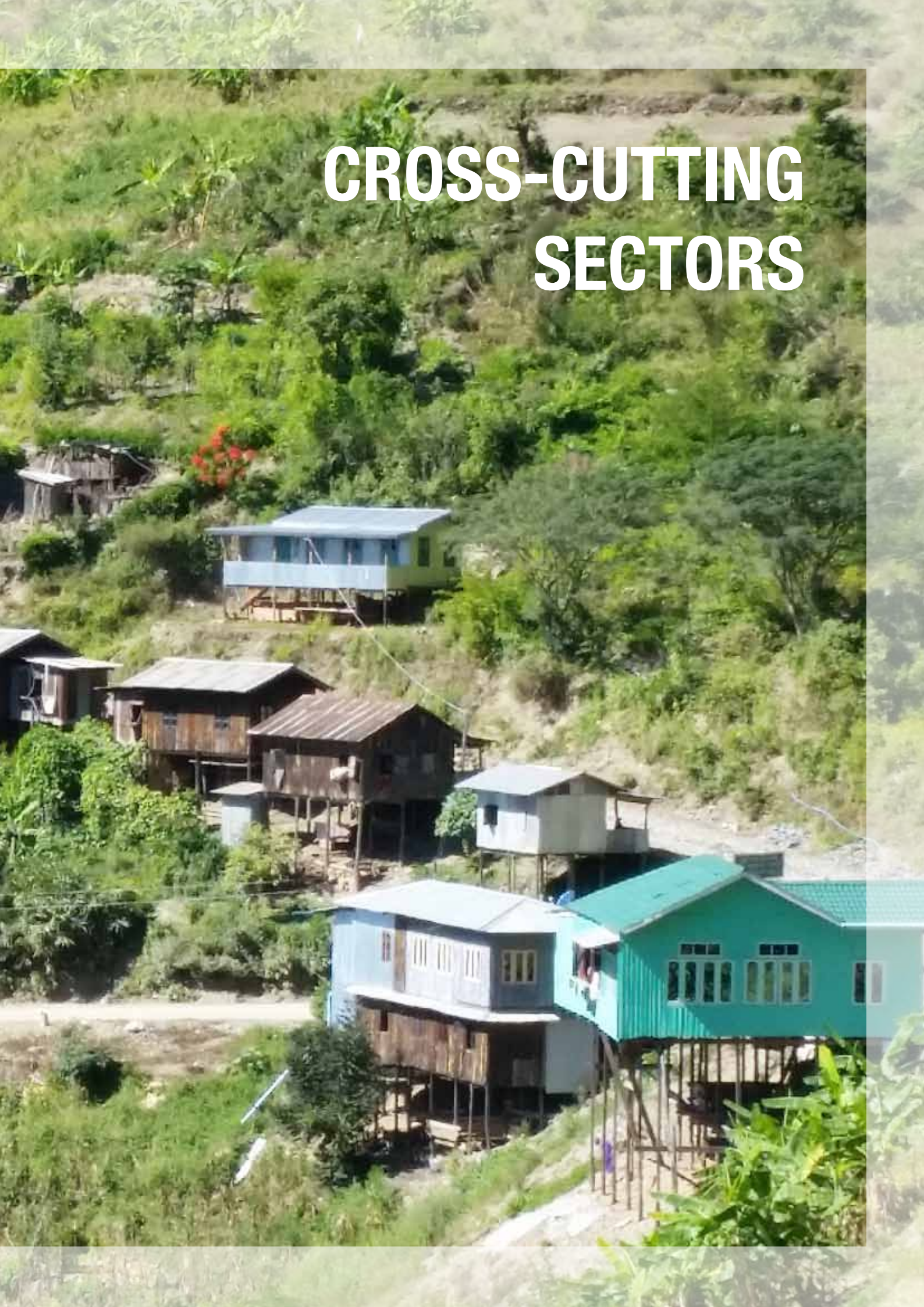




Settlements in Chin State  
Photo: © Michael Bonte-Grapentin.



# CROSS-CUTTING SECTORS



## Gender

### SUMMARY

**Women’s and girls’ priorities in a disaster differ in nature and degree from those of men and boys because their roles and status differ from—and are often secondary to—those of men and boys.** As this chapter shows, pre-disaster vulnerabilities of women and girls are exacerbated during disaster, although women and girls have also displayed great resilience. Some of the key gender-based concerns that have emerged are as follows: age- and sex- disaggregated data across sectors are lacking; compared to men and boys, women and girls are at greater disadvantage and have lower recovery capacity (associated with lower incomes and loss of already-fewer productive assets); they have more limited mobility and less access to employment and socioeconomic resources; they have higher food insecurity and malnutrition; they are subject to increased care work with fewer safety net resources, leading to indebtedness; they experience a high level of stress; they are subject to worsened privacy, safety, and security; and their participation and decision making in response and recovery is limited, especially at local levels.

**This assessment shows that women and girls brought their capacities, knowledge, and networks to bear on coping and recovery.** These assets must be drawn on in recovery planning. Further, Myanmar has a national demographic skewed in favor of women and a high proportion of female-headed households, 1 out of 4 of which were affected in the disaster. Investing in women has multiplier effects, as women tend to use benefits accruing to them for families and communities.

**To optimize and sustain investment in recovery, it is critical that women and their priorities be included in disaster assessment, response and recovery planning, and implementation—and it is especially critical that female-headed households be targeted.** **This approach** provides an opportunity to build back inclusively and better. Priorities linked to the National Strategic Plan for the Advancement of Women (2013–2022) should (i) ensure sex- and age-disaggregated data collection, classification, analysis, dissemination, and use prior to disaster and in post-disaster assessments; (ii) include women in decision making from response to recovery planning/implementation, with budgets allocated for women’s priorities; (iii) prioritize poor female-headed households in provision of assistance; (iv) focus on pregnant and nursing women’s nutrition; (v) employ women in cash-for-work programs on an equal work for equal pay basis; (vi) provide job-skills training for women in nontraditional sectors; (vii) prioritize women’s access to information; (viii) recognize, reduce, and redistribute women’s care work; and (ix) prevent violence aimed at women and children and protect them from it.

### PRE-DISASTER CONTEXT

**Females constitute 51.78 percent of Myanmar’s population,<sup>89</sup> 49.33 percent of children in the age group birth through four years,<sup>90</sup> and 58.26 percent of the elderly (65-plus years).<sup>91</sup> They thus outstrip males in all age groups except for birth through four years.** The disability prevalence rate is 4.4 percent for men and 4.8 percent for women (4.6 percent overall).<sup>92</sup> A very high proportion (23.7 percent) of households is female-headed,<sup>93</sup> with one in every four households in affected areas headed by women. This high proportion demands immediate attention, as these households are among the most socially and economically vulnerable in normal times, and they are

<sup>89</sup> MIP 2015, 1.

<sup>90</sup> MIP 2015, 93 (computation of sex-disaggregated percentages by UN Women using census data).

<sup>91</sup> MIP 2015.

<sup>92</sup> MIP 2015, 221.

<sup>93</sup> MIP 2015, 1.

disproportionately affected in disaster and recovery efforts. Fewer women than men participate in the labor force, and households headed by women are 51 percent of the households dependent on agriculture. Despite their significant contribution to crop cultivation, women are popularly perceived as laborers rather than farmers, self-employed farmers, or farm managers.<sup>94</sup> Compared to men, women have also less access to credit, and training (which is usually directed at male heads of households).<sup>95</sup> Despite these challenges, women in Myanmar play a key role in providing their families with nutrition and food security, as well as household income for children's education among other needs.

Myanmar does not have national data on prevalence of violence against women, but indications are that the level is of concern.<sup>96</sup> Women's representation in leadership and decision making is poor, especially at subnational levels. There are no women township administrators,<sup>97</sup> and only 19 women village tract/ward administrators out of a total of 16,743 (0.11 percent) in government-controlled areas.<sup>98</sup>

Women are almost solely responsible for care work. Although no time-use survey has been conducted at the regional or national level in Myanmar, findings from a small sample survey conducted by the United Nations Development Programme in 2012 in villages around Inle Lake clearly demonstrate that women spend much more time than men on care work—generally four or five times more per day (Table 53). When combined with limitations in access to and ownership of productive resources and a high dependence on subsistence agriculture, the long daily periods spent on care make women extremely vulnerable.

Type of work	Village							
	Inn Thar		Pa-O		Danu		Taung-yoe	
	Male	Female	Male	Female	Male	Female	Male	Female
<b>Income-generating work</b>	8.1	6.4	10.8	8.3	7.3	7.0	10.2	8.8
<b>Reproductive work<sup>a</sup></b>	1.0	5.5	0.8	4.3	1.8	4.7	1.5	4.0
<b>Community work</b>	1.5	1.4	1.3	1.0	3.0	1.5	1.8	1.0
<b>Leisure time</b>	5.2	2.9	3.8	3.0	5.3	3.5	3.0	2.3
<b>Sleeping</b>	8.4	7.9	7.7	7.5	6.5	7.3	7.3	8.0

Source: UNDP 2012.

Note: a. The data are from a small sample survey conducted as part of a project assessment.

**Table 53.**

Amount of unpaid family labor, males versus females (hours per day)

## POST-DISASTER SITUATION

Although the national census provides some baseline data, a serious constraint in the current disaster was the lack of age- and sex-disaggregated data in relation to both baselines and Post-Disaster Needs Assessment. Without these data, it is difficult to identify the diverse impacts of the disaster on different population groups (including women and female-headed households), to compute losses and damages for them, and to ensure that decision making about the allocation of finances, goods, and services is informed by their needs (i.e., that they are not excluded from the benefits of recovery planning and investment). Data collection and analysis on damages and losses would have been more comprehensive if there the rationale for data disaggregation had been better appreciated, and the information-gathering tools had included the required fields for sex- and age-disaggregated data collection.

<sup>94</sup> Faxon 2015.

<sup>95</sup> Thorpe 2014.

<sup>96</sup> Department of Social Welfare, MSWRR, UN, and ADB forthcoming; see also Gender Equality Network 2015. According to United Nations Population Fund, data sourced from the Gender Equality Network, programs in Kachin and Rakhine indicate that intimate partner violence forms over 90 percent of their total caseload.

<sup>97</sup> Minoletti 2014, 10.

<sup>98</sup> Minoletti 2014, 11.

## ESTIMATED VALUE OF THE EFFECTS AND THE IMPACT OF THE DISASTERS ON THE SECTOR

Overall, the disaster has had a more negative impact on women than on men. Faced with the loss of food stocks and livestock, inundation of farmland and subsequent loss of agricultural labor, and the inability to look for alternative livelihoods due to the high burden of care work, women under considerable burden to provide food and nutrition for their families, while at the same time having far fewer resources and options for alternative livelihoods when compared with men.

**Loss of life and disaster risk reduction.** According to the Relief and Resettlement Department (RRD) under the Ministry of Social Welfare, Relief and Resettlement (MSWRR), as of September, 30, 2015, there were 139 reported deaths in the floods and landslides in Myanmar.<sup>99</sup> Table 54 shows age- and sex-disaggregated information on the 122 deaths for which detailed data were available.

**Table 54.**  
Number and proportion of deaths in flood and landslide disaster

Age	Female		Male		Female and male Total
	Number	% of all deaths	Number	% of all deaths	
0–14 years	17a	14%	10	8%	27
15–64 years	33	27%	54	44%	87
65+ years	1	1%	4	3%	5
Unknown age	0	0%	3	2%	3
<b>Total</b>	<b>51</b>	<b>42%</b>	<b>71</b>	<b>58%</b>	<b>122</b>

Source: Raw data from RRD, MSWRR, October 2, 2015; tabulated and analyzed by UN Women Myanmar.

a. Deaths of girls 0–14 years were high compared to boys in the same age group. The causes of these deaths need further investigation to identify appropriate preparedness measures and programmatic approaches that address life-saving skills.

The patterns of these deaths are intrinsically linked to the traditional division of roles between men and women. The majority of people, 89 percent (109) drowned. Lightning strikes, landslides, and collapsing structures/objects killed 11 percent (13). Age and sex disaggregation show that 26 out of 27 children—17 girls versus 9 boys—drowned. Most women, 30 out of 33 in the age bracket 15–65+ years, were swept away with children by water flowing at high velocity, or when boats capsized as they were seeking safe ground or refuge, or moving to collect fuel, food, or water—that is, while performing traditional domestic or care-giving roles. Men also drowned in high velocity waters while trying to move to safety or when houses were damaged, but they drowned under different circumstances: they were trying to retrieve goods from the waters or to take large equipment to safety; going to worksites; rescuing others; trying to swim to safety; or rowing children to school. More men than women appear to have died in the landslides.

Women in flood-affected communities (Minbu Township in Magway, Kalay in Sagaing, and Aunglan and Myaybon in Rakhine) reported slightly different patterns in early warning and preparedness training and response.<sup>100</sup> While radio and TV warnings and written intimation from township administrations were more widespread in Rakhine, information was received via loud speakers or mobile phones in Minbu Township in Magway and Kalay in Sagaing, and it did not always percolate effectively to all villagers. Most poor women-headed households reported not owning a phone, and many women whose husbands owned a phone reported not knowing how to use one. Women and communities in areas that are not prone to routine or high levels of flooding (like Kalay in Sagaing or Minbu in Magway) were unable to assess the danger of the disaster. Communities in these sites also had poor knowledge of household/ community preparedness measures. Many waited too long to try to move

<sup>99</sup> Data provided to UN Women by Relief and Resettlement Department (RRD), Ministry of Social Welfare, Relief and Resettlement on 30 September, 2015.

<sup>100</sup> World Bank 2015.

to safe sites. A common narrative emerging from field interviews was that women and girls were very restricted in their mobility. They found it difficult to swim, row boats, climb trees—routine activities for men and boys. Moreover, women in general, and especially women household heads, did not own assets like boats, which were in short supply in the disaster. In any case the boats used were often not of the size and quality to withstand high water velocity.<sup>101</sup>

Women's participation and decision making in response and recovery. A common pattern (reported by 128 women, men, and youth in Chin, Magway, Rakhine, and Sagaing) was that women were poorly represented in formal response and recovery work and in formal decision-making bodies.<sup>102</sup> Communities perceive disasters as dangerous and better suited for male than for female leadership and action. Where women participated in response and recovery, they did so at base camps, while men went further afield into affected villages.<sup>103</sup> UN Women observed a strong tendency for men to monopolize discussions, making separate discussions with women a requirement in future disaster planning. Cultural norms around men's leadership perhaps explain women's lack of voice, participation, visibility, and influence. Including women in decision making from response to recovery across all sectors would help ensure that their priorities, which are often different from those of men, are well integrated in recovery planning and implementation, and that budgets are allocated and spent to address these priorities.

**Time use.** There was an absence of pre-disaster time-use data, and time constraints limited more quantitative post-disaster time-use analysis. Qualitative data, however, suggest that women continue to bear the sole responsibility for care work, even though care tasks and the time and effort they require have increased as a result of the floods and landslides. Women spent much time keeping young children safe above water levels; protecting them from insects and snakes; nursing family members back to health; queuing for relief items; traveling distances in unsafe conditions to fetch food, water, animal feed, and firewood; and seeking work.<sup>104</sup>

Women in Rakhine State reported that polluted village water ponds required them to travel to unaffected villages for clean water. By conservative estimates, this travel increased the time to secure water, from 20 minutes daily pre-disaster to 90 minutes each time water was needed post-disaster. Depending on family size, either two or three trips a day were required; in some cases other family members, especially girls, were involved in the work of fetching water in order to reduce the number of trips.<sup>105</sup> Women in camps/shelters in Haka spent large amounts of time in mass cooking, washing, cleaning utensils, and other care work, with little time or opportunity to earn incomes. When combined with loss of assets and livelihoods in the floods and landslides, this loss of opportunities to earn income makes it more difficult for women to recover.<sup>106</sup>

**Sexual and gender-based violence.** Domestic and sexual violence and abuse, particularly against women, girls, and boys was reported through the Multi-Cluster/Sector Initial Rapid Assessment (MIRA) in the current disaster.<sup>107</sup> Out of the 280 locations assessed, 241 (78 percent) reported security concerns affecting the community.<sup>108</sup> In 34 percent of the assessed locations, people sought police services, and in 55 percent people reported seeking community leaders' support or

<sup>101</sup> UN Women interviewed 60 women in three townships and six villages in eastern Rakhine in September 2015.

<sup>102</sup> These are initial findings emerging from a focus group discussion conducted by the Gender Equality Network in 8 townships and 16 villages in Sagaing, Magway, and Rakhine (report forthcoming); follow-up discussions with Gender Equality Network were also drawn on.

<sup>103</sup> Ibid.

<sup>104</sup> Data are from UN Women interviews with 60 women in three townships and six villages in eastern Rakhine, and with project staff of CARE, OXFAM, Chin Human Rights Organization, and the Gender and Development Institute working in northern Rakhine and Haka Township in Chin State.

<sup>105</sup> UN Women interviews with project staff from CARE and OXFAM working in flood-affected areas in northern Rakhine.

<sup>106</sup> UN Women interviews with staff from the Chin Human Rights Organization and Gender and Development Institute working in Haka Township in Chin State.

<sup>107</sup> UNOCHA 2015.

<sup>108</sup> Sites include Magway (Salin, Sidoktaya, Seikphyu, Pwint Phyu, Yenangyaung, Chauk), Rakhine (Mrauk-U, Kyawktaw, Minbya, Pauktaw, Rathetaung, Sittwe), Chin (Tonzang, Mindat, Falam, Hakha, Tiddim, Matupi, Paletwa), Sagaing (Kalay, Kanbalu, Salingyi, Kawlin, Kalewa), Bago (Shwedaung, Monyo), and Ayeyarwady (Thabaung, Hinthada, Lemyetna, Ingapu, Danubyu, Nyaungdon).

advice. Some women reported attacks when going outside the community or risk of attack when going to toilets. Women and girls were also at risk when foraging afar for firewood. Children were at increased risk while moving in camp settlements or assistance distribution and water collection points, as well as when bathing, using health facilities, and or at school. Concerns were expressed about women submitting to sexual extortion for food and shelter and their inability to access services and resources.<sup>109</sup>

Civil society and UN organizations working on response in Rakhine, Sagaing, and Chin identified several triggers for this violence: increased stress due to loss of housing, economic assets, and livelihoods; lack of privacy in shelters and lack of separate bathing and toilet facilities, contributing to opportunistic violence; alcoholism; and men's assertion of increased control over their families to compensate for a lack of routine and increased vulnerability. Key measures that should be taken to address these concerns include ensuring the equitable (50 percent) inclusion of women in planning and assistance committees at all levels of the response, as well as private bathing areas, segregated latrines, lighting, private shelters, provision of dignity kits, and psychosocial support.

**Employment and livelihoods.** This disaster has had profound, multiple effects on women's livelihoods, food security, nutrition, income, and other aspects of their lives. Women are primarily responsible for providing food in households. The loss of food stocks increases women's work because it forces them to find alternative sources of food. Women report reducing the number of daily meals prepared in order to stretch food resources as far as possible. The projected loss of both the monsoon and winter rice crop will have a further negative impact on nutrition, especially for children, lactating mothers, and pregnant women; 50 percent of pregnant women suffer from anaemia and 18 percent have vitamin A deficiency.<sup>110</sup> Prioritizing provision of cash assistance and food to these groups is critical.

Female-headed households were among those who suffered damage to land and crops. Female-headed households are less likely to own crop holdings than male-headed households,<sup>111</sup> and their acreage tends to be smaller.<sup>112</sup> With relatively fewer people in the family, resource-poor female-headed households may be at a particular disadvantage when crop lands are inundated or under debris; difficulty in clearing and replanting quickly makes them more vulnerable to income losses, food insecurity, and slower recovery.

Where farmland becomes useless, female-headed households may be further marginalized. Regenerative inputs are generally provided to males, deemed heads of households. Targeted assistance needs to be directed at female-headed households in terms of cash assistance, agricultural inputs, and clearing of debris from land.

Livestock ownership is important in Myanmar. Men own and control large livestock like cattle, while women tend to control smaller livestock like ducks and poultry. Assuming that women controlled poultry in every household in affected regions, then in absolute numbers, women lost about 84 percent of all animals to the floods (Table 55). Certainly women lost a large chunk of their livelihoods, and this loss has a huge implication for their ability to provide food and protein to their families, as well as income. Women often sell chickens and ducks and eggs to augment income, especially during stress, but this coping option will no longer be available to them.

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<sup>109</sup> To combat this, the UN Population Fund used local radio through the BBC Media Action to convey messages designed to prevent gender-based violence—such as information about the risks of trafficking, importance of staying with trustworthy people, and the right to free humanitarian assistance. The fund helped to ensure that messages were well understood by both women and girls, camp committees and village leaders who were distributing the assistance.

<sup>110</sup> World Bank 2010.

<sup>111</sup> Win 2013.

<sup>112</sup> MOAI 2013.

Livestock	Number of animals dead	% of animals dead	Damage (K) million	Loss (K) million	Total effect (K) million	% of total effect
Buffalos, cattle, goats, pigs (controlled by men)	7,180,959	16%	14,091.72	9,204.44	23,296.16	87%
Chickens, ducks (controlled by women)	36,774,543	84%	2,661.48	9,46.06	3,607.53	13%
<b>Total</b>	<b>43,955,502</b>	<b>100%</b>	<b>16,753.19</b>	<b>10,150.5</b>	<b>26,903.69</b>	<b>100%</b>

**Table 55.**

Damage and loss to livestock in affected states and regions

Source: Computed by UN Women on the basis of figures for livestock damages and losses provided by the assessment team.

Men lost the most in absolute value. Although they control large livestock and only lost 7 percent, in monetary value, men lost K 23 million versus women who lost K 3,607.53 million representing about 87 percent of the total effect on livestock. Women may find it easier than men to recoup on their livestock losses; it may take years for men to save enough to restock buffalos and cattle.

Restocking of small animals, particularly chickens, and reconstruction pens, which were also damaged, are additional urgent requirements, particularly for the poorest female-headed households. Small animals that breed quickly would help these households increase their incomes, enhance animal protein intake, and improve nutrition. This restocking should be supported by providing animal feed and vaccines to prevent the spread of animal diseases and ensure animals remain in good health.

Among female respondents in the Agriculture and Livelihood Flood Impact Assessment, 57 percent mentioned casual labor as the most important source of income for poor families, especially for poor women-headed households. Women reported a reduction in casual labor opportunities in agriculture due to destruction of land and crops, and hence a reduction in their incomes. While men are more likely to find any kind of alternative work further afield and migrate, women have a more limited set of job opportunities, and are paid less than men. Care responsibilities further limit mobility and income-earning opportunities. Cash assistance and agricultural inputs should be provided as a matter of priority to women who have lost them.

Fisheries and aquaculture were impacted by the floods and landslides. A total of about 30,000 hectares of aquaculture ponds essentially owned and operated by men have been affected. Both men and women engage in inland-water fishing. Women are involved in fish processing, vending processed products and fresh fish, and making and repairing fishing nets and lines. They have lost these processed products, raw materials for processing, and small fishing equipment (nets, traps, small kayaks) and hence their livelihoods and nutrition. They should be provided with this equipment to help restore their livelihoods.

Women reported that before the disaster, they had borrowed money for agriculture and livestock from various sources, including money lenders (at high interest rates), microfinance institutions, and NGOs with microfinance programs. Damages and losses in land, crops, and livestock, along with loss of casual labor, have made it difficult for women to repay these loans. Many have sought financial support from relatives or NGOs. This was corroborated by PACT, which implements microfinance programs in 58 townships in Myanmar.<sup>113</sup> PACT's client-needs assessment in 1,234 villages of 24 affected townships in Magway and Sagaing revealed that among its total clientele of 321,254—98 percent of them women—71,121 clients were affected; 8,547 clients required cash assistance (for good-quality seeds for paddy, vegetables, beans, and peanuts and to repair or rebuild houses); 1,587 required a loan write-off; 1,283 required a new loan; and 3,698 wanted to restructure a loan.<sup>114</sup>

<sup>113</sup> In 24 of PACT's township project sites, 1,234 villages were affected by the flood; of these, 1,081 villages in Magway, Sagaing, and Ayeyarwady were severely affected. PACT's microfinance schemes charge interest at 2.5 percent per month, or 30 percent annually.

<sup>114</sup> Interview with PACT Microfinance Project Staff by World Bank, September 29, 2015.

Women own and manage enterprises, and are employed as workers in the same. They dominate self-run microbusinesses producing/selling food, handicrafts, and kitchen garden produce (also consumed). Women report loss of cooking appliances for care work, and they have also lost equipment/raw materials for handicraft, food, and kitchen garden production/sales. Kitchen gardens themselves have been destroyed. Compensation is required to replace this equipment and seeds for kitchen garden production, and damages and losses for women-owned small and medium enterprises need to be compensated.

**Housing.** The impact of the disaster on housing may have a profound impact on women-headed households, the disabled, and the elderly. While the national average for female-headed households is 23.7 percent, the average in affected states/regions is 25 percent. A total of K 151,490.89 million in damage and losses was borne by female-headed households Table 56. These households tend to be poorer and live in inferior-quality housing, which sustained more extensive damage than of male-headed households. Poverty and a lack of resources (including the ability to purchase labor) make housing reconstruction challenging for them. They will need targeted support in housing reconstruction measures, either through government/private sector rebuilding or monetary compensation for reconstruction materials and hire of laborers to rebuild.

**Table 56.**  
Damage and loss in housing faced by female-headed households

Total damage and losses (12 states/regions)	Damage	Loss	Total effects	Weighted % of female-headed households in affected sites	Effect on female-headed households (K) million
	Private	Private	Private		
<b>Total value of affected states (K) million</b>	<b>628,981.90</b>	<b>34,288.20</b>	<b>663,270.10</b>	<b>23%</b>	<b>151,490.89</b>

Source: Computed by UN Women on the basis of figures on damages and losses provided by assessment team, and data on female-headed households from the 2014 Myanmar census.

Women and children reported that loss of housing represented a loss of “their space,” in which they spent a greater part of their time. It reduced security and privacy levels for all women and girls, which was especially a concern for those menstruating, pregnant, and nursing. Shelters and tents often were designed without sensitivity to female needs: they were too cramped, with no partitions, ledges, or storage space; leaking or touching wet ground; lacking cooking, separate bathing, or toilet facilities; and lacking proper lighting. These features heightened privacy problems and intensified stress, especially for women with young children. They also increased vulnerability to sexual abuse.

Women reported that with loss of housing, they also lost important possessions, including cooking equipment, equipment and raw material for agriculture and home-based industries, goods stored for trade, “safety net savings,” food, water, fuel, baby carriers, and toys and educational material for children. The loss of these possessions directly damaged women’s economic assets and caused losses in livelihoods and incomes, increases in care work, fewer earning opportunities, and increased stress in coping.

## RECOVERY AND RECONSTRUCTION STRATEGY

**This recovery and reconstruction strategy for gender is closely aligned with the National Strategic Plan for the Advancement of Women 2013–2022**, with particular reference to the following: (i) improving women’s livelihoods/reducing poverty; (ii) increasing employment and access to economic assets and benefits; (iii) protecting women in emergencies and their participation in emergency preparedness, response, and disaster risk reduction; (iv) ensuring women’s equal participation in decision-making/leadership at all levels; and (v) eliminating and responding to violence against women and girls.



## RECOVERY AND RECONSTRUCTION PLAN

### **Short-term needs relate to data, compensation for death, decision making, women in the agricultural sector, infrastructure, and sexual and gender- based violence.**

1. Undertake detailed assessment of special needs of poor women and women-headed households in affected areas (K 130 million); prioritize them across all sectors in recovery plan.
2. Ensure payment of compensation at agreed rate of K 100,000 for all disaster-related deaths.
3. Prioritize poor women and female-headed households in provision of seeds to enable them to quickly replant; agricultural equipment and machinery to enable them to quickly clear their land; and equipment for cooking/home-based industries for livelihoods recovery,
4. Target women, especially female-headed and poor households, in poultry restocking. At least 80 percent of the recovery resources for restocking of poultry should specifically target women (K 17.6 million).
5. Provide cash assistance, no-interest loans, loan restructuring, and loan write-offs, prioritizing women and female-headed households.
6. Prioritize the reconstruction of houses of women-headed households by the government, private sector, and NGOs, and consult with women on design features and location. Where the above-mentioned stakeholders do not directly rebuild, provide women-headed households with cash/reconstruction inputs, so that they can hire laborers to rebuild. Ensure that new housing is jointly titled in the names of both spouses and, registered in the name of women who head households.
7. Employ women in cash for work reconstruction (housing, WASH, roads, bridges, canals) on an equal pay for equal work basis with men and with crèche facilities.
8. Repair and provide safe and appropriate water/sanitation, transportation, and energy facilities, and include women in village development committees to formulate, implement, and benefit from woman-sensitive water and sanitation solutions; safe and time-saving transportation, and safe and clean energy initiatives.
9. Ensure that shelters have design features appropriate for women: partitioned rooms, separate baths, lockable toilets, and good lighting to prevent triggers to sexual and gender-based violence.

### **Medium-term needs relate to data and disaster risk reduction.**

1. Strengthen the capacity of Myanmar's Central Statistical Organization, government departments at all levels, and the disaster response and recovery community in the country to (i) address the range of gender issues that arise in disasters, and (ii) collect, classify, analyze, and make publicly available data disaggregated by age, sex, and location.
2. Provide women/children with training on early warning, household/community preparedness, warning dissemination, and orderly/timely evacuation. Use media (radio, loudspeakers, or face-to-face communication) that poor rural women are comfortable with; impart information and training at times and in venues convenient to women (face-to-face group communication in the afternoons or nights outside one of their homes), and/or post pictorial information at sites they frequent (monasteries, water collection points, local markets, community centers). Draw on women's full participation in (i) capacity needs assessment/delivery, (ii) planning and operationalizing preparedness measures, and (iii) warning dissemination and evacuations. Train women to use mobile phones to increase their ability to respond to emergencies.
3. Provide women, girls, and boys with life-skills training, such as swimming, rowing, climbing, and martial arts, that contribute to enhancing security.
4. Facilitate women's leadership and develop their capacity to participate in formal decision-making in response and recovery so that their needs, interests, and perspectives shape recovery and development plans. Ensure a minimum representation rate for women of 30 percent in these decision-making mechanisms.

**Long-term needs relate to services supporting women’s care work; employment and livelihoods for women; infrastructure; and support services to survivors of sexual and gender-based violence.**

1. Provide child care services through public-private partnerships and state-run initiatives; support women’s social enterprises/collectives that provide care work that could employ women; free up time for poor women to earn incomes; invest in public goods/services (such as safe and time-saving domestic appliances, and clean/accessible energy, water, sanitation, and transportation) that reduce time spent on care work); and raise public awareness of men’s shared responsibility for care work to help divide it more equally (K 3,900 million).
2. Adopt policies/programs that expand women’s livelihoods and are not wholly agriculture-dependent. Recovery should target women-owned businesses, especially home-based and microenterprises with compensatory packages to cover losses/damages. Longer term, it is important to provide women with sector-specific business mentoring/marketing skills to help their businesses expand, while taking account of the particular constraints they face.
3. Provide agriculture extension services to women on crop production and livestock management, combined with training of female extension workers to ensure women’s access to these services (K 1,000 million).
4. Provide women with nontraditional job-skills training, including in energy, transportation, WASH, and construction, and encourage women’s enrollment in education in these sectors (K 2,600 million).
5. Establish one-stop centers in all states/regions to provide tailored legal aid, sexual and reproductive health services, psychosocial support, and hotlines to protect women from violence.

Priority activities and costing are provided in Table 57.

**Table 57.**  
Recovery needs:  
costing of priority activities

Activity	Cost (million K)	Time frame
<b>Short term</b>		
Early recovery psychosocial services	119.78	4 months
Longer-term psychosocial support, training of trainers	30	4 months
Early recovery	3.5	4 months
Study of special needs of female-headed households in affected areas	1,300	6 months from receipt of funds
Poultry restocking for women	17.6	4 months
Training in raising poultry for women in worst-affected sites		
Gender training to extension workers	1,300	
<b>Medium to long term</b>		
Support services for child care for poor women in 20 sites	3,900	2016-2018
Setting up a 1-stop service centers for gender-based violence survivors	1,000	2016–2018
Nontraditional market-related skills training for women	2,600	2016–2018
<b>Total</b>	<b>10,270.9</b>	

Source: Computed by UN Women on the basis of figures for livestock damages and losses provided by the assessment team.

## SECTOR ASSESSMENT METHODOLOGY

This chapter is anchored in secondary and primary data sources, in particular “Agriculture and Livelihood Flood Impact Assessment in Myanmar” (by the Food and Agriculture Organization [FAO] and the World Food Programme [WFP], 2015).

Baseline information came from the Myanmar Population and Housing Census 2014, Agriculture Census 2010, “Gender Equality and Women’s Rights in Myanmar: A Situation Analysis” (by MSWRR, United Nations, and Asian Development Bank (forthcoming), and “Gender and Agriculture Review” (by FAO and UN Women, forthcoming).

Secondary information on disaster impacts on women was based on “Multi-Cluster/Sector Rapid Assessment Report—Myanmar Floods and Cyclone Response” (by UNOCHA, September 2015); sector assessment reports, including “Agriculture and Livelihood Flood Impact Assessment in Myanmar”; the World Bank Social Impact Assessment; the gender-based violence assessment in Chin State by United Nations Population Fund (UNFPA); government updates; loss/damage costing data as part of the Post-Flood and -Landslide Needs Assessment; data from Myanmar government departments and ministries (including Department of Social Welfare and RRD under MSWRR, the Ministry of Agriculture and Irrigation, and the Ministry of Livestock, Fisheries and Rural Development); specific information from the World Bank and UN agencies (UNDP, UNFPA, UNICEF, FAO, Myanmar Information Management Unit, OCHA, and WFP); and the Gender Needs Assessment and project reports of NGOs (Gender Equality Network, Chin Human Rights Organization, Action Aid, Care, Oxfam, and PACT).

Primary data were collected through the following means:

- Key informant interviews and focus group discussions in the six worst-affected states/regions (19 townships and 38 villages), including Ayeyarwady (Ingapu, Ngathaingchaung, Yekyi); Bago (Monyo, Tharrawaddy, Waw); Chin (Falam); Magway (Sidoktaya, Pwint Phyu, Aunglan, Hakha); eastern Rakhine (Minbya, Mrauk-U, Kyauktaw); northern Rakhine (Buthitaung, Maungdaw); and Sagaing (Kawlin, Kantbalu, Kalay). Interviews were conducted with government officials and male and female market vendors. Focus group discussions were conducted with men and women (316 of each) via the Agriculture and Livelihood Flood Impact Assessment.
- Focus group discussions with 60 women in eastern Rakhine (in three townships and two villages), conducted by UN Women.
- Focus group discussions with 128 women in four states and regions in eight townships, including Chin (Matupi, Rezua), Magway (Sidoktaya, Pwint Phyu), Sagaing (Kawlin, Kantbalu), Rakhine (Myauk-U, Myinpya), and 16 villages. Discussions were part of Gender Equality Network’s Gender Needs Assessment; further discussions were held with the Gender Equality Network enumerators.
- Key informant interviews with project staff from UNDP, UNFPA, Action Aid, Care, Chin Human Rights Organization, Gender Equality Network, Gender and Development Institute, Oxfam, and PACT working in sites such as Rakhine, Sagaing, Magway, and Chin.



Debris after floods.  
Photo: © Enlightened Myanmar Research.

## Environment

### SUMMARY

While appreciable damages and losses were not reported for the environment sector, it is recognized that environmental degradation played a role in the 2015 floods and landslides, contributing to damages and losses in other sectors. Going forward, these drivers will continue to contribute to disaster risks. In order to manage these drivers and thereby reduce disaster risks, the following priorities were identified: (i) in the short term, ensure reconstruction efforts do not exacerbate future disaster risks; (ii) in the medium term, assess and strengthen capacity for environmental and land governance, through adopting policies and procedures, and through strengthening institutional capacity at all levels; and (iii) in the long term, promote ecosystem-based approaches to disaster risk reduction.

### PRE-DISASTER CONTEXT

Myanmar is located at the intersection of three different ecoregions: the Sino-Himalayan region in the north, the Indochinese region in the east, and the Malayan Peninsular region in the south. As a consequence, the country includes several ecological and climatic zones and contains diverse aquatic and terrestrial habitats and species. The four main rivers—Ayeyarwady, Chindwin, Sittaung, and Thanlwin—flow from north to south over a large area of the country and, along with large wetland areas and lakes, support extensive freshwater ecosystems. Beaches and dunes occur along most of Myanmar's extensive coastline, with coral reefs and seagrass beds featuring in the Myeik Archipelago, and estuaries and mud flats in the Ayeyarwady delta.

Myanmar has some of the most ecologically intact forests remaining in the Southeast Asia region. About 43 percent (or about 29 million ha) of the country is covered by natural forest, half of which is closed (i.e., in good condition) forest and the other half open (i.e., degraded) forest. The country's rich natural forest resources include evergreen forests in the southern part of the country, deciduous dipterocarp forests and thorn scrub in the central part, and subalpine forests in the north. In addition, Myanmar has the fourth-largest area of mangroves in Asia, which covered an estimated area of 467,330 ha (or 1.47 percent of Myanmar's total forest area) in 2010, mostly on the Ayeyarwady floodplains, but also in Tanintharyi and a small area of Rakhine.

Between 2010 and 2015, Myanmar is estimated to have lost about 546,000 ha of forest, or 1.7 percent of the 2010 forest area, representing the third-largest loss of forest area in the world during this period, behind only Brazil and Indonesia. This is in addition to the estimated 7.4 million ha (about 20 percent) of forest lost during the previous two decades (1990–2010). During the last five years, the proportion of closed forest in total forest area has declined significantly.

Myanmar's forest cover comprises several classifications of forest land, which signify different levels of legal protection. The largest category is Permanent Forest Estate (PFE), which is divided into

- **Reserved forests**, intended for multiple purposes, for both conservation and sustainable forest use
- **Protected public forests**, intended primarily for conservation purposes, although some logging is permitted
- **Protected areas**, including national parks, nature and wildlife reserves, and other conservation areas, where no use is permitted except for conservation purposes

A second category is Non-Permanent Forest Estates, including public forests and so-called wastelands.

Management of PFE is the responsibility of the Ministry of Environmental Conservation and Forestry (MOECAF), Forest Department (FD). Although the PFE currently covers approximately 24 percent

of total land area, the target is to expand this to 30 percent. This target will likely be difficult to achieve, however, given the limited effective protection and significant demand for land for various uses. As a result of significant past and continuing encroachment, including for large-scale agriculture development in particular, much of the land classified as reserved forest is de facto in other land uses. Protected public forests tend to be better demarcated and relatively less susceptible to encroachment. There are currently 34 protected areas, but these are not adequately representative of the country's diverse ecology and biodiversity; moreover, the designation offers limited effective protection, as these areas are generally understaffed and undermanaged. Public forests (aka unclassified forests) are not gazetted or classified as PFE but fall under the Forest Law and are the responsibility of the MOECA, FD.

The main contributors to loss and degradation of forest area are conversion for large-scale agriculture and mining; dam development for irrigation and hydropower; overexploitation of timber, including from illegal logging and exceeding annual allowable cut limits; shifting cultivation in upland areas; and a heavy reliance on wood as the primary energy source, particularly for cooking and heating, in rural areas.

Public forests, along with so-called wastelands, are under significant conversion pressure for agriculture and other development, including mining. Under the Vacant, Fallow and Virgin Land Law (2012), "virgin" land is defined as any land that has not been previously cultivated (including forest lands that are not gazetted or reserved), and "vacant and fallow" land is defined as land that had been cultivated and consequently abandoned (including shrub land and secondary forests in shifting cultivation areas). The Central Committee for the Management of Vacant, Fallow and Virgin Lands, an interministerial committee chaired by the minister of the Ministry of Agriculture and Irrigation (MOAI), may make a request to MOECA, FD to use "virgin" land for agriculture development purposes. The committee also oversees the granting and monitoring of use rights over vacant, fallow, and virgin lands for agriculture, mining, and other allowable purposes under the Vacant, Fallow and Virgin Land Law.

Dam development is also an important driver of deforestation, as large areas of forest are often submerged by reservoirs. In support of agricultural development and power generation, dams and reservoirs are being constructed at a rapid rate in Myanmar. To date, the MOAI has constructed over 371 dams and has plans for many more. A significant number of the dams (about 67, or 18 percent) do not yet have associated canals and irrigation infrastructure. Moreover, only a fraction of the watersheds above these dams are being actively managed, since MOECA, FD has limited resources allocated for watershed management.

Logging, both legal and illegal, also contributes to deforestation. The Myanmar Selection System, a silvicultural system that is in principle well suited for use in complex multispecies forests, focuses on selective extraction of mature trees while protecting immature stock. The system defines the annual allowable cut—that is, the size and number of trees that can be extracted per year. In practice, however, Myanmar's forest management system has not been implemented as intended; the annual allowable cut is often not strictly applied, and the result has been systematic overexploitation.

A key driver of illegal logging is demand from the wood-processing industries in China, Vietnam, and Thailand. While these countries have strict logging controls in their own natural forests, they have continued to source raw materials, often illegally, from Myanmar, which still has stocks of valuable species, notably teak and rosewood. In April 2014, Myanmar enacted a log export ban in an effort to slow the rate of forest loss. Nonetheless, significant illegal cross-border trade has continued. More recently, bilateral discussions between Myanmar and China resulted in the China State Forest Administration putting in place a temporary log import ban (September 1 to December 31 2015) to give some time for an assessment of the situation.

Shifting cultivation by smallholder farmers is common in public forests. If practiced on a sufficient rotational basis, shifting cultivation is sustainable and compatible with management of natural forests. However, as upland populations grow and traditional lands are lost to other uses, fallow periods have

shortened. As a result, shifting cultivation has spread into new forest land, and degraded areas with reduced regeneration potential have increased.

Given relatively limited access to electricity, from both on-grid and off-grid sources, both rural and urban households are heavily dependent on biomass energy, which contributes more than 60 percent of the total energy consumption and is used by more than 70 percent of the population. Wood is the largest source of biomass energy, and households are heavily dependent on fuelwood and charcoal, particularly for cooking. It is estimated that the total annual fuelwood demand is about 20 million cubic tons,<sup>115</sup> which puts tremendous pressure on forests. To help meet this demand, the FD has started to establish designated village supply plantations in degraded reserved forests and protected public forests.

Like other forests, mangroves have long been exploited for charcoal and firewood for cooking, and they are under intense pressure due both to overexploitation to conversion of growing areas to other uses, particularly agricultural expansion and conversion to fish ponds and shrimp ponds. In Ayeyarwady Region in particular, mangroves have been degraded because of overexploitation to meet the demand for fuelwood from the large population nearby. Given lower population density and a more sheltered coastal landscape in Rakhine State and Tanintharyi Region, mangroves in these areas are under less intense pressure.

Myanmar enacted the Environment Conservation Law in 2012 and adopted the related implementing regulations the following year. MOECAF is responsible for coordinating implementation of this law and also has specific regulatory responsibilities for developing and implementing environmental management systems. MOECAF's Environmental Conservation Department (ECD) is responsible for Environmental and Social Impact Assessments (EIA) of private investments issuing environmental compliance certification through the Myanmar Investment Commission. Recently ECD finalized the drafting of new environment impact assessment procedures, which broaden the requirement for EIA to also cover public investment. The EIA procedures are under review by the cabinet and are expected to be in place soon. Nonetheless, ECD has limited capacity to implement the new EIA and regulations, and requires more staff and significant capacity building to be able to fulfill its expanded mandate.

## POST-DISASTER SITUATION

**Effects on natural environment and environmental management and governance.** MOECAF reported that overall, the 2015 floods and landslides caused minimal damage to or losses of natural forests, protected areas, or wildlife. In most of the affected areas, the extent of the impact was within the natural system's ability to recover in the short term, and system stability was not adversely affected. In the areas affected by landslides, particularly in Chin State, there were localized severe effects from which recovery will take longer, and significant resources will be needed to plan, design, and put in place structural and biological measures to stabilize slopes.

While disasters can affect institutions responsible for environmental management and governance, MOECAF reported that such effects were limited as a result of the recent floods and landslides. Damage to physical resources, including MOECAF infrastructure, vehicles, equipment, data-gathering systems, and data records, were relatively minor and were reported and accounted for under the agriculture sector. MOECAF further reported that staff capacity in the affected areas was not disrupted appreciably.

In post-disaster settings, there may be pressure on the environmental ministries not to enforce environmental regulations in an attempt to help speed recovery. In the aftermath of the recent floods and landslides, there will be significant demand both for timber for reconstruction of houses and other

<sup>115</sup> A "timber" cubic ton equals 40 cubic feet, or 1.133 cubic metres.

structures, and for fuelwood for production of housing materials (e.g., bricks). Also, under normal circumstances, rural populations rely heavily on wood as a fuel source for cooking and heating. The floods and landslides have displaced significant numbers of people, and these people will need to source fuelwood from other areas than their location. MOECAFD is aware of the need to monitor the situation to ensure that the geographic shift of fuelwood demand does not adversely affect PFE, particularly protected public forests and protected areas.

In post-disaster settings, there also may be impacts associated with reconstruction and repair to damaged infrastructure if done without appropriate environmental controls. In the case of Myanmar, environmental controls are still weak. As noted above, revised environment impact assessment procedures are still under review by the cabinet and not yet in effect. Without appropriate environmental review and controls, there is a risk that the reconstruction work could cause unintended impacts on the environment. For example, in the case of demolition and reconstruction of damaged infrastructure, it will be important to give sufficient attention to appropriate sourcing of construction materials. Also, careful planning and implementation will be needed for disposal of debris and rubble, including early identification of suitable disposal sites accessible from affected areas, and for disposal of landslide materials (either on site or off site).

Effects on risks and vulnerabilities. Environmental degradation can aggravate the effects of natural hazards, and thereby act as an environmental driver of disaster risks. Changes in land cover and land uses, which affect the ability of water to infiltrate and be stored in the soil column for slow release, are known to increase runoff, and thereby exacerbate soil erosion and flooding.

Land-use and land-cover changes can affect flood risks as well as seasonal water availability. Alterations in catchment surface characteristics (e.g., land cover and land uses that compact soil or otherwise limit soil's permeability and capacity to store water) can modify the physical characteristics of river floods. The reduction in forests and wetland areas, for example, means that these ecosystems will play a smaller role in buffering flood events. The role of mangroves in dampening the effects of coastal storms, wind, and tidal surges on coastal lands and nearby infrastructure is also well-recognized; thus damage to mangroves can result in increased coastal flooding. Moreover, changes in land use are known to influence the scale and extent of erosion. For example, the loss and degradation of forest areas affects the velocity and intensity of runoff and thereby increases the amount of soil erosion and sedimentation. Mine tailings also increase sedimentation of reservoirs and rivers.

The sediment load in a river system is influenced by the amount of natural and human-influenced erosion in the river basin, as well as by construction of dams and reservoirs that trap sediment upstream. Sediment load contributes significantly to the river's physical, chemical, and biological characteristics, including navigability, water and habitat quality, conveyance capacity, and flood risk. In Myanmar, a 2011 study concluded that changes in land use over time in the Ayeyarwady basin have affected the hydrology of the basin, which in turn has influenced the sediment load and flux.<sup>116</sup> The study further concluded that changes in water flow and sediment flux in the river in both wet and dry seasons can have significant implications for seasonal water availability and flood risks. Sediment-related flood damages can be significant. In the 2015 floods, extensive overbank deposition of coarse sediments caused significant damage to farmland, residential property, and public infrastructure.

## RECOVERY AND RECONSTRUCTION STRATEGY

The extent of the devastation caused by the 2015 multi-hazard disaster, and a growing awareness of how underlying environmental factors contribute to disaster-related damages and losses in key sectors, present a significant opportunity to address within the recovery strategy some long-standing issues related to managing the environment and natural resources—and in this way reduce disaster risks in future. The proposed strategy focuses on three strategic elements within three different time frames:

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<sup>116</sup> Win (2011).



- Short term (within four months): Ensure reconstruction efforts do not exacerbate future disaster risks.
- Medium term (within one year): Assess and strengthen capacity for environmental and land governance, through adopting policies and procedures and strengthening institutional capacity at all levels.
- Long term (more than two years): Promote ecosystem-based approaches to disaster risk reduction.

## RECOVERY AND RECONSTRUCTION PLAN

To achieve these objectives, the following priority work areas are proposed.

### **Ensuring appropriate siting for waste disposal and sourcing of reconstruction materials.**

During the reconstruction period, MOECAAF should provide guidance to affected states/regions and townships on (i) criteria for appropriate siting for disposal of demolition rubble, construction debris, and sediment; and (ii) environmental screening for sourcing of reconstruction materials that is compatible with disaster risk management.

**Deriving environment-related lessons for disaster risk reduction.** An ex post systematic environmental assessment in the disaster-affected areas should be conducted. By providing information on the relationship between environmental degradation and disaster risks and how environmental management can contribute to disaster risk management, this assessment will offer important lessons for future disasters.

**Strengthening environmental and land governance.** This would include (i) approval of the draft EIA procedures, capacity assessment of the procedures, implementation of the new procedures, as well as increased staffing and budget for effective implementation of the EIA system; and (ii) approval of draft National Land Use Policy, and undertaking a land governance assessment.

**Promoting ecosystem-based approaches to disaster risk reduction.** Sustainable natural resource management can be a significant contributor to a disaster risk reduction strategy, since healthy and diverse ecosystems are more resilient to hazards. Improved land-use planning and management would help to proactively use ecosystems as disaster-reduction measures. Improving and maintaining good land cover and soil integrity would increase infiltration and allow water to be stored in the soil column, thereby slowing runoff and decreasing risks of flood and sediment-related damages and losses. For example, restoring or preserving forests and wetlands can lower potential flood risks. Forests provide shelterbelts and windbreaks and stabilize soil and reduce soil erosion. Wetlands are a natural sponge and capable of absorbing floodwaters; research has found that maintaining a relatively small area of wetlands can reduce peak stream flows by a significant amount compared with no wetlands.

Work in this area would include (i) rationalizing the legal framework for land management; (ii) strengthening coastal and wetland (including mangrove) management; (iii) strengthening forest exploitation and management and watershed management; (iv) conducting strategic environmental assessments of key sectors, especially large-scale agriculture, mining, infrastructure, and dam development programs; and (v) introducing measures to reduce current overreliance on fuelwood, including more efficient stoves, increased energy access (from both grid and nongrid renewable sources), and increased use of biofuels.

Table 58 presents the prioritization, sequencing, and costing of recovery activities to be implemented under each of the work areas described above.

**Table 58.**

Recovery and reconstruction needs (million K)

Short term (< 4 months)				
Area	Program of activity	Value (million)	Responsible Agency	
Environmental governance	Approve EIA procedures and disseminate	Negligible	Cabinet MOECAF, ECD	
Land governance	Approve National Land Use Policy	Negligible	National Land Resource Management Committee; MOECAF, FD	
Environmental conservation	Provide advice on appropriate disposal of debris and sediment	Negligible	MOECAF, ECD	
Forest	Provide advice on appropriate sourcing of timber and fuelwood for reconstruction	Negligible	MoECAF, FD	
<b>Subtotal</b>			<b>No increment</b>	
Medium term (1 year)				
Area	Program of activity	Value (million)	Responsible agency	
Environmental assessment	Capacity building in key sector ministries	200	MOECAF, ECD	
Land	Land governance assessment	300	National Land Resource Management Committee MOECAF, FD	
Environmental assessment	Systematic Environmental Assessment for Disaster Risk Management	200	MOECAF, ECD	
Watershed management	Watershed Management Assessment Tool	1,000		
<b>Subtotal</b>		<b>1,700</b>		
Long term (1-3 years)				
Area	Program of activity	Value (million)	Responsible agency	
Environmental assessment	Increased staffing for implementation of new EIA procedures	1,000		
Environmental assessment	Strategic environmental assessment for key sectors	1,000		
Forest and watershed management	Strengthened watershed management and natural forest management, including mangroves (including through REDD+)	60,000		
Forest management	Reduce fuelwood dependence	1,000	MOECAF, FD; MOAI	
<b>Subtotal</b>		<b>63,000</b>		
<b>TOTAL</b>		<b>64,700</b>		

Source: Assessment team.

## IMPLEMENTATION STRATEGY AND ARRANGEMENTS FOR RECOVERY

The MOECAFD and ECD are the central departments for the environment-related recovery effort, but MOAI is also a key player. On land, the FD acts as the Secretariat for the National Land Resource Management Committee, and it has coordinated the recent work on the National Land Use Policy with other key agencies, including MOAI. Going forward, FD will continue to have a key coordinating role with the Attorney General's Office in drafting the proposed umbrella Land Law and will also be involved in the proposed land governance assessment.

ECD has the lead role in strategic environmental assessments in key sectors, as well as in implementation of the new EIA procedures (which are expected to be approved soon).

The National Electrification Program will expand access to electricity from on-grid and off-grid sources and so contribute significantly to reducing reliance on fuelwood; but the program will take decades to roll out to the entire country. In the interim, the FD has a continuing role to play in village plantations. The MOAI also has a key role in promoting the use of agro-waste for fuel (direct combustion) as well as biofuels.

## SECTOR ASSESSMENT METHODOLOGY

No field visits or surveys were conducted for the environment sector assessment. The chapter was based on detailed face-to-face consultations with MOECAFD, ECD, and FD; with Myanmar Forestry Association; and with individual experts and advisors. In addition, available reports were consulted as references.



31.7.2015

Flood line in Magway  
Photo: © World Bank.

## Disaster Risk Management

### SUMMARY

**The floods and landslides caused destruction of public and private infrastructure, including houses, railways, roads, bridges, schools, health facilities, and monasteries, with extensive impacts on the agriculture and other sectors.** Strengthened disaster risk management (DRM) systems will play a critical role in coordinating and informing the resilient recovery and reconstruction of Myanmar, and in preventing future such disasters in the country. In order to manage risks in this multi-hazard environment, the government needs to strengthen its capacity to understand, assess, and anticipate future disasters, and it also needs to improve both physical and financial preparedness systems. The following priorities will help to achieve these goals: (i) public awareness and community engagement through community-based DRM, (ii) strengthened risk assessment and risk information systems, (iii) development of DRM financing instruments, (iv) strengthened disaster risk governance and mainstreaming of DRM, and (v) enhanced disaster preparedness.

### PRE-DISASTER CONTEXT

**DRM institutional arrangements.** A positive impact of Cyclone Nargis was that it increased government's awareness of the need to plan and prepare for future disasters, and of the need for prevention, mitigation, and community awareness activities.<sup>117</sup> At the national level, the National Natural Disaster Management Committee (NNDMC) is the apex body for disaster management in the country. It has the authority to formulate disaster management policies, issue guidelines, and activate working committees.<sup>118</sup> These committees are dormant in normal times, and get activated by the NNDMC, on a case-by-case and needs basis, to respond to medium to large disasters. At the subnational level, interdepartmental disaster management committees are chaired respectively by the chief minister at state/region level, the district commissioner at district level, and the township administrator at township level. These subnational committees are also typically activated only after a disaster has happened. The Relief and Resettlement Department (RRD) under the Ministry of Social Welfare, Relief and Resettlement (MSWRR) is responsible for the coordination of DRM activities in the country.<sup>119</sup> However, although RRD has the mandate for DRM,<sup>120</sup> limited financial<sup>121</sup> and human resources, combined with lack of interministerial convening power and limited presence below state/region level,<sup>122</sup> make it challenging for the department to perform these wide-ranging responsibilities and coordinate and influence the work of a number of line ministries.

**DRM legal arrangements.** In 2009, the government issued Standing Order on Disaster Management, which outlined the roles of each ministry before, during, and after a disaster to increase preparedness and response capacity. In 2013, the government enacted the Disaster Management Law and the supporting Disaster Management Rules were issued in July 2015. The Disaster Management Rules require all ministries and administrative units to prepare standing orders and disaster management plans in order to promote systematic and effective risk reduction as well as preparedness and response. At the time of the floods and landslides, however, the Rules had not yet been disseminated; accordingly enforcement and application of both the Law and Rules were weak.

<sup>117</sup> TCG 2009.

<sup>118</sup> The Disaster Management Law (2013) and the Natural Disaster Management Law – Rules and Regulations (2015) describe the mandate and responsibilities of the different institutions involved in DRM. See Annex 5 for further details.

<sup>119</sup> The RRD acts in its capacity as Secretariat of the NNDMC.

<sup>120</sup> See the Natural Disaster Management Law, Rules and Regulations, Chapter IV.

<sup>121</sup> According to UNICEF's calculations based on the BOOST database and union budget, MSWRR's budget has fluctuated between US\$15 million and US\$16 million in the last two years (0.07–0.08 percent of the union's budget), with RRD absorbing around 31 percent of the ministry's budget.

<sup>122</sup> RRD's institutional footprint reaches down only to the state/region level and to a limited number of districts and townships identified as high risk.

**DRM financing.** The budget for RRD, which is meant to have the responsibility for coordinating DRM, is very small (Table 59). There has not been an assessment of all DRM expenditures throughout the government.

**Table 59.**  
Budget of the  
Relief and  
Resettlement  
Department,  
2009/2010–  
2015/2016  
(million K)

	2009/ 2010	2010/ 2011	2011/ 2012	2012/ 2013	2013/ 2014	2014/ 2015	2015/ 2016
MSWRR	4,362	5,160	4,904	9,101	10,898	16,578	15,369
RRD	1,389	1,206	1,564	3,671	3,156	--	--
Government budget	5,472,944	6,670,326	7,144,622	12,613,339	15,199,400	20,995,251	20,613,750

Source: 2009/2010–2013/2014 data from BOOST database; 2014/2015–2015/2016 data from the union budget.

Note: -- = not available. The budget for RRD is not a fully adequate proxy for the DRM sector budget, given that it omits important infrastructure and other investments that build disaster resilience. However, the government of Myanmar does not have a DRM financial tracking system and currently uses the total budgets of RRD, the Fire Services Department, and the Emergency Reserve Fund as a proxy for DRM spending in the Hyogo Framework for Action reporting system. The Emergency Reserve Fund, however, is spent on relief operations only if a national disaster is declared and should not be accounted as DRM spending.

The Disaster Management Law and Rules have provisions for a Disaster Management Fund that would finance disaster-related activities at national and subnational level.<sup>123</sup> The fund has only recently been activated,<sup>124</sup> so it has not had an impact on response activities or risk reduction activities to date. The budget reserve fund (or President's Reserve Fund) is allocated at the union level under the Union Budget Law and can be accessed by ministries and states/regions with the approval of the cabinet for urgent and priority needs, including (but not limited to) disaster response. The allocation to the fund is K 100 billion and is replenished every year. Myanmar does not currently have a strategy or policy in place to systematically manage the financial impact of natural disasters. Overall, limited budgetary provision is made, and preliminary analysis suggests that current disaster funds are insufficient to cover even recurrent losses. The government remains exposed to extreme events, and relies heavily on international donor assistance for response, relief, and recovery.

**Hazard monitoring and warning dissemination.** The Department of Meteorology and Hydrology (DMH) is the National Hydro-Meteorological Service of Myanmar and responsible for monitoring, forecasting, and warning for severe weather and hydrological and tsunami events. In addition, various departments (such as the Irrigation and Agriculture departments in the Ministry of Agriculture and Irrigation) have their own observation stations. However, there is no data sharing among these agencies, and the numbers of observation stations are well below World Meteorological Organization recommendations for all types of observation.

With the above limitations, at present DMH is able to provide good general forecasts (daily, 3-day, 10-day, monthly, and seasonal). However, it is unable to meet the specific requirements of many of its stakeholders or to provide accurate forecasting of rainfall intensity in the remote catchment areas (a failing that impacts dam safety and irrigation networks). As a consequence, DMH's capacity to detect and forecast flash floods and riverine floods is limited. A modernization process is under way to strengthen the system.

The National Multi-Hazard Early Warning Center, established in July 2006 and operated by DMH, is responsible for issuance of early warning for hydrometeorological, geological, and maritime-related hazards to all public authorities and stakeholders. In addition, the NNDMC is supported by the Emergency Operation Center (EOC) with real-time hazard information collected from regional and global networks.

<sup>123</sup> The fund is chaired by the deputy minister of finance; the secretary is the permanent secretary of MSWRR.

<sup>124</sup> As of the time this report was prepared, the regulations for the use of the fund had been drafted but had yet to be shared or discussed with stakeholders.

When flood danger levels are reached, DMH collects rainfall and river-level data much more often, and issues hourly forecasts. These forecasts and flood warnings are shared with the media and state/region governments, which in turn disseminate downward using administrative channels. Recent developments in telecommunications in Myanmar, in particular the increased mobile coverage, also help communities to promptly receive the early warning from different information sources. However, communities residing in the most remote areas remain hard to reach through traditional warning dissemination systems as well as new technologies.

**Risk assessment capacity.** DMH provides meteorological, hydrological, and seismological information to authorities from the transport, health, agriculture, construction, and tourism sectors to assist in development planning; but this is limited to single-hazard maps for floods and tsunamis. A hazard profile of Myanmar was developed in 2009 based on the historical data.<sup>125</sup> Professional societies such as the Myanmar Geo-Sciences Society and Myanmar Engineering Society have developed hazard-specific maps (earthquake, landslides) for various spatial scales. Over the past few years a number of geographically targeted and hazard-specific assessments were undertaken with the support of development partners.<sup>126</sup> However, these efforts have remained fragmented and have lacked a comparable methodology. Other layers of risk assessment data, in particular exposure and vulnerability data, are lacking or outdated. Historical hazard data are also incomplete, although RRD is establishing a National Disaster Damage and Loss Database.<sup>127</sup> RRD is also in the process of finalizing a road map that establishes a common vision and objectives for a national risk assessment and that identifies the steps, roles and responsibilities, and resources that will be needed to develop a national risk atlas within the next five years.<sup>128</sup>

## POST-DISASTER SITUATION

**Emergency operations, relief.** The National Disaster Management Committee started search-and-rescue and emergency relief operations in late July. On July 31, the president declared Chin and Rakhine States and Magway and Sagaing Regions to be natural disaster zones. The National Natural Disaster Management Working Committee (NNDMWC) took the lead in emergency coordination, communication, and relief-item distribution; it also took the lead in facilitating the inflow of international assistance (cash and in-kind) and in conducting immediate needs assessments. The NNDMWC was supported by the EOC, which was established under the Relief and Resettlement Department in mid-2014 to provide situational awareness and support emergency operations. Regional bodies (ASEAN-ERAT), UN agencies, international organizations, and Red Cross staff were also deployed at the EOC to provide technical support, primarily in the areas of logistics and ICT (information and communication technology) systems, intragovernmental coordination, and information management and reporting. Although the EOC greatly contributed to the response efforts, there is a need to adapt its systems to the country context and to further strengthen the capacity of its staff. The EOC indeed faced several challenges, such as difficult communication with authorities at the state/region level, lack of standardized data collection formats, and limited information management and reporting capacity.

With help from international agencies, the EOC was able to produce six situation reports that provided key information on the identified needs and ongoing response efforts. Other information management products, however, had to be deprioritized because of human resource constraints. In spite of the presence of international partners in the EOC, the linkages between the national institutional framework and the international humanitarian community were limited, in particular at the sectoral level. This was mainly because the subcommittees under the NNDMC were never fully

<sup>125</sup> Union of Myanmar, MES, MGS, MIMU and ADPC 2009.

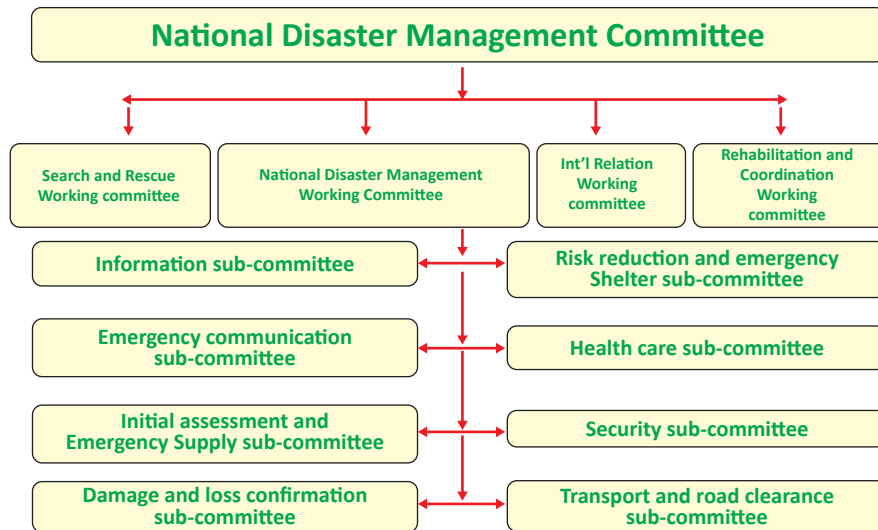
<sup>126</sup> UNDP Myanmar 2011; RRD and UNDP Myanmar 2011.

<sup>127</sup> The work is being carried out in conjunction with the United Nations Development Programme and UN-Habitat.

<sup>128</sup> RRD, UNICEF, and ADPC 2015.

activated, but also partly because most international humanitarian agencies operate from Yangon while the subcommittees are based in Nay Pyi Taw. There is a need to strengthen the role of the EOC in bringing together line ministries, subcommittees, and international sectors and clusters to increase the effectiveness of the response. An overview of the response and recovery coordination structure is included in Figure 39.

**Figure 39.**  
National response and recovery coordination structure for 2015 floods and landslides



Source: Relief and Resettlement Department.

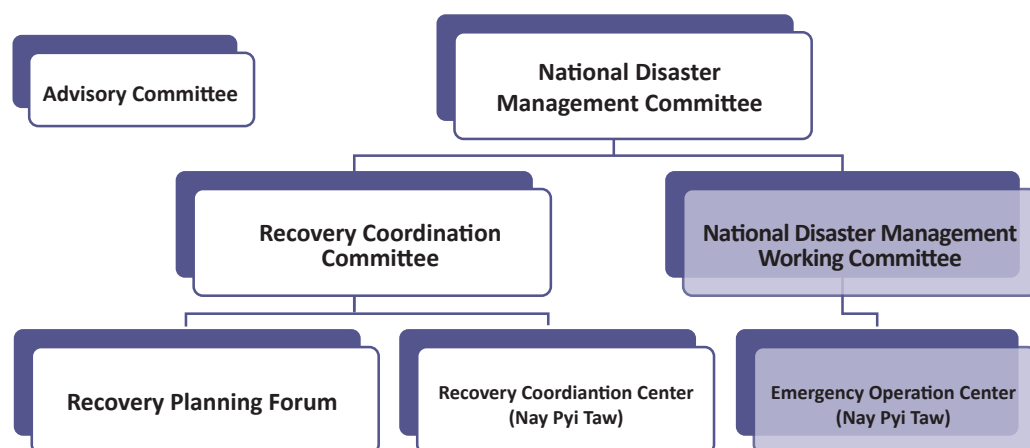
Emergency coordination at the subnational level was led by respective local governments, using varying models (see Box 2) and achieving different levels of effectiveness. Overall, there was a recognized vertical coordination gap between the national and the subnational levels, as well as a horizontal gap among the different branches of local government in affected townships. These gaps affected the allocation of emergency funds and relief items; some areas received a higher level of support in spite of being relatively less affected. In addition to government, civil society organizations and the private sector actively participated in the emergency operations and provided relief materials; there was a broad mobilization of the public under the slogan “Save Myanmar.”

**Box 2.**  
State/region- and township-level response

A rapid qualitative survey was carried out by the Disaster Risk Reduction Working Group (DRR WG) in five affected townships. The results indicated that response and recovery activities at the state/region level varied significantly from one area to another. For instance, Chin State established a state-level 10-member Rehabilitation and Reconstruction Committee, chaired by the chief minister, to lead relief efforts, while Ayeyarwady focused on the township level, and the regional government took a supporting role. In terms of early warning, some townships reported receiving information well before the flood event (e.g., Hintada Township); others were given very little notice, undermining their preparedness efforts (e.g., Kalay Township). A few townships reportedly relied on information received through social media (e.g., Hakha Township), while others struggled to share the information down to the village level due to disrupted communication services (e.g., Kalay). Almost all townships reported having disaster management plans and committees, but the content of those plans was not always adapted to the local risk profile, nor were the committees formally activated in most places. Previous disaster experience, timely early warning, investment in mitigation, and presence of safe shelters have been identified by the assessed townships as critical elements in the disaster management system performance at the local level. All assessed townships identified the need to increase investment in disaster mitigation, awareness-raising, and capacity development.



**Transition from relief to recovery.** The government of Myanmar transitioned rapidly from the relief to the recovery phase in line with international standards. In order to effectively manage the recovery planning and implementation process, the NNDMC constituted the Recovery Coordination Committee (RCC) under the leadership of the Ministry of Construction. Recovery coordination centers were also opened in Yangon, Mandalay, and Nay Pyi Taw, although the extent to which these centers were effective in coordinating subnational recovery efforts remains unclear (Figure 40). As a first step, the RCC was tasked with collection of detailed loss and damage data. However the RCC faced a number of challenges in collecting reliable data in a timely manner, compiling and analyzing these data, and facilitating a multi-sectoral and bottom-up recovery planning process.



**Figure 40.** Recovery Coordination Committee as part of the national response and recovery coordination structure for 2015 flood and landslides

Source: H. E. U Nyan Tun, Myanmar vice president and National Natural Disaster Management Committee chair, presentation at Nay Pyi Taw, August 14, 2015.

The RCC is in the early stage of its establishment. It is now supported by a newly established Advisory Group, composed of experienced sector specialists, for the purpose of recovery planning. This Post-Flood and -Landslide Needs Assessment (PFLNA) is also meant to support the recovery planning process, and in the coming weeks the RCC-led sectoral plans should be combined with PFLNA recovery needs to form a comprehensive recovery framework. The role of RCC is then expected to become more prominent for coordinating recovery among the different actors, monitoring implementation, and communicating progress to key stakeholders, including the donor community. In this regard, there is an urgent need for the RCC to have a stronger institutional structure and capacity at both union and subnational levels. In addition, the recovery capacity and coordination mechanism of the NNDMC should be strengthened for future disasters. This includes building the capacity of RCC in post-disaster needs assessments, recovery planning and programming, institutional arrangements and coordination, resource mobilization and communication, and monitoring, in order to ensure a well-planned recovery in the future.

**Disaster response financing.** By August 9, when the affected population exceeded 1 million people, the government had mobilized K 488 million for response and received about the same amount in cash assistance from international partners. By October 5, a combined contribution of over K 187 billion had been committed to response activities, according to the government of Myanmar and the UN Financial Tracking Service. In total, the government has allocated K 42.2 billion from the President's Reserve Fund, K 6.5 billion from the national government, and K 22.3 billion from state/region governments, as well as contributions from private sector and civil society. The government of Myanmar has been promised K 22.8 billion from international partners, although much of this amount has yet to be received. The government appears to have faced challenges in mobilizing funding necessary to meet the extensive needs of the impacts of the floods and has limited budget flexibility, especially as the government goes into an election in early November. While the government was able to draw on the President's Reserve Fund for emergency funding, there remain concerns that regular

budget lines in line ministries have been diverted toward recovery and reconstruction activities, and away from sectoral development activities. The absence of insurance coverage in the country has placed extra burden on the government to support households in recovering from the floods.

## ESTIMATED VALUE OF THE EFFECTS AND THE IMPACT OF THE DISASTER ON THE SECTOR

**Damages to DRM systems were negligible—amounting to K 0.27 million—and included only a few damages to the Department of Meteorology and Hydrology’s office buildings and equipment.** Losses were calculated based on the budget allocated to relief activities, as well as materials and food provided throughout the disaster that were not accounted for in other sectors. Losses also do not include the cost associated with search and rescue, which amounted to almost K 24 billion. It is important to note that two members of the search and rescue teams operated by the Fire Services Department lost their lives during the disaster, highlighting the need for increased investment in relief workers’ health and safety. The geographic distribution of damage and losses is provided in Table 60.

**Table 60.**  
Geographic  
distribution of  
damage and  
losses by state  
and region  
(million K)

State/Region	Damage Public	Loss Public	Total effects Public
Ayeyarwady	0	6,115	6,115
Bago	0	3,024	3,024
Chin	0	1,082	1,082
Kachin	0	216	216
Kayin	0	2,767	2,767
Mandalay	0	305	305
Mon	0	207	207
Rakhine	2	2,991	2,993
Sagaing	21	1,559	1,579
Shan	0	3,257	3,257
Yangon	0	625	625
Magway	5	1,726	1,730
<b>Total</b>	<b>27</b>	<b>23,674</b>	<b>23,701</b>

Source: MSWRR data taken from line ministries’ reports on relief and response spending.  
Note: There are no private sector effects.

## RECOVERY AND RECONSTRUCTION STRATEGY

**Despite the devastation that was caused by the multi-hazard disaster, the event presents many opportunities to learn and reinvigorate DRM systems in the country.** The current context also presents a key opportunity for resilient recovery, as highlighted in each of the sectoral chapters. The present strategy focuses on strengthening the DRM system itself according to the following strategic objectives:

- Short term (within four months): Strengthen the understanding of the disaster event (including the performance of the DRM system at all levels) and capitalize on increased awareness to operationalize key DRM policies and instruments (Disaster Management Rules, Disaster Management Fund, etc.).
- Medium term (within one year): Strengthen institutional capacity for disaster risk management at all levels through improved risk assessment systems, comprehensive and inclusive DRM policies, capacity development for policy implementation, and enhanced community engagement in DRM.

- Long term (within five years): Integrate disaster and climate risk management into national development planning and budgeting and scale up DRM implementation at all levels.

In order to achieve these overall objectives, the following five priority work streams are proposed, each of which is associated with a specific gap or need.

1. **Awareness raising and community engagement through community-based DRM.** Communities' awareness of disaster risk is low, undermining their capacity to prepare for, mitigate the impacts of, and respond to the next disaster. Public awareness and education initiatives have had limited coverage and impact at the grassroots level. Furthermore, community-based DRM activities are typically driven by external agencies, resulting in issues of scale and sustainability. A more comprehensive, strategic, and sustained investment in both public awareness of and community participation in DRM is therefore required to build resilience at the grassroots level, with a particular focus on reaching vulnerable groups and linking community resilience efforts to the formal DRM structures.
2. **Strengthening risk assessment and risk information systems.** There is no comprehensive national risk assessment in Myanmar; and although early warning and forecasting capacity has improved substantially in the last decade, it requires further strengthening and increased investment. With rapid telecommunication changes, Myanmar can take advantage of newly affordable technologies to improve the collection, management, and applications of risk data and information.
3. **DRM financing and financial protection.** A disaster management fund has been established; however, it is not yet clear how the resources will be mobilized. Myanmar does not currently have a strategy or policy in place to systematically manage the financial impact of natural disasters. The government has a unique opportunity to design new financing instruments that are able to effectively address post-disaster funding needs—from emergency response to long-term reconstruction—for events of different frequency and severity.
4. **Strengthening disaster risk governance and mainstreaming.** Based on learning from the floods and landslides, there is a need to streamline and strengthen institutional arrangements for DRM at both union and subnational levels. This will be particularly important for the RCC in the short to medium term, given their role in monitoring the implementation and progress of recovery activities throughout the country. The flood and landslides also provide an opportunity to review and/or operationalize key DRM policies and to develop disaster management plans in all sectors and at all levels, as called for in the Disaster Management Rules. Developing the institutional structure and incentives required to integrate DRM into the government's budgeting and development planning process should also be considered.
5. **Enhancing disaster preparedness.** Disaster preparedness and response capacity and coordination have room for improvement. An assessment of the preparedness and response performance of the government in the recent disaster will provide the foundation for renewed investment in disaster preparedness, with a focus on the following: updating and/or developing standing orders and contingency plans in all sectors and at all levels, strengthening the role and capacity of the EOC, improving key emergency response functions (search and rescue, logistics, ICT, information management), and improving the safety of frontline relief workers. The opening of the National Disaster Management Training Center also provides an opportunity to improve capacity in preparedness and response at all levels. Finally, continuous investment is required in an end-to-end early warning system, building on opportunities created by the rise of new technologies.

**Table 61. RECOVERY AND RECONSTRUCTION PLAN**

Recovery and reconstruction needs (million K)

Table 61 presents the detailed activities to be implemented under each of the priority work streams, along with cost estimates for each of these activities.

Priority work stream	Short term (4 months): Build back better by integrating resilience measures in recovery and reconstruction	Medium term (1 year): Strengthen institutional capacity for disaster risk management	Long term (2–5 years): Integrate disaster and climate risk management into national development planning and budgeting
<b>Awareness raising and community engagement through community-based DRM.</b> Communities need support to better manage disaster risks.	<ul style="list-style-type: none"> <li>- Conduct targeted training in DRM and awareness raising about DRM</li> </ul>	<ul style="list-style-type: none"> <li>- Strengthen disaster risk reduction youth volunteer program and community-based disaster risk reduction program</li> <li>- Develop national public awareness strategy and conduct campaign</li> <li>- Integrate DRM into curriculums</li> </ul>	<ul style="list-style-type: none"> <li>- Develop national policy and program on community-based DRM</li> <li>- Develop community risk mapping program</li> <li>- Develop community forest conservation and rehabilitation program</li> </ul>
<b>Subtotal 1,800</b>	100	700	1,000
<b>Strengthening risk assessment and risk information systems.</b> Almost all risk information and forecasting data are paper-based and need to be digitized for strengthened risk understanding.	<ul style="list-style-type: none"> <li>- Collect all information from recent flood and associated events into a central repository</li> <li>- Create damage and loss database</li> </ul>	<ul style="list-style-type: none"> <li>- Set up an online platform to host and share disaster risk data</li> <li>- Digitize all risk information and upload onto platform</li> <li>- Conduct training program for digital data management and risk information</li> </ul>	<ul style="list-style-type: none"> <li>- Collect new disaster risk data</li> <li>- Map assets throughout the country</li> <li>- Modernize hydromet systems</li> <li>- Produce national multi-hazard risk atlas</li> <li>- Promote regional hazard forecasting and risk data sharing</li> </ul>
<b>Subtotal 10,100</b>	100	4,000	6,000
Developing DRM financing instruments. A financial strategy and financial mechanisms are needed to manage the costs of future disasters.	<ul style="list-style-type: none"> <li>- Share and consult on purpose and rules of Disaster Management Fund</li> <li>- Assess budget disbursement mechanisms in recent disaster</li> </ul>	<ul style="list-style-type: none"> <li>- Prepare financial protection strategy</li> <li>- Strengthen mechanisms of Disaster Management Fund</li> <li>- Develop regional risk-pooling mechanism</li> </ul>	<ul style="list-style-type: none"> <li>- Develop insurance market for both public and private assets</li> <li>- Establish rules-based post-disaster disbursement mechanisms</li> </ul>
<b>Subtotal 4,550</b>	50	2,000	2,500
Strengthening disaster risk governance and mainstreaming. It is important to promote the systematic integration and coordination of DRM into development planning and budgeting.	<ul style="list-style-type: none"> <li>- Operationalize Disaster Management Law and Rules and subnational committees</li> <li>- Establish and/or strengthen recovery coordination centers at union and subnational levels</li> </ul>	<ul style="list-style-type: none"> <li>- Strengthen institutional and technical capacity for recovery (assessments, planning, programming, monitoring, communication)</li> <li>- Develop DRM action plan at all levels and in all sectors (national/regional)</li> <li>- Strengthen government coordination and information-sharing mechanism</li> <li>- Develop disaster and climate risk screening tools and tracking systems</li> </ul>	<ul style="list-style-type: none"> <li>- Monitor DRM action plans and review the effectiveness of Disaster Management Law and Rules</li> <li>- Screen investments for disaster risks and integrate DRM measures</li> <li>- Develop results-based tracking system for DRM investments and expenditures</li> </ul>
<b>Subtotal 7,050</b>	50	3,000	4,000
Enhancing disaster preparedness and emergency operations. Disaster preparedness and response capacity can be strengthened and informed by recent experiences.	<ul style="list-style-type: none"> <li>- Assess institutional performance of emergency response capabilities at all levels</li> <li>- Launch the National Disaster Management Training Center</li> </ul>	<ul style="list-style-type: none"> <li>- Strengthen standing orders and contingency plans at all levels.</li> <li>- Strengthen emergency support functions and capacity</li> <li>- Strengthen EOC systems and network</li> </ul>	<ul style="list-style-type: none"> <li>- Strengthen disaster management training center</li> <li>- Develop multi hazard end-to-end early warning and dissemination system</li> <li>- Provide sufficient safe shelters</li> </ul>
<b>Subtotal 8,450</b>	450	4,000	4,000
<b>TOTAL = 31,950</b>	<b>750</b>	<b>13,700</b>	<b>17,500</b>

Source: Assessment team.

## RECOVERY AND RECONSTRUCTION IMPLEMENTATION

This PFLNA and the following national recovery strategy will likely inform key strategic documents and plans in the coming years. For example, because the Disaster Management Rules were adopted and the Disaster Management Fund was established just before the disaster, their operationalization may still be able to take advantage of lessons learned from the recent disaster and associated recommendations.

At the same time, the Myanmar Action Plan for Disaster Risk Reduction (MAPDRR) is due for an update. MAPDRR lays out a list of activities to implement the priorities of the Hyogo Framework for Action. The new MAPDRR consultations have already started, and the proposal is to structure the new plan on the successor to the Hyogo Framework: the Sendai Framework for Disaster Risk Reduction, which was adopted in March 2015. This action plan may also benefit from these recent experiences and analysis.

Financing for resilient recovery and development will be critical for these activities. The government will benefit if it is able to demonstrate a results-based approach that is transparent and fair, reaching down to the local communities and benefitting those households that need it the most.

## SECTOR ASSESSMENT METHODOLOGY

This analysis was based on detailed consultations with the following government departments: MWSRR, Relief and Resettlement Department, Emergency Operations Center, Ministry of Transport, Department of Meteorology and Hydrology, Fire Services Department, and Myanmar Red Cross Society.

Damage data were collected from DMH, while data on relief spending were gathered from a database at MSWRR that was being used to inform the writing of the situation reports. This information was being faxed from all ministries to MSWRR. A rapid qualitative survey was carried out by the Myanmar Disaster Risk Reduction Working Group in five affected townships to assess the impacts of the floods and get some preliminary feedback on performance during the floods.

# ECONOMIC AND SOCIAL IMPACTS





## Macroeconomic Impact

### SUMMARY

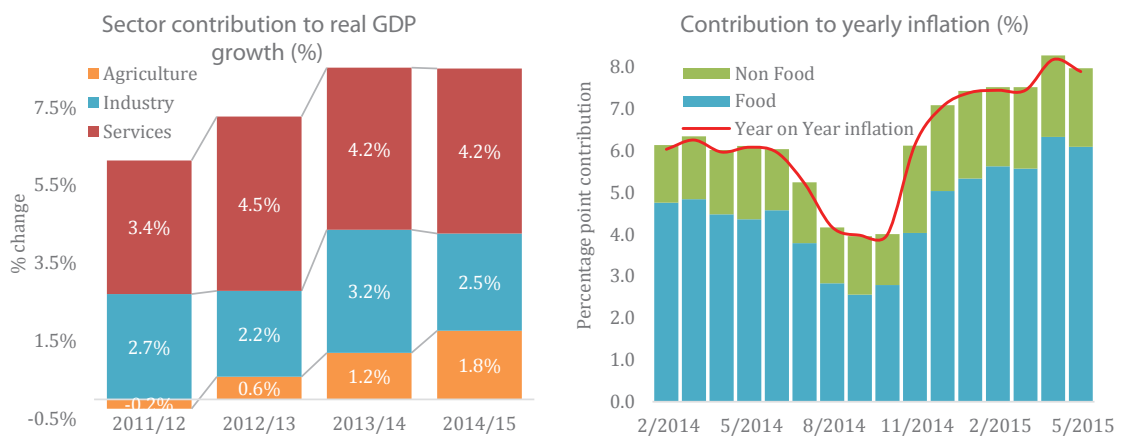
From a macroeconomic perspective, the floods and landslides are estimated to have caused K 1,080,573 million of production losses to the economy for 2015/2016, or about 1.7 percent of last year's GDP. In value-added terms, the economic loss is estimated at K 609,265 million, equivalent to around 1 percent of 2014/2015 GDP. GDP growth could drop by 0.8 percentage points in 2015/2016 if recovery efforts are not undertaken. This impact is driven by the effect of the floods on crop and fisheries production. Crops alone account for over 20 percent of GDP in Myanmar, and are therefore a strategic sector of the economy. In addition, the current account deficit is expected to increase to above 8 percent of GDP, and the fiscal deficit is projected at just under 5 percent of GDP. In the medium term, the economy is expected to bounce back with strong recovery in the agriculture sector.

### PRE-DISASTER CONTEXT

Myanmar grew at an estimated 8.5 percent in real terms in 2014/2015. Economic reforms have supported consumer and investor confidence despite ongoing challenges in the business environment and sociopolitical issues. Public consumption and private investment on the demand side, and the services sector on the production side, were the main drivers of growth. Agricultural output picked up in 2014/2015 after two years of sluggish growth (Figure 41). Output in manufacturing and industry has been strong thanks to gas in particular and growing investment in light manufacturing.

The pre-floods growth prospects remained strong for 2015/2016 (and over the medium term), though they were tempered by some slowdown in investments this fiscal year. Private investments have grown very rapidly since 2011, expanding by more than 20 percent in real terms over the past two years. Some moderation is therefore to be expected, particularly when also factoring in the possibility of investments slowing down during the upcoming political transition.

**Figure 41.** Sector contribution to real GDP growth (left) and yearly inflation (right)



Source: Government of Myanmar, World Bank staff estimates.

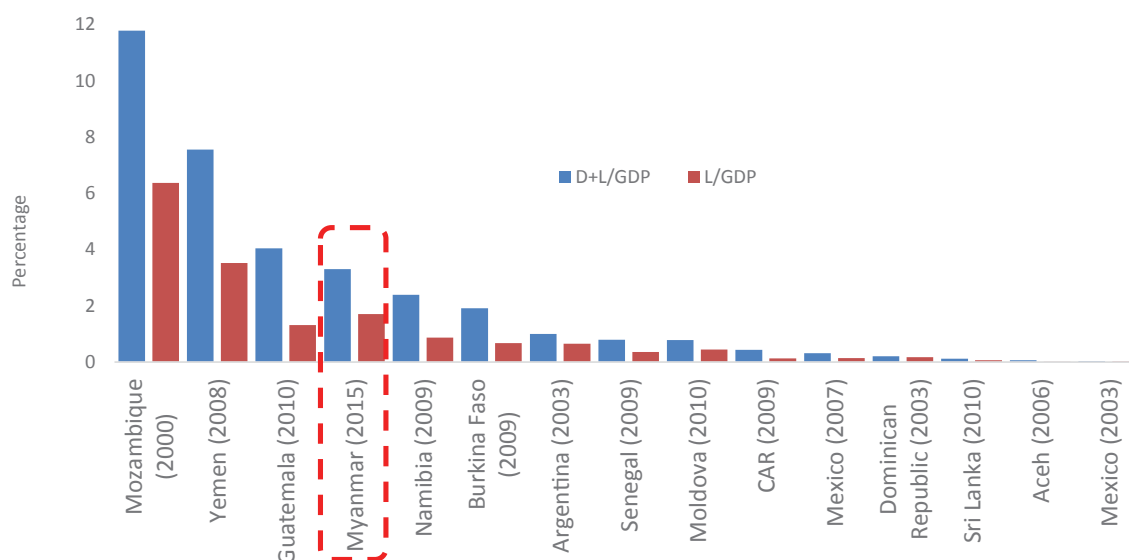


Inflationary pressures have been strong over the course of 2014/2015 (7.5 percent year on year) and first half of 2015/2016 (Figure 41). Part of this trend was due to very rapid growth in private sector credit (36 percent in 2014/2015), which contributed to a rapid expansion in overall money supply. General government consumption also grew rapidly (around 30 percent in nominal terms in 2014/2015) to meet large public service delivery needs.

These factors contributed to growing external pressures, including a rising current account deficit (6.3 percent of GDP in 2014/2015) and strong downward pressure on the exchange rate (25 percent nominal depreciation against the U.S. dollar in the 12 months to August 2015). At the same time, the current account deficit in 2014/2015 was largely driven by foreign investment-related imports. While investment-related imports are expected to have slowed down in the first half of 2015/2016, exports are also expected to have slowed down, so a wide trade deficit will be maintained.

## POST-DISASTER SITUATION

**Economic losses due to the floods.** The economic impact of the floods, as measured by damage to physical assets and loss in production flows, is estimated at K 2.06 trillion, which is close to 3.3 percent of 2014/2015 GDP. Total production losses are estimated at K 1.08 trillion (1.71 percent of 2014/2015 GDP), whereas damages are around K 913 billion (1.4 percent of 2014/2015 GDP). This is not an insignificant disaster impact when compared to other floods in the world in the early 2000s. On the other hand, recent floods in Bosnia and Herzegovina (2014) were estimated to have caused damages worth 15 percent of GDP, and losses close to 5.6 percent of GDP. The 2011 floods in Thailand caused around 11 percent of GDP in damage and losses. Figures for other countries that have experienced significant floods since 2000 are shown in Figure 42.



**Figure 42.** Flood damage and loss as share of GDP in selected countries

Source: Global Facility for Disaster Reduction and Recovery, Damage and Loss Database.  
Note: D= damage; L = loss.

While the economic impacts of the 2015 floods are less than those of Cyclone Nargis in 2008 (Table 62), they are also geographically more widespread, with 12 out of 14 states and regions affected. Economic losses during Nargis were concentrated in the Ayeyarwady and Yangon Regions. This had an impact on the economy as a whole, given that these are two important growth centers in the country. Most of the losses were concentrated in industry and commerce. The economic losses resulting from the 2015 floods, on the other hand, are less concentrated geographically. This distribution of losses poses its own challenges for economic recovery, as reconstruction and rehabilitation efforts will have to be spread across a bigger part of the country.

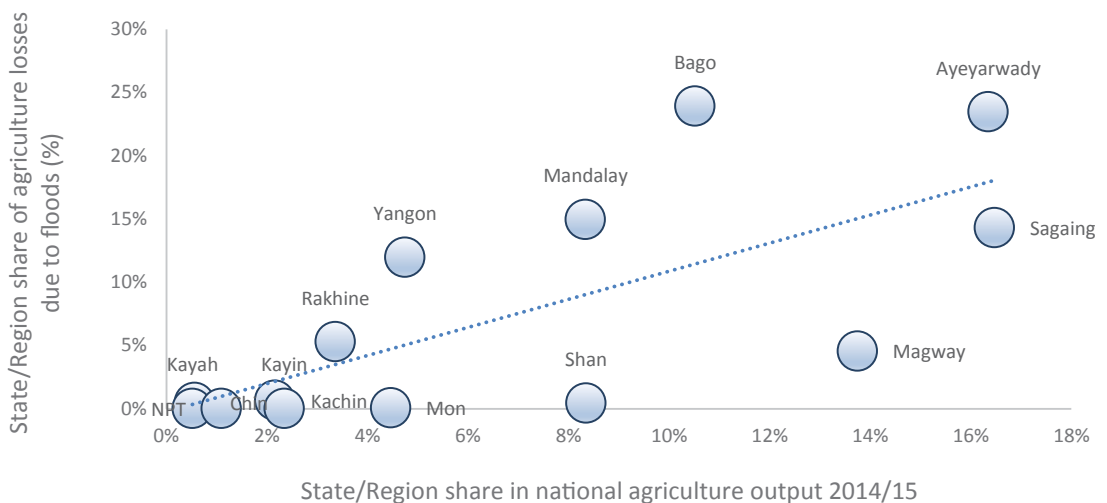
**Table 62.**  
Damage and losses: Cyclone Nargis vs. 2015 floods

	Cyclone Nargis	2015 floods
Total damage (K billion)	1,930	913
Total losses (K billion)	2,495–2,618	1,150
Total damage and losses (K billion)	4,424–4,547	2,063
Total damage and losses/previous year GDP	21 percent	3.3 percent

Source: Assessment team, based on comparison with Cyclone Nargis Post-Disaster Needs Assessment.

Aside from the wide geographic coverage, the floods have also hit major agricultural areas. This includes regions like Sagaing, Magway, Ayeyarwady, and Bago, which together account for a large share of the national production of crops, which account for around three-quarters of agriculture value added. Areas like Bago, which accounted for 11 percent of national agriculture output in 2014/2015, are particularly badly affected, with around 24 percent of total agricultural losses from the floods (Figure 43). Similarly Ayeyarwady, which accounted for around 16 percent of national agriculture output in 2014/2015, suffered around 23 percent of total agricultural losses.

**Figure 43.**  
State and region share of agricultural GDP vs. share of agriculture losses



Source: Government of Myanmar, World Bank staff estimates.

**Impact on GDP.** The floods are estimated to have had a significant impact on GDP in 2015/2016. The production losses are estimated to reach K 1,081 billion, which translates into K 609.2 billion in value-added losses. After taking into account relief expenditures, which add to GDP, the total disaster-induced losses are estimated at K 571 billion, which is equivalent to 0.9 percent of 2014/2015 GDP (Table 63). In terms of 2015/2016 projected growth, the disaster impact could reduce GDP growth by up to 0.8 percentage points, before factoring in reconstruction and recovery effort. Reconstruction and rehabilitation works aimed at restoring damaged assets would of course reduce the negative growth impact. A 50 percent replacement of damaged private assets in non-agriculture sectors could lessen growth reduction to 0.6 percentage points.

	Production losses (billion K)	Value-added coefficient	Value-added losses (billion K)	Nominal GDP 2014/2015 (billion K)	Value-added losses/GDP
Crop	335,210	0.82	275,878	13,773,872	2.0%
Livestock and fishery	315,827	0.60	190,444	5,317,422	3.6%
Manufacturing and processes	300,191	0.17	52,233	13,212,338	0.4%
Commerce (trade)	125,308	0.7	87,841	11,773,208	0.7%
Utilities (power and water)	1,187	0.42	497	753,181	0.1%
Communication	1,244	0.94	1,173	2,899,663	0.0%
Transportation	80	0.70	56	7,863,014	0.0%
Rental and other services (including housing)	1,526	0.75	1,143	1,511,134	0.1%
Relief and emergency expenditures	n.a.	n.a.	-38,220	n.a.	n.a.
<b>Total</b>	<b>1,080,573</b>		<b>571,045</b>	<b>63,323,000</b>	<b>0.9 %</b>

**Table 63.**  
Impact on GDP

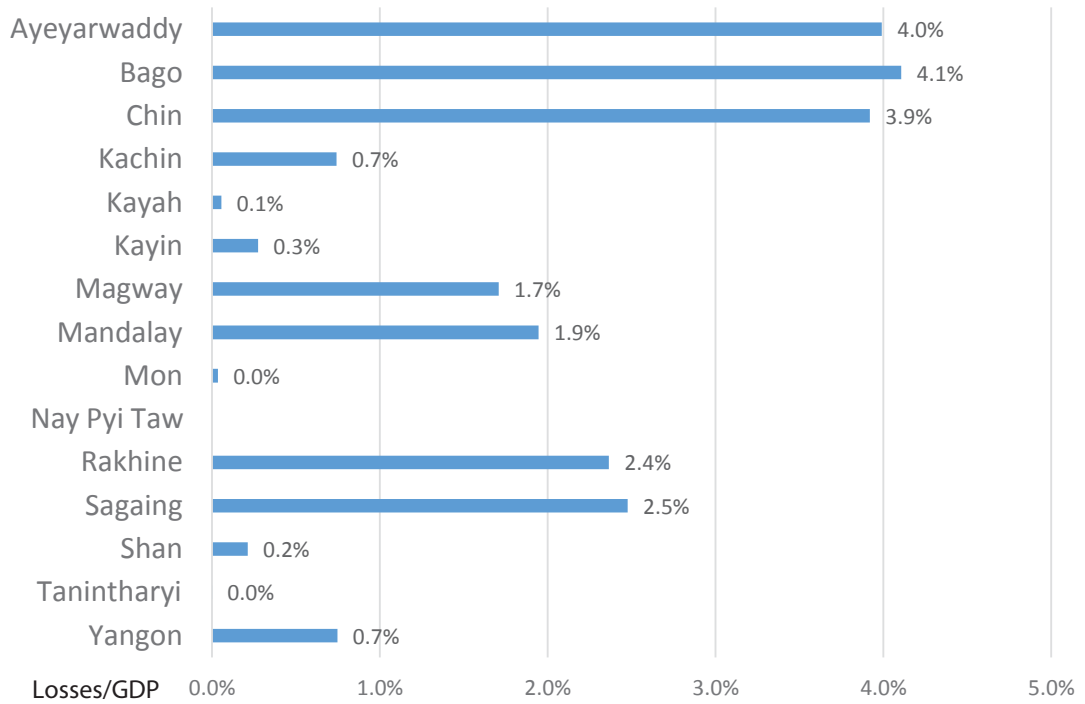
Source: Assessment team estimate.

Note: n.a. = not applicable. Total nominal GDP includes other sectors that are not mentioned in this table.

Eighty-two percent of the value-added losses come from the agriculture sector. The crop subsector contributes to around 48 percent of value-added losses, which is due mostly due to reduced yield in all affected areas. Although replanting has already started in some regions, the expected yield in these areas will quite likely be lower due to the delay in sowing and the lack of good agricultural practices (see agriculture sector assessment). The second-biggest losses in terms of value addition were incurred by the livestock and fishery sector (33 percent); losses occurred mostly in freshwater fishing due to the loss of almost 30,000 ha of fish and shrimp ponds. The losses in the agriculture sector also affected the commerce and industry sector, particularly food processing sectors through the disruption in the availability of raw agricultural materials.

The magnitude of production losses in terms of GDP is more significant in some states and regions than in others (Figure 44). There are five states/regions whose losses-to-GDP ratio are higher than the national ratio, namely Sagaing, Chin, Ayeyarwady, Bago, and Rakhine. The remaining three states/regions that also incurred significant production losses are Mon, Mandalay, and Magway.

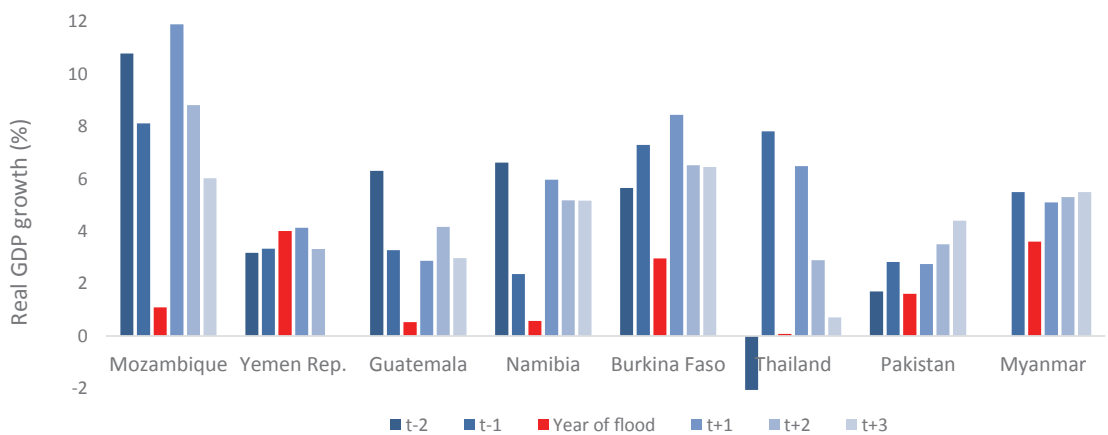
**Figure 44.**  
Losses by state/ region in terms of GDP percentage



Source: Assessment team estimate.

Although GDP growth is expected to bounce back rapidly in 2016/2017, it is difficult to estimate the extent to which the economy will begin recovering in 2015/2016. Replanting has already started, but the likelihood of offsetting agriculture production losses in 2015/2016 may not be very high due to the timing of the monsoon harvest and the quality of seeds. Reconstruction and rehabilitation works aimed at restoring damaged assets would reduce the negative growth impact. A 50 percent replacement of damaged private assets in nonagriculture sectors could lessen growth reduction to 0.6 percentage points. Experience from other countries suggests that while the short-term impact of floods can be quite severe, growth tends to bounce back rapidly over the medium term (Figure 45).

**Figure 45.**  
Real GDP growth in the periods preceding and succeeding floods (%)



Source: World Development Indicators, Global Facility for Disaster Reduction and Recovery, and International Monetary Fund Article IV 2011.

**Inflation.** Inflationary pressures are expected to pick up as a result of the floods, and inflation is projected to average over 11 percent over the course of 2015/2016 (or above 12 percent year-on-year by end March 2015/2016). Inflation in the 12 months ending July 2015 is estimated at over 10 percent. The price of food items, which accounts for 68 percent of Myanmar's consumer price index basket, is expected to have picked up sharply in August. The prices of staples such as rice, beans, and pulses in particular have reportedly jumped as a result of supply pressures caused by the floods.

Rice prices tend to be quite volatile, dropping in the period after the major paddy harvest, which usually takes place in November–December every year. However, this year it is still unclear whether the monsoon paddy will be able to recover the losses from the floods. Even if losses are not recovered, Myanmar is expected to produce sufficient rice for export. The price of rice is mainly influenced by two factors: export prices in the cross-border rice trade (largely with China) and domestic demand/consumption. The government needs to balance these two factors, and develop appropriate export and import policies and a rice stock policy to protect against disasters. The Ministry of Commerce is already aware of this. Advised by the Myanmar Rice Federation, the ministry took steps in August to impose a temporary export ban on rice. After carefully monitoring rice prices, it lifted the ban once farm-gate prices started falling (when the harvest season for short-lived varieties began).

Inflationary pressures are likely to be further compounded by increased cost of imports, particularly processed foods and other necessities coming from China and Thailand in particular. Without adequate external support, foreign reserves and the exchange rate could be under further pressure, contributing to even higher inflation.

**Balance of payments.** The floods are expected to lead to a slowdown in agricultural exports and further widen the current account deficit, which is projected to increase to around 8 percent of GDP. Agriculture exports in recent years accounted for around a quarter of all merchandise exports. The moratorium on rice exports imposed over the summer (until October 15), together with lower production due to losses, will negatively affect overall export growth. This is likely to be compounded by a more challenging external environment, dominated by the slowdown in China. China accounts for around 40 percent of Myanmar's exports, which are mostly natural resources, including gems. The recent decline in gem sales may be a symptom of falling demand in China.

Investment-related imports are expected to have slowed down in the first half of 2015/2016, though this trend would be to some extent offset by demand for humanitarian and reconstruction-related needs. Some of these will be financed by external aid and concessional financing. However, the decline in foreign investment flows is likely to lead to a slowdown in the accumulation of foreign exchange reserves. This will put added pressure on Myanmar's overall external position and the exchange rate.

**Fiscal policy.** Public expenditure on humanitarian and reconstruction-related activities resulting from the floods will pick up. However, the government is still expected to maintain the general government budget deficit at below 5 percent of GDP in 2015/2016. It will do so for several reasons. Revenue tends to be underestimated in the budget. Ongoing reforms to tax administration and to tax collection from the service and manufacturing sectors should enable the government to meet its 2015/2016 revenue target even with any impact from the floods, which will affect mostly the agriculture sector. If the government collects 10 percent above what was planned, which is not unlikely, it could cover the costs of nearly all damages (though recovery will not be possible to implement in one year) and maintain the general government deficit within 5 percent of GDP. One important risk to this outlook is the potential impact of international commodity prices on Myanmar's gas receipts. A sustained decline would require important spending adjustments even assuming steady growth in output. At the same time, the drop in gas prices could also be offset by the positive impact of currency depreciation on kyat-denominated earnings.



Magway flooding.  
Photo: © Martin Alrecht.

## Employment and Livelihoods Impact

### SUMMARY

The 2015 floods and landslides dealt a serious and pervasive blow to the livelihoods of millions in 12 states/regions. The floods displaced at least 1.6 million people and may have adversely affected up to 5.4 million people. They also brought significant economic losses and damages to many local economies across different agro-ecological zones. Given that six of the most affected regions (Chin, Rakhine, Magway, Ayeyarwady, Sagaing, and Mandalay) were home to approximately 60 percent of the entire labor force, the effects of the flood could be devastating and further jeopardize the national economy. It is expected that at least 9.4 million workdays will be lost, along with K 21,133.1 million in personal wage income. Since the adverse effects of the floods are disproportionately felt among the most vulnerable sectors of Myanmar society, labor-intensive recovery strategies and social protection measures should be deployed immediately to restore economic continuity and livelihood losses in the flood-affected areas.

### POST-DISASTER CONTEXT AND ESTIMATION OF DAMAGES AND LOSSES

**Assumptions.** As with the estimation of the impact of flood on employment in agriculture, several assumptions were made in the calculation of employment and livelihood losses in commerce and industry. To calculate the total workdays lost in commerce and industry sectors, the information on the number of firms, the number of workers, annual sales, and value of fixed assets for every state and region were gathered from the business census of the United Nations Development Programme for 2014. Subsequently, the percentage of firms affected per state/region, average stopping time, and average reduction of workers were extracted from the quick assessment of the commerce and industry sector. In the areas where the data are missing, we assumed that the percentage of damaged housing in a given area can be used as a proxy to estimate the percentage of affected firms



in that area. For wage information in the agricultural sector, in light of the absence of information on sector-specific and region-specific wages for 2015, we used the information from the Livelihoods and Food Security Trust (LIFT) household survey on average rural wages in three agro-ecological zones for 2013. For commerce and industry, regional agricultural wages were weighted by 1.5 to reflect higher wages in the commerce and industry sectors. To account for the effects on livelihood and employment of the decline in raw materials due to the flood, the ratio of value loss from stoppage and value loss from decline per state/region was used to produce a weight to estimate the personal income loss and employment loss due to the decline in raw agricultural materials and consequent effect on the commerce and industry sector.

**Agriculture.** It is estimated that 7.2 million workdays will be lost in the agriculture sector, resulting in personal income loss of K 14,647.8 million over the next year in this sector. This will have a singularly pronounced effect on the livelihood of casual agricultural workers, given that the six most-affected regions/states account for approximately 80 percent of all casual labor, and that casual labor accounts for more than 65 percent of the rural agricultural labor market in Myanmar. Thus casual workers—the most vulnerable segment of the labor market, with extremely limited access to social protection—will likely incur a large proportion of losses. The flood also poses a major threat to the livelihood of small landholders with substantive damages to their shelters and farmlands, who have become vulnerable to casualization of their labor for livelihood, and to that of workers in aquafarms, especially in the dry zone and delta region, where damage to aquaculture was severe (approximately 67 percent of aquafarms were destroyed in Bago, and 40 percent were destroyed in Ayeyarwady).

A majority of female workers in the agricultural sector are employed as “own account workers” and “unpaid family workers.” Given their fragile socioeconomic conditions, characterized by gendered employment segregation and wage gap in agricultural work, lack of social protection, and lack of access to secure land tenure, female-headed agricultural households and female agriculture workers are particularly vulnerable in the affected areas.

It is expected that the flood will increase rural-urban migration from the affected areas to nearby urban centers such as Yangon and Mandalay. With at least 1.6 million displaced people and 5.4 million affected people, the flood-induced exodus will have the effect of increasing the composition of casual labor in the urban sector. More importantly, since casual workers in the urban sector are subject to the risks and vulnerabilities associated with urban slums (unsanitary living conditions, irregularity of income, and absence of social protection mechanisms), this influx of migrant laborers could further strain scarce resources available to slum dwellers for coping with shocks and emergencies.

**Commerce and industry.** It is estimated that as a result of the floods, 1.6 million workdays were lost in the industry subsector and 0.57 million workdays were lost in the commerce subsector. These losses in employment have resulted in personal wage income losses of K 3.7 million and K 1.37 million in industry and commerce respectively.

It is important to highlight that in the most-affected regions/states, the average share of commerce and industry in total employment is conspicuously lower than that of agriculture; the total share of manufacturing, construction, and retail typically is less than 10 percent of total employment in these six most-affected regions/states. However, the effects of flood in the commerce and industry sector will be more acutely felt among female employees, because of the higher percentage of women working in manufacturing and retail sectors in most of the affected regions and states.

It is common for casual workers in agriculture as well as in commerce and industry to borrow money with high interest to finance consumption. In the post-flood credit-constrained environment, these casual workers are in grave danger of being caught in a high-interest perverse loan circle and ultimately trapped in deep poverty. Owners of small and medium enterprises in the most-affected areas are also vulnerable in the credit-constrained environment if they seek to resuscitate their businesses. In Pwint Phyu, one of the most affected townships in the country, all 40 enterprises included in the rapid assessment surveys were temporarily suspended, and 65 percent of these enterprises claimed that their access to finance had been affected by the flood.

## RECOVERY AND RECONSTRUCTION STRATEGY AND PLAN

**Short term.** The key immediate recovery strategy is to provide income for basic needs and income-generating opportunities so that farmers and owners of small and medium enterprises can rebuild their livelihoods and return to their workplaces.

An immediate cash transfer program to the most vulnerable and affected groups, such as casual workers and female-headed agricultural households, is required. The Ministry of Social Welfare, Relief and Resettlement has already put in place a series of cash transfer programs in the affected areas. The programs cover rice assistance, emergency food assistance, housing assistance, rehabilitation assistance, and compensation for death and have a total value of K 591.53 million. Given the magnitude of the floods and their large effect on the labor market, the cash transfer programs should also cover employment protection and salary disbursement for the flood-affected workers in the formal sector. Cash transfer programs as well as food transfer programs should be based on an employment scheme for rehabilitation, reconstruction, and development of disaster adaptation and mitigation activities, including flood protection, water harvesting, soil improvement, and watershed management within individual regions. Large cash transfer programs need to be piloted to ensure transparency and accountability.

Labor-intensive strategies are also an important element in a short-term recovery plan because they can generate rural employment and restore rural infrastructure in affected areas. Cash-for-work programs offer a particularly effective policy platform for implementing this strategy. According to figures from the Ministry of Labour, Employment and Social Security (MOLES) on post-flood reemployment in affected areas, a total of 6,210 unemployed workers were able to regain their employment for



construction work in the reconstruction projects and for the fisheries sector. However, there is a geographic imbalance in the current regeneration of post-flood employment, since Sagaing Region accounts for approximately 69 percent of all reported reemployment. A short-term reemployment scheme should be reviewed and implemented to ensure inclusivity, transparency, and accountability. The participation of the community as community contractors should be encouraged in the restoration of rural infrastructure.

As part of the short-term recovery strategy for the agricultural sector, cash/voucher transfers for inputs and government subsidies for inputs will be crucial; they will help to revitalize the agricultural sector and allow it to reabsorb the labor losses due to the flood. Given the severe credit constraint in the rural sector, an extension of rural credit and a moratorium on credit payment should be implemented to offer farmers and rural enterprises an opportunity to overcome the binding constraint of finance in their production. Because the labor demand for construction will increase in the aftermath of the flood, vocational training programs for specific skills (such as construction and welding) are crucial for generating employment opportunities for those affected by the flood. MOLES has already implemented a series of measures to provide vocational training in the most-affected areas.

The ministry has designed a program to offer high-frequency training on carpentry, brick masonry, and ironwork in places such as Haka and Kalay in Chin State. With the collaboration of the Ministry of Construction and other relevant line ministries, MOLES will act as a focal ministry in designing and implementing training programs for elementary skills required in rural roadwork and reconstruction. The ministry plans to send mobile training teams, in conjunction with existing vocational training programs, to affected areas to train people in carpentry, masonry, electrical work, and bricklaying. It is critical that these multi-sectoral programs address both short-term needs (generating employment for affected workers) and long-term recovery needs (generating enterprises in affected areas). The International Labour Organization is well positioned to offer technical assistance on these important initiatives.

In the short term, employment facilitation centers, building on the existing structure of labor exchange offices under MOLES, should be set up to facilitate the job search process for workers in affected areas.

The recovery efforts should take into account the existing gender and social inequalities in the labor market. It is important to ensure the participation of women and other marginalized minorities in vocational training and skill development. Further, sensitivity and awareness of important labor issues—such as forced labor, child labor, and occupational safety and health—need to be integrated into the employment and livelihood recovery programs. Implementation of these programs should also embed enforcement of international labor standards and minimum wage practices.

**Medium and Long term.** Consistent with the government of Myanmar's initiative on fiscal decentralization, regional and state governments should play an important role in the design and implementation of labor policies and social protection measures for recovery. Large-scale recovery and reconstruction efforts are likely to stimulate local economies in both the short and long term. The government should ensure that recovery financing would strengthen the fiscal and physical capacity of the local governments, while also funneling the benefits of the recovery boom to generate local enterprises and employment. In the long term, the possibility of labor employment guarantee scheme should be reviewed to ensure employment and livelihood for casual workers in the rural sector.

New-skills development should be consistent with the principles of building back better. For example, in construction/infrastructure work, the objective is to not reconstruct the damaged infrastructure to its pre-disaster form; it is to build better and more resilient infrastructure while also developing new skills for the labor force involved in the process of the reconstruction.

In the long term, the role and capacities of labor exchange offices should be strengthened to offer employment facilitation services at the local level. It is therefore important to support and strengthen the existing infrastructure—specifically the national employment database—to minimize the search cost for workers.

To ensure that an influx of rural migrants to urban centers does not add further strain to urban livelihoods in the slums, the government should devise and design adequate social protection measures for the most vulnerable groups in the urban slums and should also provide vocational training and skill development programs for migrant workers. Existing urban planning and urban structure should be reviewed to accommodate the expansion of urban livelihoods within the slums.

Table 64 summarizes the recovery and reconstruction needs for this sector.

**Table 64.**

Recovery  
needs  
(million K)

	Financial year (million K)					Total
	2015/ 2016	2016/ 2017	2017/ 2018	2018/ 2019	2019/ 2020	
Skill development programs for enterprises (Financial Literacy, Entrepreneurship)	0	2,700	2,700	2700	1,000	9,100
Skills training programs: skills development for rebuilding; mobile skill-development teams in the most affected areas for most-vulnerable groups	21,328.5	21,328.5	0	0	0	42,657
Cash-for-work programs	101,351.25	67,567.50	0	0	0	168,918.75
<b>Total</b>	<b>122,679.75</b>	<b>91,596</b>	<b>2,700</b>	<b>2,700</b>	<b>1,000</b>	<b>220,675.75</b>

Source: Data and estimates from MOLES, International Labour Organization, and World Bank.

Note: n.a. = not applicable.

## METHODOLOGY

The damage and loss estimates for the employment and livelihood sector are based on a multitude of assumptions and extrapolations from limited data sources and are used to inform recovery policies and programs in the sector. The methodology for estimating the effect of flood on employment is as follow. Average workday per acre per crop (for agriculture) and average workday per acre (for aquaculture) were estimated using the information from the Integrated Households Living Condition Assessment (2010). Using the information on damaged and destroyed acreages per types of crop in Myanmar, workdays lost per crop were estimated. For destroyed crops, the information of nonfamily labor needed for one crop season was used to estimate the agricultural workday per acre, whereas nonfamily labor needed for half a crop season was used to estimate average workday per acre for damaged acreages.



TengKay Village: Homeless families lined up in makeshift shelters on the road  
Photo: © Luc Vaillancour.

## Poverty, Social Impact, and Social Protection

### SUMMARY

**The floods and landslides are affecting a population that even before the disaster struck was more likely to be poor than the rest of Myanmar’s population.**<sup>133</sup> The floods took place predominantly in rural villages. Half of the most-affected 40 townships are in the two poorest states in Myanmar: Rakhine and Chin. The most severely affected areas had a 50 percent higher poverty incidence than the national average in 2009–2010.<sup>134</sup> These areas also have high elderly and child dependency rates, and affected households are more likely to have less resilient housing. There is great disparity in housing stock in Myanmar; poorer households have lower-quality stock and are more vulnerable to damages. The full poverty and social impacts of the floods will take time to unfold and will depend on the nature of the flood response. Understanding the social and economic structures of villages in rural Myanmar can guide external actors, including government and development partners, in how communities will react to damage and how best to support recovery.

### POST-DISASTER SITUATION

**Up to 5.2 million people were exposed to the floods and landslides in the 40 most heavily affected townships.** An estimated 1.6 million individuals were recorded as having been temporarily displaced from their homes by the disaster, and 132 lost their lives. Within the 40 most-affected townships, 775,810 individuals have been displaced, representing approximately half of the total displaced population (Table 65).

**Table 65.**  
Population in  
affected town-  
ships

	40 most-affected townships	178 moderately affected townships
Township population <sup>a</sup>	5,195,863	30,634,992
People temporarily displaced <sup>b</sup>	775,810	886,146

Source: GOM 2015e (for township population); Myanmar Relief and Resettlement Department, September 30, 2015 (for people temporarily displaced).

Note: a. Number of people in townships exposed to floods, landslides, and wind damage. This figure reflects the enumerated population in the 40 most-affected and 178 moderately affected townships.

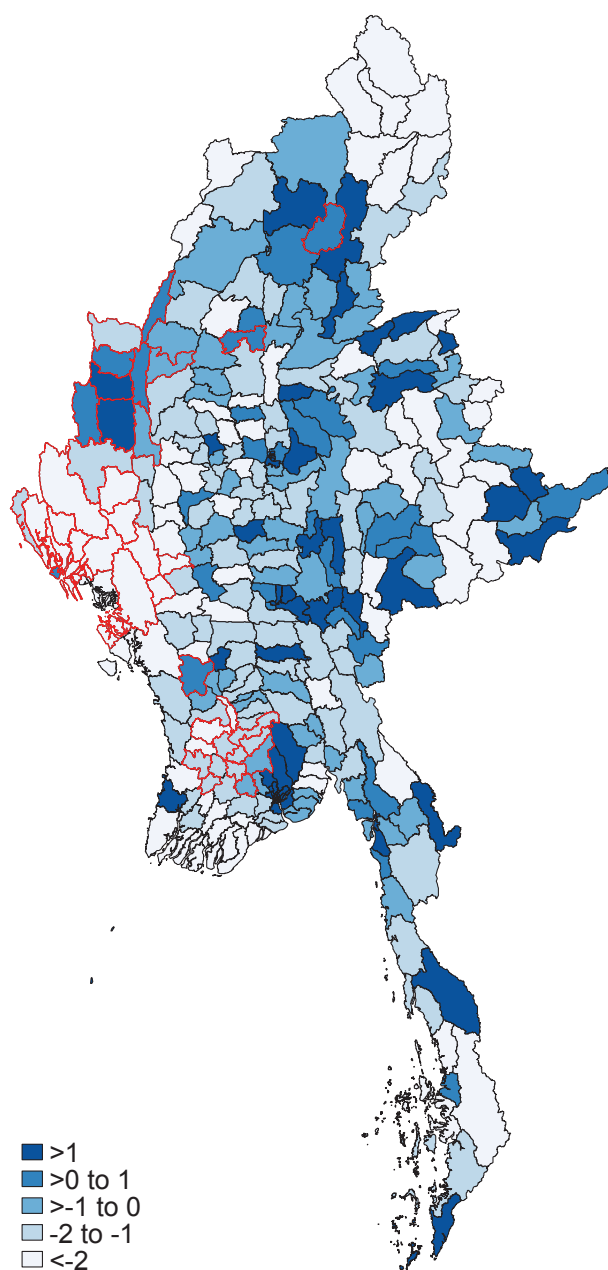
b. This figure reflects those who were displaced on a temporary or permanent basis by the disaster to shelters such as camps, schools, religious buildings, and the houses of relatives/friends.

**The most severely flood-affected areas had a 50 percent higher poverty incidence than the national average in 2009–2010.**<sup>135</sup> The floods took place predominantly in rural villages; the townships most severely affected have less than 19 percent of the population living in urban areas. Those most affected by the disaster were worse off in 2009–2010 and in 2014 than those either less affected or unaffected. Half of the 40 most-affected townships are in the two poorest states in Myanmar: Rakhine and Chin (Figure 46).

<sup>133</sup> This analysis is robust to the consumption aggregate used; see Annex 6 for further details. Since the Integrated Households Living Condition Assessment (IHLCA) data are from 2009–2010, this analysis was verified using a welfare analysis from the 2014 Population and Housing Census. Poverty measures are not collected by the census; see Annex 6 for further details.

<sup>134</sup> Analysis from the IHLCA (2009–2010).

<sup>135</sup> Analysis from the IHLCA (2009–2010).



Data: World Bank ests. based on census, EOC 07/09/2015

**Figure 46.**  
Welfare index among the most-affected 40 townships

Source: World Bank estimates based on census and data from Emergency Operations Committee, July 9, 2015.  
Note: Lighter colors indicate poorer areas. Red outlines indicate most affected 40 townships.

**These most severely affected areas have high elderly and child dependency rates (Table 66).** Households with a larger share of children are more likely to have been among the bottom 40 percent—that is, among the two lowest quintiles—of the welfare distribution prior to the disaster. School costs compared to labor income are an important factor in children’s failure to complete school; declines in income may place children at risk of dropping out.

	40 most-affected townships	178 moderately affected townships
Elderly dependency ratio	9.77	8.87
Child dependency ratio	47.9	44.4

**Table 66.**  
Dependency ratios in affected townships

Source: GOM 2015e

**Affected households are more likely than others to have less resilient housing. There is great disparity in housing stock in Myanmar; poorer households have lower-quality stock and are more vulnerable to damages.** Households in these townships are more likely to have roofs made of more permeable and easily damaged *dhani*, *theke*, and leaves. The likely result is that the poorer households will have far greater damage to housing as a consequence of the disaster. Among the bottom 40 percent of the welfare distribution in the most-affected areas, only 24 percent of households have resilient roofing.

**The majority of the population in flood-affected areas relies on agriculture.** According to data from the Integrated Households Living Condition Assessment-2 (IHLCA-2), 52 percent of those in the economically active population in the most severely affected areas work in agriculture (Table 67). This share is similar to the national average. A further 4 percent work in fisheries. Farming patterns and types of crops produced vary significantly. Across agro-ecological zones, however, farmers face ongoing vulnerability because of low profitability, and they tend to rely on credit to finance agricultural production. The result is heavy debt burdens, a lack of steady labor, and limited income-generating opportunities.

**Table 67.**

Percentage of farmers and casual farm laborers in affected areas

		Most affected	Less affected	Not affected
<b>Farmers and family workers</b>	<b>Bottom 40 percent<sup>a</sup></b>	37.0	44.4	41.0
	<b>Average</b>	38.5	43.6	36.0
<b>Casual laborers</b>	<b>Bottom 40 percent<sup>a</sup></b>	17.0	19.5	13.1
	<b>Average</b>	13.4	11.8	7.5

Source: World Bank estimates using IHLCA-2 (2009–2010).

Note: a. The bottom 40 percent refers to the two lowest quintiles of the welfare distribution.

**These households face routine risks associated with weather-related events.** One in three households engaged in agriculture had reported at least one flood or storm that negatively affected production in the five years prior to the IHLCA survey. The highest incidence was in Ayeyarwady and Rakhine, where (respectively) 40 percent and 23 percent of agricultural households suffered from an average 50 percent crop loss due to flooding.

**Rural households are increasingly attempting to diversify income sources.** There is increasing migration of family members, predominantly to find work as unskilled laborers in Yangon. Recent years have also seen more investment in rural nonfarm businesses to provide a secondary source of income, although the nature and extent of these small enterprises vary significantly by location.

**Villages have traditionally been relatively self-reliant and socially cohesive.** Villages have a tradition of collective action. This has played a crucial role in responding to previous natural disasters, including Cyclone Nargis (2008) and Cyclone Giri (2010). Formal village leaders, informal elders, and religious institutions all play an influential role in managing village affairs.

**As result of recent trends, people in rural villages have wider social networks than in the past.** These trends include increased government services at the local level, mobile phone penetration across much of the country, and increased migration of predominantly young family members to urban areas.

**A minority of townships in flood-affected areas have experienced conflict and communal tension, complicating the social risk of the flood response.** In a quarter of the 40 most-affected townships, residents have experienced some form of conflict in recent years. This includes several townships in northern Rakhine, and a smaller number in Chin and Shan States. The delivery of assistance in these areas will need to be sensitive to conflict dynamics to avoid exacerbating tensions.

## PRELIMINARY IMPACT ANALYSIS

**Crop losses have been significant.** The floods damaged crop production in all states and regions; this damage is affecting those engaged in cultivation as well as landless laborers. Assessments indicate that floods affected almost 9 percent of cultivated land in the six most-affected states, though with significant variation both across regions and within regions.

**Small and medium farmers and casual laborers—a population already at risk of not meeting basic minimum needs—were particularly affected.** In the most-affected areas, 54 percent of those in the bottom 40 percent of the welfare distribution work in agriculture, and a further 5 percent work in fisheries. Small farmers will be burdened by loans taken to plant a monsoon harvest with little return, and it will be difficult for many to invest in a winter crop. The loss of the monsoon harvest will reduce labor opportunities at harvest time in late 2015, and casual laborers will face greater competition from farmers for nonfarm casual labor.<sup>136</sup> The worst-off households—those in the bottom 40 percent—are also far more likely to be working as casual laborers.

**The impact on fisheries was felt by subsistence fishermen across a number of regions and by commercial fishermen, mainly in Rakhine.** There will be a need, primarily in Rakhine, for capital to rebuild damaged embankments and restock fish and prawn farms. The floods also harmed small-scale and subsistence fishermen by damaging boats and nets. Even prior to the floods, subsistence fishermen had been identified as a particularly vulnerable socioeconomic group.<sup>137</sup>

**Women-headed households appear to have suffered disproportionate housing losses and higher immediate post-disaster costs.** Women-headed households tend to have less sturdy houses and experienced more significant damage to their houses. In one village visited by research teams, for example, houses of all eight women-headed households were destroyed. These households reported having to pay casual laborers to help with the cleanup after the floods, a cost not borne by other households that could draw on male labor.

**The cumulative impacts of livelihood degradation and increased indebtedness are likely to worsen over the medium term, and include a risk of increased food insecurity.** The effects on livelihoods described above are cumulative over time and are highly likely to result in significant problems for villagers in early 2016 and beyond. Potential risks due to cumulative pressure on livelihood include high levels of food insecurity, high debt levels, and a range of negative coping strategies in response to these pressures. Some examples of extremely high interest rates were already beginning to emerge. One villager, for example, described paying interest of K 500 per day on a loan of K 10,000 taken following the floods.

**Food insecurity risks have longer-term consequences for young children and babies in utero.** As the implications of the floods and landslide for food production and insecurity become clearer, it will be important to protect young children and babies in utero from the longer-term consequences of a nutritional deficit. For more details see Annex 6 and Table 68).

	Most affected	Less affected	Not affected
Urban	34.86	27.13	17.41
Rural	40.32	32.19	27.84
Total	39.79	31.20	24.84

Source: World Bank estimates using IHLC-2, 2009/10.

Note: Moderate underweight prevalence captures those whose weight for age falls below two standard deviations of the reference population norm for children under five.

**Table 68.**

Prevalence of moderate underweight (<-2 standard deviation)

<sup>136</sup> This conclusion is based on field research; see also FAO and WFP (2015).

<sup>137</sup> EMR and World Bank 2014.

**The effects of the flooding on livelihoods are likely to be regressive, with poorer households struggling more than wealthier ones.** As the negative effects on livelihoods accumulate, it is those households least able to withstand economic shocks that will be hurt the most. Poor landless households that are dependent on labor will not have access to agricultural jobs. Small farmers, also a vulnerable economic group, have few assets apart from their land and are therefore ill equipped to deal with the economic shock that will emerge in early to mid-2016, when the lack of harvest begins to take its toll on savings and food stocks.

**Land and resettlement. There will be a need to relocate at least 4,500 households in Chin State and Sagaing Region.** According to the National Natural Disaster Management Committee (in October), this figure includes 2,987 houses destroyed by landslides in Chin State and over 1,600 houses destroyed by flooding in Kalay Township, Sagaing. Relocation will require identification and selection of land not exposed to landslide hazards, as well as negotiations relating to meeting the costs of relocation. It will also require informing affected communities about relocation and ensuring that they can participate in decision making. Finally, it will require developing relocation plans that consider access to basic services and livelihoods. In some cases, careful consideration of land ownership issues will be necessary, although, in some instances, for example in Chin, relocation is expected to occur on government land. Land allocation mechanisms will also need to be equitable to ensure that the poor and vulnerable are not disadvantaged in identifying new land.

**The damage in Chin differs from that in other regions.** Chin was affected by a number of landslides, and the damage they caused will have longer-term impacts than damage in other areas. It is estimated that 4,000 people are still residing in internally displaced person (IDP) camps due to destruction of housing.<sup>138</sup> There has been widespread damage to infrastructure, with approximately 500 instances of damage to local roads and bridges.<sup>139</sup> The lack of access to townships and markets, along with the more complex nature of rebuilding infrastructure in remote areas, is likely to have significant ongoing livelihood impacts, including aggravating food shortages already common in rural Chin.

**Some areas face more permanent damage to agricultural land.** Approximately 2,154 hectares of agricultural land were destroyed by landslides across six townships in Chin State.<sup>140</sup> Some land in other regions will require rehabilitation from sand and sediment debris. Managing these land issues is also likely to have implications for social relations of affected communities.

**Household coping strategies. Households are employing a range of strategies to cope with the floods.** The Agriculture and Livelihood Flood Impact Assessment<sup>141</sup> conducted in Ayeyarwady, Bago, Chin, Magway, Rakhine, and Sagaing reports various coping patterns (see Figure 47). However, some of these coping strategies are negative: they reduce assets and undermine the recovery over the longer term. See Annex 6 for more detail.

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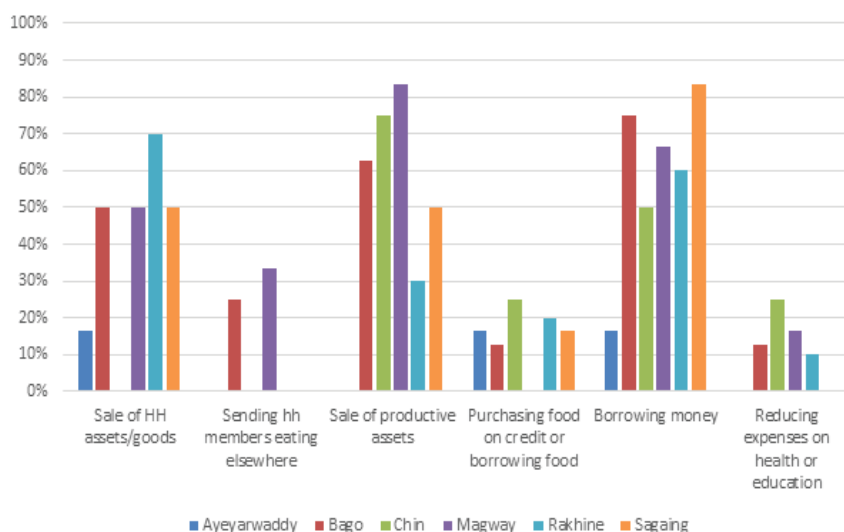
<sup>138</sup> IOM 2015.

<sup>139</sup> CCERR 2015.

<sup>140</sup> FAO and WFP 2015.

<sup>141</sup> FAO and WFP 2015.





**Figure 47.**  
Percentage of households resorting to different coping strategies

Source: FAO and WFP 2015.  
Note: HH = household.

**Households face a risk of increasing indebtedness from already high levels. A third of all households and half of agricultural households were overindebted prior to the floods.**<sup>142</sup>

During the qualitative assessment, farmers indicated relying increasingly on informal credit sources and in some cases were borrowing at high interest rates (~10 percent per month) to pay existing low-interest (1–2 percent per month) loans. Respondents also expressed concern that their repayment challenges will likely worsen over time, as the lack of harvest income takes its toll on savings and payment of the principal comes due in December/January.

**Households report borrowing for food, eating cheaper food, and eating less food, all of which may undermine health and well-being. In the areas affected by the floods, households were already more likely to borrow to meet basic food needs.** One in 10 households in affected areas had a loan to meet basic food needs in 2009–2010. The Agriculture and Livelihood Flood Impact Assessment found that up to 75 percent of villages reported using a variety of food-based coping mechanisms.<sup>143</sup> Twice as many women as men reported reducing their food intake and eating smaller portions. For example, respondents told field researchers that they omitted the curry in their meals and ate just rice and chili.

**There are risks of additional negative coping strategies in the medium term.** The field research found no current indications that withdrawing children from school was a widespread problem, though parents highlighted the difficulties of meeting the costs associated with sending children to secondary school. As food security risks become more severe, however, additional school withdrawals are likely. Migration as a flood response has been limited to areas where improved opportunities are clear and village networks exist, but this response will potentially increase as job opportunities in the winter crop season fail to materialize.

**Over time, the compounded impacts of livelihood degradation, indebtedness, and negative coping strategies are likely to weaken the ability of households to cope with subsequent external shocks.** Households struggling to meet their basic minimum needs have been coping through channels that are likely to reinforce a cycle of poverty.

<sup>142</sup> Overindebtedness is measured in terms of a ratio of debt to asset value (Schicks and Rosenberg 2011; Khandker, Faruqee, and Samad 2013). Households are regarded as overindebted if their debt-to-asset ratio is equal to or larger than 0.4. The calculation includes only assets that can be liquidized easily. These figures come from analysis of IHLC-A-2 data.

<sup>143</sup> FAO and WFP 2015.

**Community coping mechanisms and social relations. In the immediate aftermath of the floods, community structures played a pivotal role in helping communities to cope.**

Warnings issued by township authorities through village leaders enabled communities to relocate to safer locations. Early warning mechanisms appeared particularly effective in locations that had had previous experience with natural disasters. In rural areas, religious buildings were generally the primary point of relocation. Field research found that community groups quickly mobilized to facilitate access to immediate food and nonfood aid and to ensure equal distribution of that assistance. The importance of community coping mechanisms continued into the medium-term recovery period.

**Affected people were starting to use mobile phones and social media to collectively mobilize assistance.**

Improvements in telecommunications resulted in some noticeable changes in how communities accessed immediate aid; for example, some local NGOs and volunteers within communities set up Facebook or messaging groups to elicit donations. At the same time, the ability to draw on advances in telecommunications varied greatly depending on access to networks. Thus more remote communities had less ability to mobilize these forms of support. Communities' access to preexisting migrant networks also affected their ability to access aid, since these networks appear to be the source of most private donations.

**The impacts of the floods and landslides on social relations and cohesion are likely to derive not from demographic changes, which have been few, but rather from livelihood degradation and the nature of the flood response.**

The significant degradation of livelihoods in highly affected areas is likely to have secondary, cumulative effects on poorer households and vulnerable groups. Whether and how communities participate in decisions about aid is also likely to affect social cohesion.

**There are risks of social tension over perceived aid inequity.**

The experience of previous disasters in Myanmar suggests that an influx of post-disaster aid can create social tension, especially if community members feel left out of decision making and have perceptions of aid inequity.<sup>144</sup> Field researchers heard some complaints relating to aid distribution, particularly in heavily affected areas. Respondents reported tensions between a village and religious leader over their respective role in the distribution of aid, and complaints that better-off villagers were receiving food aid. Villagers reported preferring that officials be offered the opportunity to participate in and influence how aid was delivered to their communities.

**The floods and landslides have had different impacts on men and women.**

Women and men across the survey areas experienced high levels of stress. Women, however, were reported to show particular emotional distress and sadness. The teams sent to affected areas by the Emergency Operation Center of the Ministry of Social Welfare, Relief and Resettlement (MSWRR) found that floods have had a psychological impact. A UN assessment in Rakhine also found that people living in shelters began to use negative coping strategies, such as turning to alcohol, which could lead to an increase in gender-based violence.

**Aid effectiveness and village delivery mechanisms. At the request of township officials, new village-level committees were created to distribute aid in the worst-affected areas.**

These appear to be separate from existing village administration structures and, in the villages visited, were heavily influenced by senior monks and village elders. Most non-NGO assistance was collected and distributed by these committees. Where NGOs had preexisting activities in villages, they used committees established through those activities.

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<sup>144</sup> This is the conclusion of Myanmar Social Impacts Monitoring, rounds 1 through 4 (TCG 2008, 2009, 2010; World Bank/GDDRR 2014). These studies were conducted between 2008 and 2013. Three rounds of Post-Nargis Social Impacts Monitoring accompanied the post-disaster recovery period from 2008 to 2010; the fourth round assessed the economic and social life five years after Cyclone Nargis struck.

**Villages demonstrated a tendency toward equal redistribution to the whole village of any targeted aid.** Village administrators justified this approach as a way to eliminate potential communal tension. Vulnerable populations voiced some dissatisfaction with it, however. While they reported understanding why the village distributed aid equally, they claimed it was unfair that rich farmers were receiving the same level of food aid as more vulnerable households. Appropriate grievance mechanisms will help to ensure that the voices of these villagers can be heard.

**Women lack a formal role in aid governance, but can influence delivery through informal means.** In villages visited by the research team, women played no formal role in aid delivery. This is consistent with findings from other research, though donor projects that explicitly require women to take leadership positions—for example, on village development committees—constitute an exception.<sup>145</sup> There were signs of women having informal influence on aid, such as a woman in one village who persuaded the village administrator that households missing on a village list be included in aid distribution.

## RELIEF AND RESPONSE PROGRAMS: SOCIAL PROTECTION

Myanmar seeks to improve “livelihoods of poor families and communities before disasters arise, by smoothing consumption over the year to address seasonal or weather-related nutrition shortfalls, by building the capacity to deliver cash benefits where needed, and by supporting public employment programs that mitigate community risks to disasters.”<sup>146</sup> This section outlines social protection programs that currently exist in Myanmar, and it examines options for programs that can respond to social protection needs following the floods while also entrenching a more systematic approach to social protection issues.

**Pre-flood social protection programs.** At present, there is no comprehensive safety net for the country, and few delivery mechanisms that could be used in the event of emergencies. Government spending on social assistance is extremely low, at 0.02 percent of GDP. The main social assistance programs include welfare programs and support for vulnerable groups from MSWRR and the stipends program from the Ministry of Education (MOE), with new programs specified under the recently endorsed Social Protection Strategic Plan (SPSP) and the Rural Development Strategic Framework (RDSF). Development partners have provided social assistance to vulnerable populations in selected areas, through unconditional food and cash transfers along with cash/food for work programs.<sup>147</sup> However, Myanmar’s social protection programs and delivery systems are still underdeveloped, requiring people to resort to informal coping mechanisms.

**Nature of support offered by immediate relief and response programs.** Government response channeled through ministries and state/region governments so far amounts to K 28.8 billion.<sup>148</sup> The MSWRR Relief and Resettlement Department (RRD) has coordinated cash and in-kind support for emergency relief and household assistance. Food assistance accounted for 59 percent of the total support provided as of October 1, followed by cash (26 percent) and nonfood items (17 percent),<sup>149</sup> but there are significant geographic variations in this distribution. The Ministry of Agriculture and Irrigation and state and region governments have provided cash and in-kind support. The MSWRR Department of Social Welfare (DSW) has coordinated psychosocial support and awareness raising about protection issues in selected areas. Development partners have also focused on distribution of food and essential nonfood items. The use of cash support has been limited so far, but it is expected to become more prominent in the near future as part of early recovery activities. As of September, food support had reached nearly half a million people;<sup>150</sup> and development partners had also provided displaced populations with nonfood items (see Annex 6). There was also an influx of private

<sup>145</sup> World Bank/GFDRR 2014.

<sup>146</sup> GOM 2014, 16.

<sup>147</sup> Infante Villarreal 2015a.

<sup>148</sup> GOM 2015c.

<sup>149</sup> MSWRR 2015.

<sup>150</sup> WFP 2015.

contributions, including private donations and localized and informal responses from communities, as noted above. Much of this assistance was donated directly to villages in affected areas. Local groups provided clothes, water, food, and cash. Private donations have decreased considerably after the initial period following the floods.

**Geographic coverage.** Response efforts have largely focused on the most-affected areas. There is generally higher RRD spending in townships with a greater number of people affected. Ayeyarwady has seen the highest government spending (24 percent), both in absolute terms and relative to other regions/states, followed by Rakhine (15 percent), Bago (13 percent), Shan (11 percent), and Kayin (10 percent).<sup>151</sup> Support from development partners has primarily focused on severely affected areas, such as Rakhine, Chin, Magway, and Sagaing, largely in locations where they operate. Taking economic losses into account, additional geographical needs become apparent. For instance, 79 percent of all destroyed houses and 36 percent of direct economic losses are found in Rakhine and Chin, but only 19 percent of government support has gone to these states.<sup>152</sup> Government is increasing support to these areas and including them as a priority in recovery programs; better coordination with development partners could enhance coverage of underserved areas.

**Remaining needs.** Response efforts seem to be reaching most communities in need, but challenges on coverage and duration of support remain. The Multi-Cluster/Sector Initial Rapid Assessment (MIRA) shows that nearly all respondents (92–100 percent) reported receiving some sort of humanitarian assistance in the areas surveyed.<sup>153</sup> There is a general overlap between government and development partner support, but some townships and some groups are being underserved (see Annex 6). For instance, IDP needs in Chin camps were met quickly and effectively,<sup>154</sup> but there were difficulties reaching the worst-hit areas in Chin and Rakhine through early September, which are likely continuing in areas not assessed by MIRA.

**More sustained effort is required to increase food, income and livelihood security for the flood-affected households, particularly the poorest and most vulnerable.** The damage and loss assessments suggest a cumulative decline in household livelihood and food security in coming months, with a weakened ability to withstand future shocks. As seen before with Cyclones Nargis and Giri, most humanitarian response from development partners has a short time horizon of one to six months.<sup>155</sup> Financing for recovery and rehabilitation beyond the initial relief and response efforts is thus needed.

## RECOVERY AND RECONSTRUCTION STRATEGY

**There is no large-scale social protection program in Myanmar that could be scaled up to support flood-affected households in terms of cash transfers and social work support services.** Nor are there robust systems in place that facilitate rapid identification and enrollment of beneficiaries and benefit payments. International experience demonstrates that these are critical for protecting people against disasters and building long-term resilience (see Annex 6).

**The President's Instructions call for social protection interventions to support flood-affected households as a core element of the government's recovery plan.**<sup>156</sup> These interventions include rice rations, cash transfers to poor households and vulnerable groups, youth volunteer opportunities, reconstruction of housing and public infrastructure, and creation of employment opportunities through cash for work programs. The SPSP and the RDSF also include these interventions as core elements of Myanmar's emerging social protection system (see also the 2015 National Natural Disaster Management Committee Action Plan).

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<sup>151</sup> MIMU 2015a.

<sup>152</sup> GOM 2015b, 2015c.

<sup>153</sup> OCHA 2015a.

<sup>154</sup> IOM 2015.

<sup>155</sup> MIMU 2015a.

<sup>156</sup> GOM 2015d.

## RECOVERY AND RECONSTRUCTION PLAN

**The proposed social protection recovery plan described below summarizes the interventions required in the short term (six months), medium term (one year), and long term (two or more years).** These will form the foundation for a robust social protection system able to respond to future disasters. The plan includes interventions to meet different needs of men and women, as well as those of different age groups. Design of certain interventions such as cash for work would need to be adapted to local conditions to reflect geographical needs and priorities (e.g., infrastructure projects).

### 1. Provide immediate income support to households.

**Cash transfers are an important component of how countries coordinate and deliver emergency assistance.** In the short term, immediate income and psychosocial support will be provided through cash transfers and social work interventions for poor households and vulnerable groups; in the medium term, an equitable national social protection system will be strengthened. The following cash transfers are proposed: (i) categorical benefits (monthly) for pregnant women, children under two years of age, persons aged 70 and above, and persons with disabilities; and (ii) household benefit (monthly). The National Action Plan also calls for the provision of psychosocial support in the flood-affected areas; this support has been initiated in the flood-affected areas by mobile teams (see Annex 6 for details).

**Implementation and financing.** DSW (under MSWRR) has the oversight of the flood recovery cash transfers and the responsibility for providing psychosocial support through social work case management; implementation of the cash transfers will be through the collaborative efforts of the General Administration Department and the Myanmar Maternal and Child Welfare Association. The financing requirement for providing the benefits in the short term (for the preferred option) is estimated at 0.03 percent of GDP, while medium- to long-term continuation of these benefits would cost roughly 1 percent of GDP. In addition, medium-term needs include the development of and capacity building for MSWRR/DSW offices in each of the affected townships. The related infrastructure and equipment costs are estimated at roughly K 712.5 million in the affected townships, with total staffing/operational costs accordingly at roughly K 625 million per year (or roughly 1 percent of program costs under Option A in Annex 6).

### 2. Provide income security and livelihoods opportunities for affected households while contributing to asset recovery.

**Cash/food for work programs are effective in reconstructing community assets while also contributing to household recovery by providing temporary employment at low wages, mainly to unskilled workers in rural areas.** In the medium term, a cash/food for work recovery program is proposed to provide temporary employment and rebuild/repair damaged local infrastructure in selected flood-affected areas only. The extensive experience of development partners in implementing these programs in Myanmar provides a firm foundation for introducing a government-led cash/food for work program. This will form the basis for a long-term cash/food for work program in rural areas that suffer high levels of seasonal unemployment, food insecurity, and indebtedness (see Annex 6).

**Implementation and financing.** The Department of Rural Development (DRD), under the Ministry of Livestock, Fisheries and Rural Development (MLFRD), has the mandate for implementing cash/food for work programs according to the RDSF and the SPSP. The financing requirement for providing the benefits in the medium term ranges from 0.07 percent to 0.09 percent of GDP (depending on geographic coverage), while long-term continuation of these benefits would cost roughly 0.2 percent of GDP. Annex 6 provides further information on benefit costs and related administrative and other costs.

### 3. Ensure financial access to essential health and education.

**Ensuring geographical and financial access to essential health and education is crucial for limiting impoverishment due to catastrophic health expenditure, and for fostering the return to school of children and preventing child labor.** After the recovery of health and education physical assets in the short term, existing government programs could be scaled up in affected areas to meet these objectives. In particular, school stipends and school feeding programs piloted by MOE could be scaled up, first in affected townships to provide an incentive for children to go back to school after the floods, and then progressively across the country to ensure longer-term resilience. Those forced to migrate should be properly registered and given the necessary documents to be able to access health and education services in the area of destination (see also recovery plans in the chapters on the education and health sectors).

## RECOVERY AND RECONSTRUCTION IMPLEMENTATION

**Current institutional arrangements for social protection.** Government policies provide clarity on institutional mandates for design and implementation of social protection programs, as follows:

- MSWRR/DSW is responsible for supporting vulnerable groups, such as older people, women and children in need, and persons with disabilities.
- MLFRD/DRD is responsible for cash/food for work programs in rural areas.
- Ministries of Education and Health are responsible for implementing stipends and vouchers (i.e., cash and near-cash transfers) to promote access to education and maternal and child health care, respectively.
- Ministry of Construction has overall responsibility for reconstruction (that contributes to restoration of livelihoods and income security), and General Administration Department plays a key role in social protection delivery. At the local level, elected village administrators and village tract administrators can potentially support some of the delivery functions more actively. The role of communities is also central.

**Delivery systems.** The implementation modalities for the proposed interventions are outlined in Annex 6. Having effective systems in place will make response and recovery efforts faster and more effective in the future. These systems include data collection and mapping of vulnerability and hazard risk; systems for geographic targeting; beneficiary identification and enrollment; systems for payments (moving from cash to electronic payments); communication and outreach; grievance redress; record keeping; and monitoring and evaluation.

## SECTOR ASSESSMENT METHODOLOGY

The analysis presented is by definition preliminary. Immediate livelihoods and socioeconomic impacts were measured and are likely to evolve over time. It is too early to identify the full social impacts of the floods: they will take time to emerge, and depend on the nature of the flood response. Poverty and social impacts are identified based on a combination of qualitative and quantitative evidence. The primary data sources are a review of baseline data sources, the existing post-floods secondary assessments and data, lessons from two large-scale longitudinal studies, and small-scale field verification. The analysis follows the categorization of the National Natural Disaster Management Committee by dividing the disaster-affected townships into the most severely affected areas, consisting of the 40 most-affected townships, and the remaining less-affected areas, covering 178 townships. These top 40 townships account for 92 percent of destroyed houses, 83 percent of destroyed schools, and 64 percent of destroyed farmland. These townships also account for 49 percent of displaced people.



Damaged house in Myan Aung in Ayeyarwady.  
Photo: © National Community Driven Development Project

## Disaster Impact on Quality of Life

### SUMMARY

Disaster may or may not have a significant impact on overall economic development, but it always has a very significant impact on affected populations' quality of life or well-being at the personal or household level, especially for more vulnerable population groups, including women, children, and the elderly. The 2015 Post-Flood and -Landslide Needs Assessment in Myanmar used existing sectoral baseline information and the estimated value of the main disaster effects as observed during field surveys to estimate the sectoral indicators and define quality of life. A gap analysis of the quality-of-life indicators reveals that the impact of the floods and landslides has triggered a geographically widespread decline in the quality of life of the disaster-affected population, particularly in Ayeyarwady, Bago and Chin, which sustained the highest decline in the quality-of-life index. There seems to be a correlation between a low quality of life and vulnerability to external shocks: high exposure to a disaster was found to coincide with a significant decline in post-disaster quality of life in Chin, Bago, Ayeyarwady, Kachin, Rakhine and Magway.

### INTRODUCTION

While reliable quantitative procedures have been devised to estimate disaster impact at the macroeconomic level, methodologies to estimate disaster impact at personal or household level have lagged behind, and often qualitative means of assessment are the only ones available. Attempts have been made to adopt the Human Development Index for estimating household-level disaster impact; however, this index is relatively static and does not lend itself to measuring the sudden deterioration of quality of life caused by disasters. In addition, the Human Development Index is not available in all countries or at subnational levels.

One recently proposed approach to measuring disaster's impact on quality of life is to adopt a composite index using relatively simple indicators that can be collected over the relatively short period—three to five weeks—of a typical Post-Disaster Needs Assessment (PDNA). This approach was applied and tested during the recent PDNA conducted after the 2015 Nepal earthquake. The following sectoral indicators were selected for use in the estimation of disaster impact on quality of life for the affected population:

- Housing deficit
- Number of patients treated in hospitals because of physical or psychological injuries, or due to the occurrence of disease outbreaks arising from the disaster
- Number of school days lost by students due to interruption of classes
- Decline in household connections to electricity grid
- Decline in household connections to collective water supply and sanitation systems
- Decline in personal or household income

In addition to the above, whenever agricultural production losses have been high in comparison to the normal volume of production—such as may occur as a result of slow-evolving disasters—an additional indicator measuring food insecurity may be added.

On the basis of the values obtained for pre-disaster and post-disaster conditions for the sector indicators listed above, with equal weights assigned to each, a composite indicator can be developed that provides a picture of the disaster's effect on the population's quality of life. The estimated quality-of-life-composite indicator can also be used to measure the degree of recovery being achieved over time.



## QUANTIFICATION OF SECTORAL QUALITY-OF-LIFE INDICATORS

**Housing.** While complete information on existing housing deficits was not available, the recent census and household survey provided the number of households in all disaster-affected states and regions. It was assumed that each household occupied one housing unit. The number of housing units that were fully destroyed and partially damaged (moderately or severely) was ascertained from local and state/region authorities. Information on the number of pre-disaster households and the number of destroyed or damaged houses is shown in Table 69.

State/Region	Pre-disaster households (number)	Post-disaster households (number)		
		Fully destroyed	Partially damaged	Total
Ayeyarwady	1,488,983	19,114	21,633	40,747
Bago	1,142,974	269	13,314	13,583
Chin	91,121	2,934	211	3,145
Kachin	269,365	68	1,032	1,100
Kayah	57,274	-	-	-
Kayin	308,041	1	251	252
Magway	919,777	414	12,829	13,243
Mandalay	1,323,191	256	875	1,131
Mon	422,612	-	-	-
Nay Pyi Taw	262,253	-	-	-
Rakhine	459,772	13,392	22,933	36,325
Sagaing	1,096,857	1,963	19,648	21,611
Shan	1,169,569	128	91	219
Tanintharyi	283,099	3	15	18
Yangon	1,582,944	-	3,092	3,092
<b>Total</b>	<b>10,877,832</b>	<b>38,542</b>	<b>95,925</b>	<b>134,467</b>

Sources: Population census, household survey, and reports from states and regions on affected housing units.

Note: — = not available.

Housing units that sustained minor damage are not included in Table 69, as their impact on quality of life is deemed not very significant. On the basis of the above, and in the absence of statistics on pre-disaster housing deficits for all affected states and regions, the following indexes were developed for the housing sector for both pre-disaster and post-disaster situations (Table 70).

State/Region	Pre-disaster	Post-disaster
Ayeyarwady	1.0000	0.9726
Bago	1.0000	0.9881
Chin	1.0000	0.9655
Kachin	1.0000	0.9959
Kayah	1.0000	1.0000
Kayin	1.0000	0.9992
Magway	1.0000	0.9856
Mandalay	1.0000	0.9991
Mon	1.0000	1.0000
Nay Pyi Taw	1.0000	1.0000
Rakhine	1.0000	0.9210
Sagaing	1.0000	0.9803
Shan	1.0000	0.9998
Tanintharyi	1.0000	0.9999
Yangon	1.0000	0.9980

Sources: Estimations by the assessment team.

**Table 69.**

Pre- and post-disaster housing data in affected states and regions

**Table 70.**

Pre- and post-disaster housing index for affected states and regions

**Education.** The baseline on number of schools and of students enrolled per state/region and district was obtained from different official sources. Data on the number of schools that were fully destroyed or partially damaged were collected during field surveys by government officials at national and state/region levels. Although temporary facilities were secured to allow classes to resume and reduce student education losses even where schools had been fully destroyed, an average interruption of 15 school days did occur. Total lost education days were estimated by taking into consideration the number of students enrolled in those school facilities that had to close temporarily. On that basis, education indexes were developed for each of the affected states and regions for both pre-disaster and post-disaster situations (Table 71).

**Table 71.**  
Pre- and post-disaster education index for affected states and regions

State/Region	Pre-disaster	Post-disaster
Ayeyarwady	1.0000	0.9666
Bago	1.0000	0.9735
Chin	1.0000	0.9915
Kachin	1.0000	1.0000
Kayah	1.0000	1.0000
Kayin	1.0000	1.0000
Magway	1.0000	1.0000
Mandalay	1.0000	0.9790
Mon	1.0000	0.9964
Nay Pyi Taw	1.0000	1.0000
Rakhine	1.0000	0.9968
Sagaing	1.0000	1.0000
Shan	1.0000	0.9537
Tanintharyi	1.0000	1.0000
Yangon	1.0000	0.9859

Sources: Estimations by the assessment team.

**Health.** In this sector it was not possible to obtain data on the number of in-hospital visits or the number of cases of disaster-related disease treated after the floods and landslides. The Ministry of Health did not have such information available (although it did have data on morbidity for previous years). Because of those limitations in information, no health-related index was developed.

**Water supply.** For every state and region, full baseline information was available about the number of households with access to improved water supply, and the baseline data were compared with census data on the number of households in the country (see Table 72). During the assessment, data were collected on the number of households that no longer have such access to these services. Using data on the number of existing households in each of the states and regions of the country, available in the recent census and household survey, it was then possible to derive pre-disaster and post-disaster indexes on improved water supply access, as shown in Table 73.

State/ Region	Households (number)	Households having access to improved water supply (number)	
		Pre-disaster	Post-disaster
Ayeyarwady	1,488,983	796,553	581,608
Bago	1,142,974	831,514	717,994
Chin	91,121	66,030	55,561
Kachin	269,365	145,491	144,216
Kayin	57,274	n.a.	n.a.
Magway	308,041	177,875	177,616
Mandalay	919,049	681,832	596,615
Mon	1,323,191	1,136,879	1,134,265
Rakhine	422,612	293,742	293,027
Sagaing	262,253	n.a.	n.a.
Shan	459,772	189,870	163,989
Yangon	1,096,857	839,725	774,263

Sources: Assessment team based on the 2014 Population Census and the General Administration Department.

**Table 72.**

Pre- and post-disaster access to improved water supply in affected states and regions

State/Region	Pre-disaster	Post-disaster
Ayeyarwady	0.7020	0.3906
Bago	0.9880	0.6282
Chin	0.9263	0.6097
Kachin	0.7772	0.5354
Kayin	n.a.	n.a.
Magway	0.5774	0.5766
Mandalay	0.7419	0.6492
Mon	0.8592	0.8572
Rakhine	0.6951	0.6934
Sagaing	n.a.	n.a.
Shan	0.4130	0.3567
Yangon	0.7656	0.7059

Sources: Estimations by the assessment team.

**Table 73.**

Pre- and post-disaster water supply index for affected states and regions

**Sanitation.** As was the case for water supply, full baseline information was available about the number of households that have access to improved sanitation facilities for all states and regions, and was compared with census data on the number of households in the country (Table 74). Data on the number of households that no longer have such access to improved sanitation services were also collected during the assessment. Using data on the number of existing households in each of the states and regions—available in the recent census and household survey—it was possible to derive pre-disaster and post-disaster indexes on improved sanitation access (Table 75).

**Table 74.**

Pre- and post-disaster access to improved sanitation facilities in affected states and regions

State/ Region	Households (number)	Households having access to improved sanitation facilities (number)	
		Pre-disaster	Post-disaster
Ayeyarwady	1,488,983	1,134,712	909,807
Bago	1,142,974	841,637	701,628
Chin	91,121	71,826	59,642
Kachin	269,365	187,192	185,444
Kayin	57,274	n.a.	n.a.
Magway	308,041	212,993	212,721
Mandalay	919,049	660,082	570,016
Mon	1,323,191	1,053,531	1,051,240
Rakhine	422,612	331,075	329,984
Sagaing	262,253	n.a.	n.a.
Shan	459,772	157,100	128,299
Yangon	1,096,857	754,365	681,044

Sources: Assessment team based on the 2014 Population Census and the General Administration Department.

**Table 75.**

Pre- and post-disaster sanitation index for affected states and regions

State/Region	Pre-disaster	Post-disaster
Ayeyarwady	0.7621	0.6110
Bago	0.7364	0.6139
Chin	0.7823	0.6545
Kachin	0.6949	0.6884
Kayin	n.a.	n.a.
Magway	0.6914	0.6906
Mandalay	0.7182	0.6202
Mon	0.7962	0.7945
Rakhine	0.7834	0.7808
Sagaing	n.a.	n.a.
Shan	0.3417	0.2790
Yangon	0.6878	0.6209

Sources: Estimations by the assessment team.

**Electricity.** Baseline information on the number of households connected to the electrical grid was compared to data on total number of households (from the census and household survey) to arrive at the pre-disaster electricity index. To estimate the post-disaster electricity index, use was made of data collected by electricity companies on the number of disaster-affected houses that would not be connected to the grid until they were repaired or rebuilt. These houses were broken down into those that would be reconnected in about 12 months (rebuilt) and those that would be reconnected in about 4 months (repaired), and due weight was given to each category. These data are shown in Table 76. Using this information, the values of pre-disaster and post-disaster electricity indexes were developed for each affected state and region (Table 77). It should be noted that the change or decline in the electricity index is very limited because the rates of household connection to the grid were very low to start with.

State/Region	Pre-disaster situation		Houses disconnected after disaster, over different time periods (number)		
	Households (number)	Households connected (number)	4 months	12 months	Total
Ayeyarwady	1,488,983	134,008	1581	128	1709
Bago	1,142,974	251,454	60	96	156
Chin	91,121	13,668	153	150	303
Kachin	269,365	61,954		16	16
Kayah	57,274	21,191			
Kayin	308,041	40,045			
Magway	919,777	147,164	369	441	810
Mandalay	1,323,191	410,189	14	78	92
Mon	422,612	n.a.	8	5	13
Nay Pyi Taw	262,253	149,484			
Rakhine	459,772	27,586	552	399	951
Sagaing	1,096,857	208,403	219	184	403
Shan	1,169,569	245,609	5	32	37
Tanintharyi	283,099	25,479			
Yangon	1,582,944	1,234,696			

Sources: Assessment team based on data from General Administration Department.

**Table 76.**

Pre- and post-disaster data on connection to the electrical grid in affected states and regions

State/Region	Pre-disaster	Post-disaster
Ayeyarwady	0.0900	0.0889
Bago	0.2200	0.2199
Chin	0.1500	0.1467
Kachin	0.2300	0.2299
Kayah	0.3700	0.3700
Kayin	0.1300	0.1300
Magway	0.1600	0.1591
Mandalay	0.3100	0.3099
Mon	—	—
Nay Pyi Taw	0.5700	0.5700
Rakhine	0.0600	0.0579
Sagaing	0.1900	0.1896
Shan	0.2100	0.2100
Tanintharyi	0.0900	0.0900
Yangon	0.7800	0.7800

Sources: Estimations by the assessment team.

Note: — = not available.

**Table 77.**

Pre- and post-disaster electricity index for affected states and regions

**Personal income.** Use was made of per capita GDP information for fiscal year 2014/2015 to define pre-disaster personal income for the population living in the affected states and regions. After the values of production losses and higher expenditures were estimated by each disaster-affected sector of activity, projected state and region GDP was used to derive post-disaster per capita GDP. This process made it possible to define pre- and post-disaster personal income indexes by state and region, using the highest per capita income in Tanintharyi as the reference (values are shown in Table 78).

**Personal income.** Use was made of per capita GDP information for fiscal year 2014/2015 to define pre-disaster personal income for the population living in the affected states and regions. After the values of production losses and higher expenditures were estimated by each disaster-affected sector of activity, projected state and region GDP was used to derive post-disaster per capita GDP. This process made it possible to define pre- and post-disaster personal income indexes by state and region, using the highest per capita income in Tanintharyi as the reference (values are shown in Table 78).

**Table 78.**  
Pre- and post-disaster personal income index in disaster-affected states and regions

State/Region	Per capita GDP (thousand K/person)		Personal income index	
	Pre-disaster	Post-disaster	Pre-disaster	Post-disaster
Ayeyarwady	1,350	1,337	0.543	0.538
Bago	1,066	1,055	0.428	0.424
Chin	491	421	0.197	0.169
Kachin	756	750	0.304	0.302
Kayah	790	788	0.318	0.317
Kayin	775	773	0.311	0.311
Magway	1,520	1,509	0.611	0.606
Mandalay	1,078	1,075	0.433	0.432
Mon	1,247	1,247	0.501	0.501
Rakhine	1,449	1,425	0.582	0.573
Sagaing	1,395	1,374	0.561	0.552
Shan	690	690	0.278	0.277
Tanintharyi	2,488	2,488	1.000	1.000
Yangon	1,963	1,960	0.789	0.788

Sources: Estimations by the assessment team.

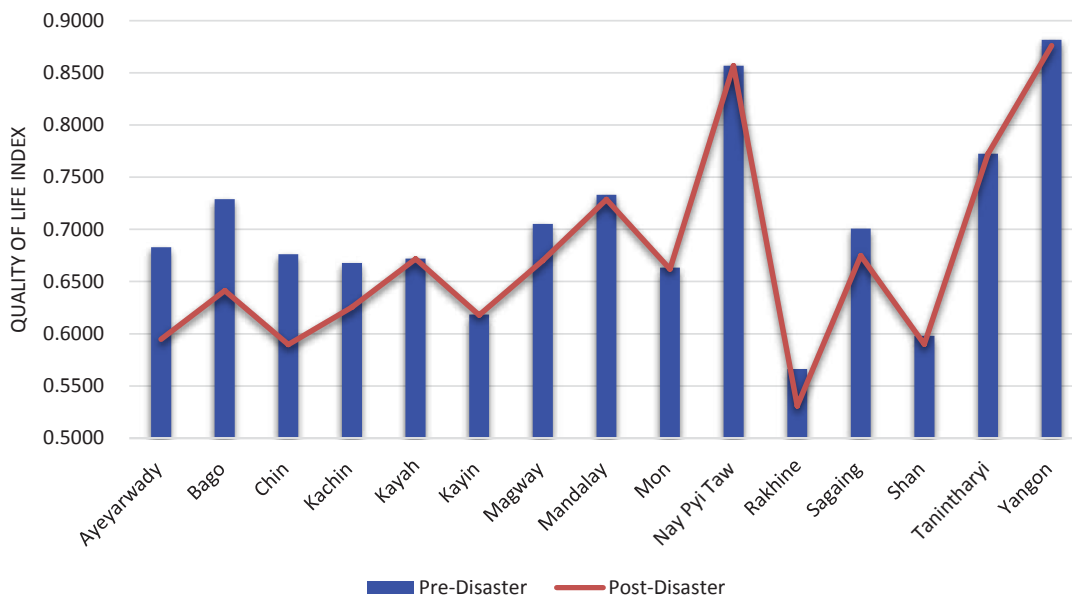
## COMPOSITE INDEX ON QUALITY OF LIFE

Using the above-described six sectoral indicators, an equal-weight composite quality-of-life index was developed for both pre-disaster and post-disaster situations in all affected states and regions (Table 79). The decline in quality of life sustained by the population in the disaster-affected states and regions is illustrated in Figure 48. Figure 49 shows the most affected states and regions in terms of the decline in quality of life among their population, and which would therefore require more focused assistance for recovery of their living conditions

**Table 79.**  
Equal-weight composite quality-of-life index for pre- and post-disaster conditions in all affected states and regions

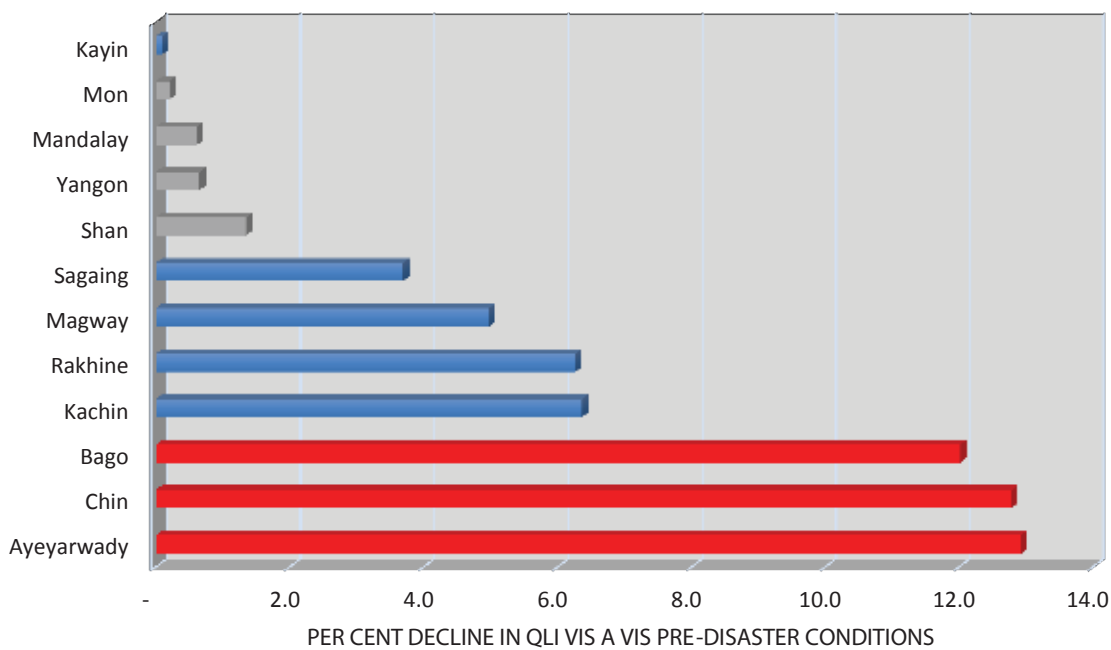
State/Region	Pre-disaster	Post-disaster
Ayeyarwady	0.6828	0.5945
Bago	0.7288	0.6412
Chin	0.6760	0.5896
Kachin	0.6677	0.6252
Kayah	0.6719	0.6717
Kayin	0.6184	0.6179
Magway	0.7052	0.6701
Mandalay	0.7331	0.7286
Mon	0.6633	0.6620
Nay Pyi Taw	0.8567	0.8567
Rakhine	0.5662	0.5307
Sagaing	0.7007	0.6748
Shan	0.5979	0.5898
Tanintharyi	0.7725	0.7725
Yangon	0.8816	0.8759

Sources: Estimations by the assessment team.



**Figure 48.** Pre- and post-disaster values of the composite quality-of-life index in all states and regions

Sources: Assessment team.



**Figure 49.** Ranking of states and regions with high values of disaster-induced quality of life index decline

Sources: Assessment team.

A ranking of the states and regions that saw the biggest decline in quality of life for their populations, and which would hence require more focused assistance for recovery of living conditions, is provided in Figure 51. Results of the analysis conducted to relate pre-disaster conditions and post-disaster decline in the quality-of-life index are shown in Table 80.

**Table 80.**  
Post-disaster  
decline in  
quality-of-life  
index by state/  
region

State/Region	Pre-disaster per capita income (thousand K/person)	Per capita disaster effects (K/person)	Decline in quality-of-life index	Decline from pre-disaster quality-of-life index (%)
Ayeyarwady	1,350.3	83,179	0.0883	12.9
Bago	490.7	132,562	0.0864	12.8
Rakhine	1,066.1	63,803	0.0876	12.0
Chin	755.9	11,741	0.0425	6.4
Magway	1,449.2	105,664	0.0355	6.3
Sagaing	1,519.7	47,734	0.0351	5.0
Yangon	1,395.3	62,526	0.0259	3.7
Shan	690.4	3,369	0.0080	1.3
Mandalay	1,962.8	19,389	0.0057	0.7
Kachin	1,078.3	23,656	0.0045	0.6
Mon	1,247.5	850	0.0013	0.2
Kayin	775.0	3,104	0.0005	0.1

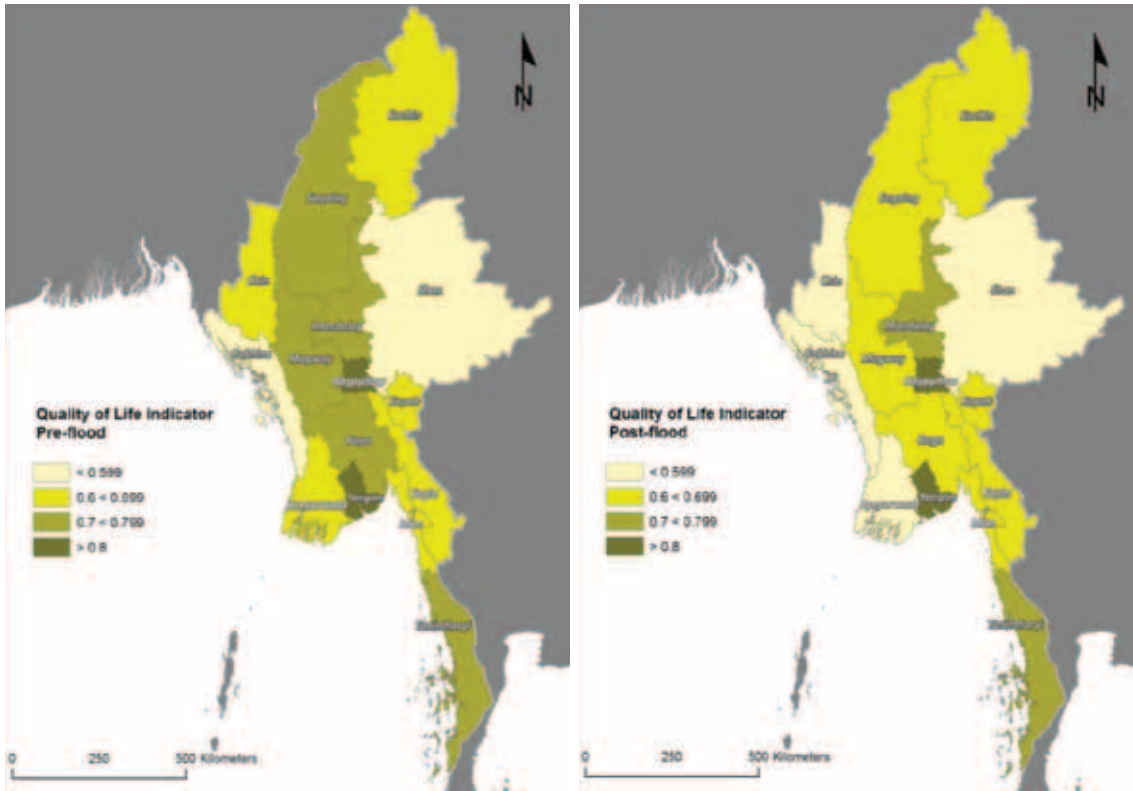
Sources: Estimations by the assessment team.

## KEY FINDINGS

Making use of the sectoral baseline and post-disaster information on disaster effects, a gap analysis of the quality-of-life indicators reveals the following:

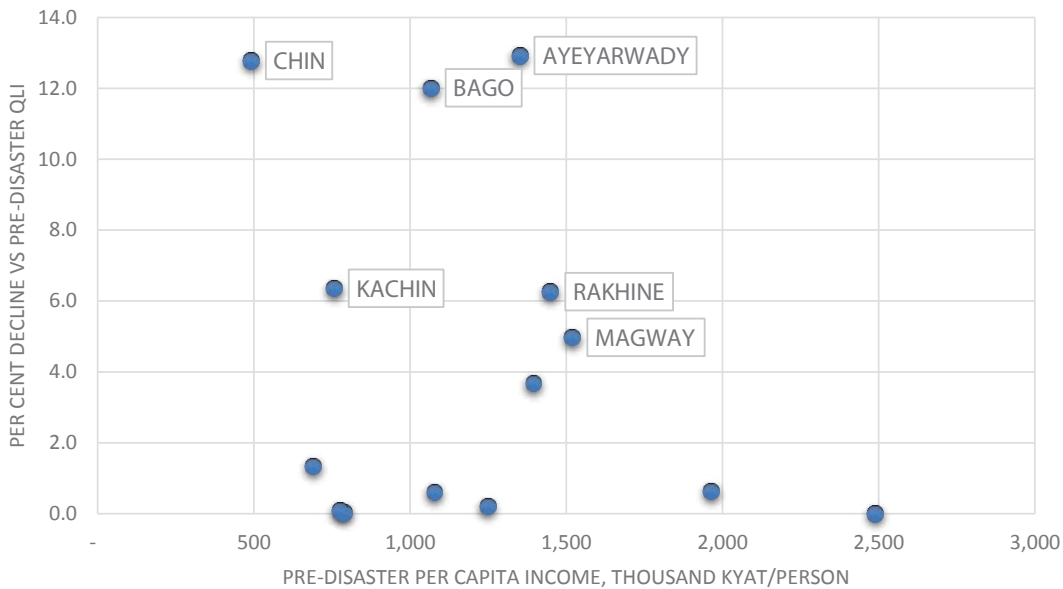
- The impact of the floods and landslides has triggered a geographically widespread decline in the quality of life in the affected population. The analysis reveals that while before the disaster five states and regions (Bago, Magway, Mandalay, Sagaing and Tanintharyi) had a quality-of-life index of between 0.7 and 0.8, after the disaster three of them (Bago, Mandalay and Sagaing) had dropped to the next lower level. The analysis also reveals that while before the disaster there were six states and regions (Ayeyarwady, Chin, Kachin, Kayah, Kayin, and Mon) with an index of between 0.6 and 0.7; after the disaster, there are four at the lowest level (Ayeyarwady, Chin, Rakhine and Shan) (Figure 50).
- There seems to be a correlation between a low quality of life and vulnerability to external shocks in at least some of the states and regions. High exposure to a disaster coincides with a significant post-disaster decline in quality of life, such as in Chin, Bago, Ayeyarwady, Kachin, Rakhine, and Magway (Figure 51).
- Overall, Ayeyarwady, Bago and Chin sustained the highest decline in the quality-of life-index (Figure 51).





**Figure 50.** Disaster impact on quality of life in affected areas

Sources: Assessment team.



**Figure 51.** Relationship between pre-disaster per capita income and post-disaster quality-of-life index decline for affected States

Sources: Assessment team.

## SPECIAL FOCUS ON CHIN

The quality-of-life index provides an essential geographical overview of the disaster's impact on the quality of life. However, a complementary demographic analysis is needed to explore the underlying socioeconomic vulnerabilities of the local population in question. In the case of Myanmar, the dramatic decline in the quality of life in Chin, combined with the region's low pre-disaster income levels, calls for a closer analysis—and for prioritized assistance during the recovery phase.

According to the 2014 Myanmar Population and Housing Census, Chin is the least-populated region in the country, with a striking population density of only 13 people per km<sup>2</sup>, compared to a national average of 76. Chin's population is predominantly rural (79.0 percent of the total) and is, as is typical for Myanmar, more heavily female (196,586 women compared to 182,406 men); furthermore, 22.9 percent of all households in Chin are female-headed.

Chin's demographic development is characterized by the highest fertility rate in the country, with an average of 4.4 children per woman. As a consequence, Chin has the highest child population (72.3 percent) in Myanmar and an average age of 12 years. These demographics give rise to the highest total dependency ratio across the country, at a staggering 81.0 percent, compared to the union average total dependency ratio of 53.0 percent. This very high dependency presents a large burden for the productive age population in Chin.

Socioeconomic development in Chin is lagging behind all the other states and regions, and Chin's performance on key indicators is alarmingly low. Chin has the lowest literacy rate across the country (79.4 percent); 28.1 percent of all women in Chin are illiterate. Chin has also the highest disability rate in Myanmar (7.4 percent), with 35,669 people who are reported to have some sort of disability. Chin has the second-highest infant mortality rate in Myanmar: the census shows that for every 1,000 children born in Chin, 76 die before reaching their first birthday. Similarly, life expectancy at birth in Chin is 63.6 years, the second lowest in Myanmar.

These demographic challenges are combined with an above-average unemployment rate of 5.4 percent, (compared to the national average of 4.0 percent) and the lowest per capita GDP across the country (K 491,000/person).

## USE OF THE QUALITY OF LIFE INDEX TO MONITOR RECOVERY

The composite quality-of-life index that has been derived for the Myanmar disaster can assist in focusing priorities for recovery in two ways: it provides a measure of negative disaster impact on the living conditions of the affected population, and it also shows the geographical distribution of the impact. But it also serves a further function by offering a quantitative means to measure progress in achieving recovery over time. Indeed, in view of its relative simplicity and of the ready availability of information for its calculation, the quality-of-life index may be reevaluated periodically to determine progress in achieving recovery and reconstruction.





TengKay village: Women sorting the morning's catch. Helping to finance non-core growing activities is crucial for rounding out rural households' cashflow. Photo: © Luc Vaillancour.

A photograph of a woman in the foreground, smiling and looking towards the camera. She has white face paint (mud) applied to her face and is wearing a white sleeveless top and a patterned sarong. She is crouching on a dirt ground, surrounded by other people, some of whom are also wearing face paint. The background shows a dirt path and some foliage. The text "RECOVERY STRATEGY AND WAY FORWARD" is overlaid in blue, bold, uppercase letters across the top of the image.

# RECOVERY STRATEGY AND WAY FORWARD

## Recovery Strategy And Way Forward

### Summary

**The post-flood and -landslide recovery strategy poses many challenges to the government of Myanmar: political, technical, social, and institutional.** The government of Myanmar's recovery vision is to promote “a people-centered resilient growth by building back better”<sup>158</sup> in all 12 affected states and regions. The government is taking a whole-of-society approach to preparing the recovery plan. It is engaging every level of government (union, state and region, township) and has support from the private sector, civil society, academia, communities, and development partners. The recovery process should be directed by guiding principles that ensure the recovery strategy is harmonious with government policies and draws on the body of international good practice. A key aspect of this approach is a seamless transition from short- to medium-term goals—a continuous process encompassing the ongoing emergency response, the post-flood and -landslide recovery, and progressive integration with the national development strategy and plan. It is recommended that the results and data from the Post-Flood and -Landslide Needs Assessment (PFLNA) be integrated in preparing the Comprehensive Recovery Plan and Strategy, so that ministries, regions, states, and unions have a baseline to use in preparing their respective recovery plans. Recovery and reconstruction needs have been estimated by the PFLNA in the order of K 2.035 trillion (Table 81).

**Table 81.**

Summary of recovery and reconstruction needs by sector (million K)

	Short term (up to 4 months)	Medium term (up to 12 months)	Long term (1–3 years)	TOTAL
<b>Productive</b>	<b>324,346.1</b>	<b>298,118.5</b>	<b>255,856.3</b>	<b>878,320.9</b>
Agriculture, Fisheries and Livestock	229,472.8	166,104.5	--	395,577.3
Water Resources Management (Irrigation and Flood Control)	4,798.3	15,870.2	180,068.8	200,737.3
Industry and Commerce	90,000.0	75,000.0	75,000.0	240,000.0
Banking and Finance	75.0	41,143.8	787.5	42,006.3
<b>Social</b>	<b>9,932.6</b>	<b>70,489.0</b>	<b>47,179.0</b>	<b>127,600.7</b>
Health	5,332.6	12,631.0	14,383.0	32,346.7
Education	4,600.0	57,858.0	32,796.0	95,254.0
<b>Infrastructure</b>	<b>12,222.3</b>	<b>296,755.2</b>	<b>515,447.0</b>	<b>824,424.5</b>
Housing	2,225.0	191,832.0	438,483.0	632,540.0
Electricity	1,019.5	1,762.6	2,209.0	4,991.1
Water and Sanitation	1,069.0	17,554.0	7,000.0	25,623.0
Transport	6,553.0	80,456.0	62,755.0	149,764.0
Communications	1,355.8	5,150.6	5,000.0	11,506.4
<b>Cross-cutting</b>	<b>79,849.4</b>	<b>40,228.5</b>	<b>84,500.0</b>	<b>204,577.9</b>
Gender	2,770.9	3,500.0	4,000.0	10,270.9
Environment	0.0	1,700.0	63,000.0	64,700.0
DRM	750.0	13,700.0	17,500.0	31,950.0
Employment and Livelihoods	21,328.5	21,328.5	n.a.	42,657.0
Social Protection	55,000.0	(110,000.0) <sup>a</sup>	(551,375.0) <sup>a</sup>	55,000.0
<b>Total</b>	<b>426,350.4</b>	<b>705,591.2</b>	<b>902,982.3</b>	<b>2,034,923.9</b>

Source: Assessment team.

Note: n.a. = not applicable. Please see individual chapters for sectoral details on the recovery and reconstruction needs.

b. The proposed medium and long-term needs cash for work flood recovery programs will help provide temporary local employment to affected households for the repair and reconstruction of local infrastructure (schools, health clinics, housing, fish ponds, water and sanitation, wells and other water sources etc.). The bulk of the equipment and material costs are already covered by reallocations to sectoral reconstruction budgets. A part of this reconstruction budget needs to be reallocated for labor costs under the cash for work program.

<sup>158</sup> GOM 2015.

## Guiding Principles

The “build back better” principle serves as the guiding framework in the development and implementation of rehabilitation and recovery interventions. The principle focuses on long-term, sustainable efforts to reduce vulnerabilities and strengthen capacities to cope with future hazard events. This approach takes into consideration the need for urgency while ensuring safety in implementing programs and projects. More specifically, recovery seeks to do the following:

- **Set up scalable programs and systems.** Adequate and predictable financing should be in place before disaster strikes. Global and ASEAN examples show that pre-committed financing mechanisms help reduce response times and allow scale-up to increase coverage after a disaster (see Annex 6).
- **Keep program design appropriate and simple.** Programs should be based on a rapid assessment of the needs of beneficiaries and build on existing experience in the country. Disaster risk management considerations need to be explicitly integrated to increase communities’ capacity to cope with future shocks (e.g., apply build back better principles in cash-for-work projects). Any new programs introduced should form the basis for a long-term sustainable social protection system.
- **In the immediate aftermath of a disaster, assist both poor and non-poor households.** Targeted assistance can be difficult to implement and can be perceived as divisive. In the recovery phase, support can be targeted to the most vulnerable and most affected households.
- **Increase impact through partnerships and coordination.** This requires minimizing program overlap geographically, ensuring program delivery mechanisms minimize the burden on local officials, and providing adequate financing for implementation costs at all levels.
- **Integrate key future risks into program design.** Risks related to the post-disaster situation include unsafe migration and trafficking, shifts in gender dynamics, and the appearance and/or increase of child labor. Programs need to take these risks into account in their design and ensure appropriate coordination with education and health services and with institutions responsible for mainstreaming information at community level.
- **Build on existing institutions.** Numerous institutions, both formal and informal, already exist in most villages. Recovery efforts should build on these structures, and build their capacities, rather than establish new mechanisms, and where limitations exist, efforts should be made to address them.
- **Ensure community participation.** Communities should actively participate in the recovery of their livelihoods and village infrastructure. Besides producing more sustainable results, community participation enables more effective grievance resolution and reduces escalation of disputes. If community-drive development platforms exist, these can be prioritized to channel resources for recovery.
- **Ensure gender equality.** Women and other vulnerable and disadvantaged groups should be able to participate in decision making for and receive benefits from social protection programs. These interventions should be directed at the needs of women, and cash/food for work programs should ensure equal pay for equal work.
- **Sustain substantial assistance in villages most affected.** After Nargis, the most severely impacted villages faced protracted challenges recovering, irrespective of their economic or social context prior to the disaster (World Bank/GFDRR 2014).
- **Establish a sound monitoring and evaluation mechanism.** This mechanism must have clear performance indicators and must be part of the post-flood and -landslide recovery framework and plan.

## Key Issues and Challenges

**The recovery strategy poses many challenges to the government.** The political challenge is to carry out the recovery planning during a preelection period (which is being closely observed by the international community, and which the diverse components of Myanmar’s civil society have high expectations for). The technical challenge is to salvage the agricultural sector, which requires seeds, other inputs, and easing of rural credit to facilitate immediate replanting of beans and pulses and to support livelihoods and food security for agriculture-dependent households. The social challenge is to provide shelter by supporting an owner-built housing initiative through financial and technical assistance. The institutional challenge stems from a situation where the implementing instruments at the central and local levels are not appropriately geared to reach affected individuals and communities in remote or conflict-prone areas. These challenges are compounded by the limited ability to mobilize resources—both within the government of Myanmar budget (during the current and 2015–2016 exercises), and by development partners in the short term (i.e., four months) in the context of the ongoing political-electoral process and the time required for processing loans and new cooperation operations that require national legislation approval.

Other challenges include the following:

- **Existing government institutional capacity.** Institutional capacity constraints involve coordination among overlapping, contrasting mandates and competences.
- **Capacity for local implementation.** Inadequate human resources, lack of material and financial resources, and local governments’ authority over land planning and use of their territories all pose problems for local implementation. These are aggravated in areas under conflict.
- **Cross-cutting needs.** Given the cross-cutting nature of recovery and resilience building, there is a need to develop or strengthen inter-sectoral and interinstitutional coordination for recovery.
- **Internal and external financial constraints.** It is strategically vital to clearly define, prioritize, and sequence interventions on the basis of immediate needs and feasibility of implementation. Given these constraints, a dialogue is needed in order to harmonize national and development partners’ priorities.
- **Additionality of resources.** In budgeting for economic and social recovery needs, the additionality of resources (internal and external) needs to be related to already existing responsibilities and tasks in order to ensure that resources are efficiently used.
- **Compatibility with national development and sectoral plans.** For recovery to be sustainable, it must ultimately be integrated into the country’s longer- term national development and sectoral plans.
- **Need for broad acceptance among diverse beneficiaries.** Recovery interventions, instruments, and operational procedures need to respond to region-specific socioeconomic, geographical, and physical characteristics in order to be widely acceptable and avoid exacerbating or creating conflict (see Box 3).



In a disaster or post-disaster context, there is a two-way relationship between intervention/action and conflict. All recovery actions in conflict contexts can be affected by, and will likely themselves affect, the conflict. It is essential, therefore, that participating agencies understand the conflict dynamics, particularly the relations between stakeholders and the relevant issues. They can then analyze how a particular intervention will impact these dynamics.

Conflict sensitivity means ensuring that recovery activities (i) avoid, as much as possible, having a negative impact, and (ii) maximize the positive impact on conflict dynamics, thereby strengthening conflict prevention, structural stability, and peace building. This sensitivity should guide any disaster recovery initiative in conflict contexts. A key principle to be applied is that of impartiality, meaning that the response should be guided by human needs alone, rather than by political or other criteria. (In peace building, impartiality or neutrality allows a mediator or peace builder to build trust among all involved parties). It is important that (i) disaster risk reduction and conflict prevention measures occur together, and that (ii) disaster response needs be conflict-sensitive, so as to prevent hard-won peace dividends from being undermined and ensure that aid programming is effective.

The process of constructing a disaster recovery framework will always be highly context specific, especially in the case of conflict settings. However, past experiences suggest some generally applicable guidelines where conflict is concerned. A conflict-sensitive framework seeks to “do no harm” (or do the least harm), and potentially uses the window of opportunity created by the disaster to contribute to peace building. Transparency and communication are essential for limiting politicization and for promoting social cohesion throughout the entire disaster recovery process.

Sources: World Bank/GFDRR, EU, and UNDP 2015, n.d.

### Box 3.

Disaster recovery in conflict or post-conflict situations

## Priorities

The sectoral and geographic characteristics of damages and losses from the floods and landslides, combined with the country's development priorities, suggest a number of clear priorities for recovery:

- **Use the recovery as an opportunity to reinforce ongoing reforms**, with the understanding that the disaster recovery is no substitute for the ongoing development plan.
- **Focus on specific needs among states, townships, and village tracts**, which will require more in-depth information and reach at the local level, over and above the existing mechanisms, and which should help to create more reliable decentralized mechanisms of implementation.
- **Provide quick assistance to the agricultural producers** unable to rebound by themselves, allowing for replanting of winter crops, beans, pulses, summer rice, and other cash crops.
- **Restore livelihoods** by several means, from cash transfers to expanding microcredit, restructuring loans and/or provide debt relief. Avoid sending already fragile, debt-ridden households and micro and small entrepreneurs into further debt such as by offering an extra twelve months for the principal repayment. Innovative means of asset creation and enhancement at the individual level should be complemented by support and financing to the microfinancing and savings and loans schemes at the community level.
- **Rapidly support self-reconstruction of housing** through provision of materials and cash grants tied to work. Use, expand, and cooperate with existing mechanisms.
- **Over the medium to long term, prioritize an integrated approach to environmental and water resource management** as part of the government's effort to mainstream risk reduction and build resilience to natural hazards. Water resource management should be accompanied by disaster risk-sensitive land-use/urban planning, which requires not only

legislative and regulative measures but also scientific research and appropriate consultation and delegation of responsibility and accountability.

- **Address risk reduction in the medium to long term**, given the country's high exposure to natural hazards and the increased vulnerabilities in the course of the floods and landslides. Specific measures should be implemented to address disaster vulnerabilities.
- **Strengthen the institutional capacity of relevant institutions to lead and manage recovery**. Given the country's disaster risk profile, this will have benefits in the medium and long-term too.
- **Make full use of the existing local good practices**, and use and strengthen local capacities, indigenous knowledge, and diverse cultural richness.

## Post-Flood and -Landslide Recovery Plan and Strategy

**The government's Comprehensive Recovery Plan and Strategy should articulate the overall strategic vision and integrated short-term, medium-term, and long-term plans and programs across the affected states, regions, unions, and townships.** The objectives are to (i) restore, rehabilitate, or reconstruct damaged infrastructure necessary to sustain economic and social activities in the affected areas; (ii) repair houses or rebuild settlements and basic community facilities and services so they are more resilient to natural calamities; (iii) restore peoples' means of livelihood and the continuity of economic activities and businesses; and (iv) increase resilience and capacities of communities to cope with future hazard events.

The results and data from the PFLNA must be integrated in preparing the Comprehensive Recovery Plan and Strategy; they will serve as a good baseline that ministries, regions, states, and unions can use in preparing their respective recovery plans. It is recommended that for better integration of the ministry recovery plans and strategies, ministry plans should be consolidated into the respective sectoral working group plans and strategies. It is further recommended that recovery plans involve a multi-year implementation of programs and projects, and that plans be disaggregated based on specific time lines (fiscal years) for implementation, per ministry and per region, state, and township to the extent possible. This will be useful for budgetary and funding purposes, will facilitate tracking of programs' progress, and will help government in managing expectations and setting clear metrics on recovery efforts. In parallel, the affected areas (unions, regions, states, and townships) are preparing their local recovery plans, which articulate the needs and requirements for integration in the Comprehensive Recovery Plan and Strategy. This confluence of efforts ensures that planning is consultative, participatory, and customized to the unique situations of each state, region, and township.

## Sequencing

**Within given time lines, priorities and needs pose budgetary, institutional, administrative, and logistical challenges to the government of Myanmar that will condition and frame the development partners' post-flood interventions.** The summary needs tables in this PFLNA show the areas that sectors are emphasizing in the short, medium, and long term; some of the key considerations are summarized below. In the immediate time frame, interventions will have to be limited and tailored to the existing financial, technical, and institutional capacities. The needs identified for the short term far exceed existing financial and technical capabilities and will spill over to the next budgetary exercise; they will have to be incorporated in the new development plan, once the current electoral process culminates. The government sees the disaster as opening opportunities for the economic rejuvenation of Myanmar in the medium and long term.

1. **The immediate focus should be on agriculture and housing**, and specifically on the following:
  - Rapid and appropriate instruments that reach individuals and communities using a decentralized approach
  - Use and strengthening of local capacities and governments
  - Ongoing support from development partners in rural development and livelihoods
  - Use of existing mechanisms and ongoing instruments
  
2. **In the medium term, the education sector and transport network require infrastructure improvement and resilience**, specifically through the following:
  - Efforts that build on work by development partners in these sectors
  - Continued effort in housing reconstruction tied to economic recovery and credit access
  
3. **In the longer term, given the recurrence and intensity of floods and impacts of climate change, a better risk reduction strategy is needed**, which would include the following:
  - Strengthened, more diversified agriculture, livestock, and fisheries that are better linked to processing and markets, which would increase value added and reduce the gap between farmers' income and market price
  - Expanded and improved flood control and irrigation designed to reduce risk and build resilience.
  - More coherent land-use and urban planning, allowing for economic activities and housing risk reduction, to include slope stabilization, flood protection, and proper buffer zones in floodplains in addition to infrastructure improvements
  - Prioritization of the transport sector as the strategic network that provides connectivity among communities and people, permits flow of goods from producers to markets, and moves goods and services to distant, hard-to-reach, and isolated locations
  - Systematic institutional and capacity-building of relevant authorities

## Implementation Arrangements

Working within the current national disaster management framework, the president has appointed an Advisory Group to work with the National Natural Disaster Management Committee (NNDMC) and the ministries in preparing and implementing the recovery plan. In order to effectively manage the recovery planning and implementation process, the NNDMC established the Recovery Coordination Committee (RCC) under the leadership of the Ministry of Construction (MOC). At present, government has embarked on three parallel and simultaneous tracks of recovery efforts: (i) the central government through the line ministries is preparing its recovery plans and strategies; (ii) states and regions are also preparing their local recovery plans and strategies; and (iii) government has conducted the PFLNA with the support of development partners.

Considering the impact and magnitude of the disaster, it is recommended that the government identify a lead dedicated agency to integrate all these parallel recovery efforts. It is crucial for the lead dedicated recovery agency to do the following:

- Put together the Post-Flood and -Landslide Comprehensive Recovery Plan, an overall strategic vision with integrated short-term, medium-term, and long-term plans and programs.
- Coordinate with NNDMC Working Groups and its member line ministries, and consult with unions, states, regions, and townships in the formulation of plans and programs for the rehabilitation, recovery, and development of affected areas.
- Propose a funding mechanism and support for the implementation of the plans and programs.
- Exercise oversight over the relevant ministries with respect to the implementation of the plans and programs.

Under Myanmar's Disaster Management Law of 2013 and the current national recovery coordination organizational structure, the vice president as chair of the NNDMC and the Advisory Group will be working closely with the RCC and the NNDMC Working Committees. The key to a speedy and effective recovery is to involve the regions, states, unions, and townships in the recovery planning and in implementation of specific projects and programs, depending on their respective capacities. They can also be involved in some of the recovery sector working group coordination meetings to allow a better flow of information and feedback between central and local governments.

To facilitate overall management and coordination of all government recovery efforts in the affected areas, it will be beneficial to strengthen the existing recovery sector working groups. Because effectively implementing the recovery programs requires the intervention of two or more ministries, the RCC is grouping the ministries according to the recovery sector working groups. This should make planning, coordination, and implementation easier. The role of RCC is expected to become more prominent for coordinating recovery among the different actors, monitoring implementation, and communicating progress to key stakeholders, including the donor community.

Implementation of major recovery programs and projects can be done through the ministries and/or clusters. The localized and smaller recovery programs and projects can be implemented by the regions, states, unions, and townships, depending on their capacities. For the simple recovery projects, communities may be involved in the implementation, depending on their capacities. Throughout the delivery of programs and projects in the recovery phase, implementation bottlenecks and cross-cutting policy issues will arise. Several ministries will need to work together to thresh out the issues and reach high-level decisions for policies that can be carried out through the recovery clusters.

**Capacity-building:** There is a need for RCC to have a stronger institutional structure and capacity at both union and subnational levels. Likewise, the recovery capacity and coordination mechanism of the NNDMC should be strengthened for future disasters. This includes building the capacity of RCC in post-disaster needs assessments, recovery planning and programming, institutional arrangements and coordination, resource mobilization and communication, and monitoring, in order to ensure a well-planned recovery in the future.

**Monitoring.** A monitoring and evaluation framework and system, anchored in the Myanmar development plans (the medium- and long-term government plans),<sup>159</sup> can serve as a periodic review mechanism to track the quality and progress of the recovery efforts at every level of government. Some countries have set up a simple and accessible recovery monitoring platform and tracking system for all recovery projects that the central and local governments will use. Such a system aims to promote transparency and accountability in the rehabilitation and recovery efforts. It ensures that government will be able to track who does what, where they do it, and how far along they are in implementing programs, projects, and activities in the affected areas. For the current recovery effort, the government can explore the possibility of setting up a simple management information system that can be lodged in the NNDMC or in any relevant ministry to track the flow of aid and funds, monitor the progress of projects, and systematically capture the efforts of all the actors and stakeholders involved in the recovery efforts. This system can later be scaled up by government to cover other programs and projects in the future.

**Strategic communications plan and community outreach.** A strategic communications plan will help to disseminate information on implementation of programs and will address recurring issues in the recovery phase by keeping affected communities and other stakeholders well-informed. The vice president as head of the NNDMC has reiterated the need to focus on the communities and the affected people. It is therefore important to set up a feedback mechanism or a grievance system whereby people can report and share their concerns in the recovery phase. This system would allow people to feel that they have a stake in the rehabilitation efforts, and that government is providing them with the platform to contribute.

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<sup>159</sup> MNPED 2013.

# ANNEXES



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## Annex 3. Electricity

State/Region	Access rate	State/Region	Access rate
Ayeyarwady	9%	Mon	29%
Bago	22%	Nay Pyi Taw	57%
Chin	15%	Rakhine	6%
Kachin	23%	Sagaing	19%
Kayah	37%	Shan	21%
Kayin	13%	Tanintharyi	9%
Magway	16%	Yangon	78%
Mandalay	31%		

Source: Myanmar National Electrification Plan.

**Table 82.**

Electricity access rate by state/region of Myanmar

	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015
<b>MEPE</b>						
HPGE-Net Generation (a)	4,267	5,302	6,890	6,587	6,822	6,539
MEPE-Net Generation (b)	1,380	1,958	2,491	2,789	2,621	2,831
MEPE-PP-Gas (c)	-	-	-	-	450	2,238
MEPE-PP-Hydro (d)	1,060	1,062	722	1,208	1,972	2,195
Availability (e) = a + b + c + d	6,707	8,322	10,103	10,584	11,865	13,802
Sale (f)	6,193	7,674	9,326	9,932	11,309	13,350
Transmission loss (g) = f - e	514	648	776	651	555	453
Transmission loss	7.67%	7.78%	7.69%	6.15%	4.68%	3.28%
<b>YESB</b>						
Power purchase (h)	2,843	3,611	4,365	4,613	5,197	5,982
Net generation (i)	0	0	0	0	0	1
Sale (j)	2,214	2,893	3,525	3,752	4,245	4,922
Distribution loss (k) = h + i - j	630	718	840	860	952	1,061
Distribution loss	22.14%	19.89%	19.25%	18.65%	18.31%	17.74%
<b>ESE</b>						
Power purchase (l)	3,403	4,063	4,979	5,326	6,112	7,367
Net generation (m)	64	69	76	84	97	95
Sale (n)	2,779	3,419	4,192	4,503	5,366	6,333
Distribution loss (o) = l + m - n	688	713	863	907	843	1,129
Distribution loss	19.84%	17.25%	17.07%	16.77%	13.58%	15.13%
<b>Country</b>						
Power purchase (p) = c + d	1,060	1,062	722	1,208	2,422	4,433
Net generation (q) = a + b + i + m	5,712	7,329	9,457	9,460	9,539	9,466
Sale (r)	4,993	6,312	7,717	8,255	9,612	11,255
Distribution loss (s) = p + q - r	1,778	2,079	2,462	2,413	2,350	2,644
Distribution loss	26.26%	24.78%	24.19%	22.62%	19.65%	19.02%

Source: Deloitte, Myanmar Power Sector Financial Analysis and Viability Action Plan Inception Report, August 2015.

Note: PP = power plan.

**Table 83.**

Energy balance (million kWh)

**Table 84.**

Fuel-wise generation position of Myanmar as of 2015

Plant	Own	IPPs+Rentals	Total	%
Hydro	2040.00	1111.00	3151.00	67.3%
Gas	954.90	456.18	1411.08	30.1%
Coal	120.00	0.00	120.00	2.6%
<b>Total</b>	<b>3114.90</b>	<b>1567.18</b>	<b>4682.08</b>	<b>100%</b>

Source: MOEP.

Note: IPP = independent power producer.

**Table 85.**

Electricity tariffs (established in April 2014 and current as of April 2015)

Tariff group	Consumption (kWh/month)	K / kWh
Residential, small-medium commercial, public buildings, street lightings	0–100	35
	101–200	40
	201++	50
Industrial and large commercial	0–500	75
	501–10,000	100
	10,001–50,000	125
	50,001–200,000	150
	200,001–300,000	125
	300,001 ++	100

Source: MOEP.

**Table 86.**List of im-  
pacted houses

State/ Region	Township	From date	To date	Duration days	Duration hours	Existing electrified HH	No. HH disconnected from grid	No. HH recovered	Estimated kWh not supplied	average use kWh/HH/ day	average use kWh/HH/ month	Consumer losses	Supplier losses	
Chin	Falam	28-Jul-15	9-Aug-15	12	290	2,774	2,774	2,774	20,300	0.61	18.3	14.29		
	Tiddim	28-Jul-15	31-Jul-15	3	82	2,356	2,356	2,356	11,170	1.58	47.4	3.03		
	Tonzang	1-Aug-15	15-Aug-15	14	346	790	790	790	11,764	1.06	31.9	4.75		
	Matupi	27-Jul-15	14-Aug-15	18	420	1,265	1,265	1,265	18,900	0.83	24.9	9.77		
	Htantlang	28-Jul-15	7-Aug-15	10	242	1,098	1,098	1,098	29,282	2.67	80.0	4.71		
	Subtotal					8,283	8,283	8,283	91,416			37	0.037	
	Magway	Sidoktaya	30-Jul-15	4-Aug-15	5	127	1,248	1,248	1,248	81,150	13.00	390.1	2.68	
		Pwint Phyu	31-Jul-15	13-Aug-15	13	341	10,218	10,218	10,218	236,805	1.78	53.5	57.01	
		Minbu	28-Jul-15	29-Jul-15	1	18.4	7,800	1,608	7,800	680	0.42	12.7	0.69	
			29-Jul-15	29-Jul-15	0	7.5				1,259			-	
		31-Jul-15	1-Aug-15	1	24.3				2,009			-		
		3-Aug-15	3-Aug-15	0	14.3				2,350			-		
Ngephae		31-Jul-15	8-Aug-15	8	209.47	920	920	920	15,093	2.05	61.5	3.16		
		29-Jul-15	8-Aug-15	10	244.1	920	920	920	19,407	2.11	63.3	3.95		
		31-Jul-15	8-Aug-15	8	210	920	920	920	19,574	2.66	79.8	3.16		
		30-Jul-15	9-Aug-15	10	241.2	706	706	706	24,824	3.52	105.5	3.03		
Saku	31-Jul-15	28-Aug-15	28	668.46	4,087	4,087	4,087	326,472	2.85	85.6	49.11			
Myothit	30-Jul-15	30-Jul-15	1	9.15	2,342	105	2,342	194	1.85	55.4	0.05			
Subtotal					29,161	20,732	29,161	729,817			123	0.292		
Sagaing	Monywa	2-Aug-15	5-Aug-15	3	543.23	52,586	2,808	52,586	15,488	1.84	55.2	3.62		
	Mawlu	24-Jul-15	27-Jul-15	3	54.43	5,280	50	5,280	8,826	58.84	1,765.2	0.06		
	Kawlin	18-Jul-15	6-Aug-15	19	432	12,447	28	12,447	10,249	19.27	578.0	0.23		
	Kalay	29-Jul-15	13-Aug-15	15	384	4,118	2,309	4,118	256,303	7.40	222.0	14.86		
	Kalewa	31-Jul-15	4-Aug-15	4	22.5	1,612	31	1,612	627	5.06	151.7	0.05		
	Mawlita	5-Sep-15	12-Sep-15	7	32	680	106	680	5741	7.74	232.1	0.32		
	Homalin	3-Sep-15	17-Sep-15	14	30	772	25	772	659	1.88	56.5	0.15		
	Kantbalu	17-Jul-15	20-Jul-15	3	82	10,239	2,361	10,239	28,493	4.02	120.7	3.04		
	Kyunhla	18-Jul-15	21-Jul-15	3	133.5	9,605	2209	9,605	3793	0.57	17.2	2.84		
	Subtotal					97,339	9,927	97,339	330,179			25	0.132	

State/ Region	Township	From date	To date	Duration days	Duration hours	Existing electrified HH	No. HH disconnected from grid	No. HH recovered	Estimated kWh not supplied	average use kWh/HH/ day	average use kWh/HH/ month	Consumer losses	Supplier losses	
Rakhine	Maiei	26-Jun-15	28-Jun-15	2	29	572	572	572	540	0.47	14.2	0.49		
	Maungtaw	30-Jul-15	8-Aug-15	9	40	572	572	572	4,050	0.79	23.6	2.21		
	Buthidaung	30-Jul-15	10-Aug-15	11	48	1,149	1,149	1,149	5,968	0.47	14.2	5.42		
	Ann	26-Jun-15	27-Jun-15	1	19	1,647	1,647	1,647	8,246	5.01	150.2	0.71		
	Thandwe	26-Jun-15	27-Jun-15	1	36	7,183	7,183	7,183	56,520	7.87	236.1	3.08		
	Taunggok	26-Jun-15	27-Jun-15	1	32	4,742	4,742	4,742	22,912	4.83	145.0	2.04		
	Sittway	30-Jul-15	12-Aug-15	13	336	13,445	13,445	13,445	666,582	3.81	114.4	75.01		
	Ponnagyun	30-Jul-15	12-Aug-15	13	336	1,387	1,387	1,387	52,836	2.93	87.9	7.74		
	Kyauttaw	30-Jul-15	12-Aug-15	13	336	2,929	2,929	2,929	88,522	2.32	69.7	16.34		
	Mrauk-U	30-Jul-15	12-Aug-15	13	336	3,203	3,203	3,203	77,224	1.85	55.6	17.87		
		<b>Subtotal</b>					<b>36,829</b>	<b>36,829</b>	<b>983,400</b>			<b>131</b>	<b>0.393</b>	
	Total Ayeyar- wady	Town -1 (100 kVA)	30-Jul-15	17-Aug-15	18	432	172	80	172	1,257	0.87	26.2	0.62	
		Town -2 (100 kVA)	30-Jul-15	17-Aug-15	18	432	232	150	232	1,950	0.72	21.7	1.16	
Town -3 (100 kVA)		30-Jul-15	17-Aug-15	18	342	149	80	149	1,203	0.84	25.1	0.62		
Town -4 (315 kVA)		30-Jul-15	14-Aug-15	15	360	535	220	535	2,867	0.87	26.1	1.42		
Town -5 (315 kVA)		30-Jul-15	17-Aug-15	18	360	173	60	173	900	0.83	25.0	0.46		
	<b>Subtotal</b>					<b>1,261</b>	<b>590</b>	<b>8,177</b>			<b>4</b>	<b>0.003</b>		
Bago	Pyay	1-Aug-15	10-Aug-15	9	264	1,163	551	1,163	11,193	2.26	67.7	2.13		
	Pyay	11-Sep-15	21-Sep-15	10	240	900	630	900	7,980	1.27	38.0	2.70		
	Padaung	1-Aug-15	8-Aug-15	7	24	3,711	3,711	3,711	11,290	0.43	13.0	11.15		
	Htaintaw	7-Aug-15	18-Aug-15	11	374	310	2,720	310	1,651	0.06	1.7	12.84		
	Tharrawaddy	2-Aug-15	11-Aug-15	9	216	97	97	97	2,800	3.21	96.2	0.37		
		<b>Subtotal</b>					<b>6,181</b>	<b>7,709</b>	<b>34,914</b>			<b>29</b>	<b>0.014</b>	
	<b>Grand total</b>					<b>179,054</b>	<b>84,070</b>	<b>2,177,903</b>	<b>-</b>	<b>-</b>	<b>348.9</b>	<b>0.8712</b>		

Source: GAD.



## Annex 4. Water Resource Management (Irrigation and Flood Control)

### SECTOR BACKGROUND

Myanmar is a water-rich country, and water resources are an integral part of Myanmar life. Endowed with a large water availability of over 20,000 m<sup>3</sup> per capita, Myanmar is far above the Asian average (of around 4,000 m<sup>3</sup> water availability per capita) and has more than twice the renewable freshwater capacity of the United States. The mean annual rainfall is around 2,341 mm, ranging from 4,000–6,000 mm along the coastal region and in the mountains of Rakhine in the west and Tanintharyi in the south, to as low as 500–1,000 mm in the central dry zone. The north-south direction of Myanmar's mountain ranges is reflected in the flow of its major rivers. The monthly distribution of river flows follows the pattern of rainfall, which means that about 80 percent flows during the monsoon season (May–October) and 20 percent in the dry season (November–April). The water flow of the Ayeyarwady, the largest river in Myanmar, varies from 2,500 m<sup>3</sup>/s in the dry season to 35,000 m<sup>3</sup>/s in the wet season.

Most of Myanmar's rural poor are located in the dry zone and the Ayeyarwady delta, and they rely heavily on water resources and agriculture for their livelihood. Around 70 percent of Myanmar's incipient irrigated agriculture is located in the dry zone, although most of these schemes function below their potential, and there is great opportunity for expansion. The hydropower potential of Myanmar is estimated at 100,000 MW, of which 2,600 MW has already been developed. The government is increasingly interested in developing hydropower in a sustainable way, and wishes to better manage controversies over hydropower developments, which have occurred in the past. For example, construction of the Myitsone was halted in 2011 due to public concerns. Myanmar water-related infrastructure is overall aged and poorly maintained. Access to improved water supply is reported as 86 percent nationwide, while for sanitation it is 77 percent, with open defecation at just 5 percent. There are serious deficiencies in service quality and reliability, however, which are often seasonal in rural areas. The availability of safe drinking water depends on some reservoirs, communal ponds, and privately collected rainwater and groundwater, and sanitation relies mostly on latrines and septic tanks.

Most of Myanmar's rivers flow within its national border, which puts Myanmar in a position to solely manage its water resources. The legal and institutional framework for Myanmar's water resources management is in the process of being developed, but overall it is fragmented, with outdated sectoral laws, over 34 government agencies with some water management mandate, and daunting capacity and budgetary challenges. The 2014 Myanmar Water Policy, the ongoing Water Law drafting, and the establishment in 2013 of the National Water Resources Council, are a few examples of recent developments. No single institution has the overall mandate to carry integrated water resources management; there are no river basin organizations currently managing water at the basin level; and incipient water users' associations do not have a clear function. Municipal bodies and Village Development Committees are slowly taking over tasks related to water supply and sanitation.

Given the magnitude of available water, as well as the spatial and seasonal variability, managing water resources in an integrated way is a major challenge. Myanmar water resources are affected by severe weather events and floods on an annual basis, and climate change will likely intensify these events. Myanmar's mostly undeveloped rivers carry a remarkable amount of sediment load, and water quality is an increased concern due to unrestricted mining and poor sanitation. Groundwater availability is a significant but yet unquantified resource.

Name	Length (km)	Catchment area (% of territory)
Ayeyarwady-Chindwin	3,100	58%
Sittaung	420	5.4%
Than Lwin	2,410	18.9%
Kaladan	650	4.2%

**Table 87.**  
Rivers in  
Myanmar

Source: DWIR 2014a.

In July 2003, the president of Myanmar established by decree the National Water Resources Committee (NWRC). The objective of the NWRC is to promote cooperation between agencies with water management mandates. The NWRC consists of over 34 members, including union ministries, deputy ministries and mayors, state and region ministers, and director generals. The NWRC, chaired by the vice president, has three pillars: (a) a Secretariat; (b) a Hydro-Informatics Center; and (c) an Advisory Group. The Advisory Group is in the process of developing key legislation such as the Water Framework Directive and the National Water Policy Action Plan. The Hydro-Informatics Center, which is currently being developed, staffed, and trained, aims to be a center of expertise for all the knowledge domains involving integrated water resources management, including planning, hydrology, hydraulics, environment, social, and economy. The NWRC Secretariat carries out the day-to-day coordination among different entities. Municipal bodies—such as the Yangon, Nay Pyi Taw, and Mandalay City Development Committees, as well as Village Development Committees—are slowly taking over tasks related to water supply and sanitation.

Beyond the fragmentation of water resources management mandates, most of these agencies have daunting capacity challenges, are understaffed, and are underfunded. Myanmar is in the process of increasing its data collection, storage, and modeling capacity, but there is no cohesive water resources management decision support system. Coordination between sectoral ministries and between union and local government needs to be improved. The main agencies with a water management mandate are described below.

**Table 88.**  
Agencies  
with water  
resources  
management  
responsibilities

Ministry	Agency	Water resources management responsibilities
Ministry of Agriculture and Irrigation	Irrigation Department	Responsible for (i) agriculture water supply for irrigation development, (ii) to some extent, urban water supply, (iii) preventing of saline water intrusion, and (iv) water-level recording and discharge measurement, especially for irrigation dams and canals.
	Water Resource Utilization Department	Responsible for pumping up water from surface and groundwater for irrigation purposes. Also responsible for drinking water supply to villages.
Ministry of Transport	Meteorology and Hydrology Department	Responsible for discharge stations, sediment discharge stations on main rivers and big tributaries, and water quality stations on Ayeyarwady delta for measuring discharge and sediment flows and monitoring salt intrusion.
	Department of Water Resources and Improvement of River Systems	Responsible for improving waterways, canals, and river systems for navigation, sedimentation, and water quality purposes. Also responsible for preventing river water pollution and managing the utilization of river water for domestic and agricultural water use.
	Inland Water Transport	Responsible for transportation (navigation) of cargo and passengers all along the inland waterways of Myanmar, and for repair and maintenance of the barges, vessels, and docks.
Ministry of Environmental Conservation and Forestry	Environmental Conservation Department	Responsible for approving Environmental and Social Impact Assessments and granting licenses.
	Forest Department	Responsible for rehabilitation and conservation of forests and watersheds and maintaining the stability of environment in order to develop the social and economic conditions of the nation, especially in rural areas.
Ministry of Livestock, Fisheries and Rural Development	Department of Rural Development	Responsible for water supply and sanitation to the rural areas (home to approximately 70 percent of population).

Ministry	Agency	Water resources management responsibilities
Ministry of Electric Power	Department of Hydropower Implementation	Responsible for approving hydropower projects, reviewing feasibility studies, and monitoring construction.
	Department of Hydropower Planning	Responsible for inviting developers to jointly implement hydropower projects and negotiate terms and conditions. (Once contracts are signed, projects are handed over to the hydropower implementation department.)
Ministry of Health	Department of Health	Partially responsible for some aspects related to rural water supply and sanitation.

Source: Deltares, et al. 2014.

Myanmar does not have umbrella legislation for integrated water resources management. Instead, various sectoral laws and bylaws grant some water management duties to different institutions, leading to fragmentation and to overlap of and gaps in responsibilities. For example, the 2006 Conservation of Water Resources Law grants different functions to the Ministry of Transport for protecting water resources and river systems, but it is mostly focused on navigation management and river training works. Table 89 provides a more detailed description of Myanmar's water-related legal framework.

Sector	Law/ regulation/ pPlan	Brief description
Water resources	2014 National Water Policy	Aims at providing guidance for (i) all further policy development on water resources or subjects that relate to or have an impact on Myanmar's water resources; (ii) further development of legal instruments and a system of institutions to protect and manage Myanmar's water resources; and (iii) strategies, master plans, development plans, and projects that relate to or have an impact on Myanmar's water resources.
	2006 Conservation of Water Resources and Rivers Law	Aims at (i) conserving and protecting the water resources and rivers system; (ii) promoting smooth and safe navigation along rivers and creeks; (iii) contributing to the development of state economy; and (iv) protecting environment. The law grants different functions to the Ministry of Transport and the Department of Water Resources and Improvement of River Systems, which aim at managing the waterways for navigation purposes, including licenses for waterway maintenance works. The Directorate aims at preventing environmental harm from commercial use of rivers and is responsible for granting permission for the extraction of some river resources such as sand or gold. The law does not mention integrated water resources management or create any type of river basin institutional framework.
Environmental management	2008 Constitution	Grants the government the mandate of <i>"protect[ing] and conserv[ing] the natural environment."</i> Provides the national legislature as well as state and division legislatures with the power to enact "laws to protect the environment and help restore areas degraded or damaged." However, the state and division legislatures have to pass legislation within the boundaries of the legislation passed by the national legislature. The Constitution does not grant the right to a healthy and clean environment.
	2012 Environmental Conservation Law	Aims at (i) implementing Myanmar National Environmental Policy, (ii) mainstreaming environmental issues into Myanmar's development agenda, and (iii) promoting cooperation in conservation efforts. Grants environmental management tasks to the Ministry of Environmental Conservation and Forestry, including (i) implementing environmental conservation policies, (ii) prescribing environmental quality standards, including management of hazardous waste and pollution control. The ministry should also <i>"cause to lay down"</i> an environmental and social impact assessment system and stipulate the category of business requiring a <i>"prior permission"</i> to operate. Creates the Environmental Conservation Committee with tasks related to (i) carrying out education activities relating to environmental conservation,

**Table 89.**

Myanmar laws and policies affecting water resources management

Sector	Law/ regulation/ pPlan	Brief description
		<p>(ii) laying down environmental policies together with the government, and (iii) sending “<i>suitable suggestions and encouragements</i>” relating to environmental conservation to the relevant government departments and organizations.</p> <p>Grants to the Minister of Forestry, with the approval of the government of Myanmar, the possibility of exempting any government department or private business from complying with the law in the “<i>interest of the Union and its people.</i>”</p>
	2014 Environmental Conservation Rules	<p>Created the Environmental Conservation Committee and grants it the task of carrying out environmental conservation nationally and in coordination with local entities, creating an environmental fund, and acting in case of environmental emergency. Ministry of Environmental Conservation and Forestry might develop quality standards, waste, urban environment, and cultural heritage management, as well as further develop the environmental impact assessment procedures.</p>
	1994 Myanmar National Environmental Policy	<p>Aims at integrating environmental considerations into the development process to “enhance the quality of the life of all Myanmar citizens.” Establishes the National Commission for Environmental Affairs as the main environmental body aimed at (i) ensuring sustainable use of environmental resources, and (ii) promoting environmentally sound practices in industry and other economic activities. Placed originally under the Ministry of Foreign Affairs, the commission led the compilation and systematization of environmental data and information.</p> <p>Asserts that it is the responsibility of the state and every citizen to preserve natural resources in the interests of present and future generations. Establishes that environmental protection should always be the primary objective in seeking development.</p>
	1997 Myanmar Agenda 21	<p>Serves as a blueprint for natural resource management and environmental conservation work in Myanmar.</p> <p>Lays the groundwork for pursuing activities aimed at biodiversity conservation throughout the country, including sustainable forest management, sustainable tourism, and sustainable transport and infrastructure development with a reduced impact on biodiversity.</p>
	2009 National Sustainable Development Strategy	<p>Focuses on sustainable production and consumption, energy efficiency, and forest-based ecotourism as part of its integrated economic development. Identifies 26 priority areas for sustainable development and establishes goals and action plans, including for environmental quality management and enhancement, water resources management, and sustainable land use.</p>
<b>Fisheries</b>	1991 Freshwater Fisheries Law	<p>Establishes a system of licenses and leases for freshwater fishing in Myanmar.</p> <p>The Ministry of Livestock Breeding and Fisheries is the national fishery authority.</p> <p>The township zone officer-in-charge is responsible for auctioning or granting licenses or leases to local individuals; the director general of the Department of Fisheries is responsible for foreign individuals or organization operating with foreign capital. The minister can also grant permission to operate a fishery, cancel any lease or license, and exempt any fishery from the provisions of the law.</p> <p>The law does not specify the process of establishing a total allowable catch or the individual fishing quotas.</p>
<b>Conservation</b>	1994 Protection of Wildlife, Wild Plants and Conservation of Natural Areas Law	<p>Establishes a framework for natural areas protection. The law established the Committee for Protection of Wildlife and of Natural Areas under the Ministry of Forestry, whose main task is providing guidance on conservation and protection of wildlife.</p> <p>The Minister of Environmental Conservation and Forestry, together with the government of Myanmar, has the power to establish and modify the protection of any natural area.</p> <p>The law establishes categories of natural protected areas that do not coincide with the International Union for Conservation of Nature categories.</p>

Sector	Law/ regulation/ pPlan	Brief description
	2012 National Biodiversity Strategy and Action Plan	Outlines conservation priorities for 2012–2020, including (i) strengthening conservation of priority sites, (ii) mainstreaming biodiversity in other policy sectors, (iii) implementing focused conservation actions for priority species, (iv) supporting local NGOs and academic institutions in biodiversity conservation, (v) creating capacity to coordinate conservation investment in Myanmar, (vi) scaling up the implementation of in situ and ex situ conservation of agriculture, livestock, and fishery biodiversity and genetic resource management, (vii) promoting the initiative to manage invasive alien species, (viii) facilitating the legislative process of environmental protection and environmental impact assessment, and (ix) enhancing communication, education, and public awareness.
<b>Forestry</b>	1992 Myanmar Forest Law	Lays the ground rules for forest management and commercial use. Makes the Minister of Environmental Conservation and Forestry the main national forest authority with the capacity to establish protected public forests and grant commercial permits.
<b>Extractives industry</b>	1994 Myanmar Mines Law	Includes some provision for environmental protection, including <i>“making provision for the environmental conservation works that may have detrimental effects due to mining operation.”</i> The Ministry of Mines has the sole responsibility for granting permits for mining operations. The law establishes up to one year of imprisonment and K 10,000 fine to any permit holder who violates the terms of the permit, including detrimental environmental effects.

Source: DWIR 2014b, updated by the assessment team.

Other regulations affecting water resources management include the following:

- The Rangoon Water Works Act, 1885
- The Burma Municipal Act, 1898
- The Burma Canal Act, 1905 as amended by Burma Act, 1914, 1924, 1928, and 1934
- The Burma Embankment Act, 1905 as amended by Burma Act 1923 and 1931
- The City of Rangoon Municipal Act, 1922
- The Underground Water Act, 1930
- The Burma Water Power Rules, 1932<sup>160</sup>

In an effort to modernize its water resources framework, the government of Myanmar approved two major pieces of legislation in 2014: the National Water Policy, which for the first time introduces integrated water resources management concepts into decision making; and Water Quality Standards. In 2015, based on the National Water Policy and numerous consultations, the Myanmar Water Vision 2040 was published. The Water Law, currently being drafted, is expected to further operationalize integrated water resources management and establish a much clearer institutional framework.

The National Water Policy is the first integrated water policy for the watersheds, rivers, lakes, reservoirs, groundwater aquifers, and coastal and marine waters of all of Myanmar. Its objective is to take cognizance of the existing situation and to propose a framework for creating a system of laws and institutions and a plan of action with a unified national perspective.

The Expert Group of the National Water Resources Committee is in the process of drafting a Myanmar Water Framework Directive, which aims at including general principles governing the exercise of legislative and/or executive powers by the union, the states and regions, and the local governing bodies. The Expert Group is also tasked with preparing a plan of action based on the National Water Policy.

The Myanmar Water Law is in the process of being drafted. The government has led various consultations and is expecting to finalize the Myanmar Water Law by November 2015.

<sup>160</sup> Ni 2012.

## Annex 5. Disaster Risk Management

**Myanmar's disaster risk management plans.** Myanmar endorsed the Hyogo Framework for Action 2005–2015 (HFA), as well as its follower agreement, the Sendai Framework for Disaster Risk Reduction 2015–2030. In par with other ASEAN member states, Myanmar also ratified the ASEAN Agreement on Disaster Management and Emergency Response, which was the first legally binding regional treaty aligned with the HFA. For the implementation of the HFA and ASEAN treaty at the national level, the Myanmar Action Plan for Disaster Risk Reduction (MAPDRR) was developed in 2009 and enacted in 2012 to accelerate the implementation of prioritized activities. The objective of MAPDRR is “to make Myanmar Safer and more Resilient against Natural Hazards, thus Protecting Lives, Livelihood and Developmental Gains.”<sup>161</sup> The plan lays out a series of objectives and projects that the government and international partners can undertake to support achievement of the HFA priorities.

**Myanmar's disaster risk management framework.** The National Natural Disaster Management Committee (NNDMC) is chaired by the vice president, with the Union Minister of the Ministry of Social Welfare, Relief and Resettlement (MSWRR) and the Union Minister of Home Affairs as vice-chairs; and the Deputy Minister of MSWRR is the secretary. Union ministers from different ministries and the chief ministers of 14 states/regions are also included in the NDMC. Two working committees operate under the NDMC: the Search and Rescue Working Committee, chaired by the union minister for the Ministry of Home Affairs, and the National Natural Disaster Management Working Committee (NNDMWC), chaired by the Union Minister for Social Welfare, Relief and Resettlement. Further, there are 10 subcommittees with different technical and sectoral functions under the NNDMWC.

**Department of Meteorology and Hydrology (DMH).** DMH has significant assets, such as government land where observation sites and facilities are located; its main facilities in Yangon, Nay Pyi Taw, and Mandalay; 14 regional offices; a water quality laboratory at Yangon; and observation equipment and machinery. DMH has recently built a new forecasting and early warning center building in Nay Pyi Taw. The facility, which was completed in 2014, provides a separate large meteorological office and a smaller hydrological office. A large studio designed for recording of daily television segments is located at the rear of the ground-floor complex. Although DMH's total staff quota is 1,425, the current staff ceiling is 730, including 40 seismologists. One hundred and seventy-seven DMH personnel are based in Yangon, where the Lower Myanmar and Aviation Divisions are located; and 110 are based in Nay Pyi Taw at DMH's headquarters. DMH employees include 299 women and 431 men; 600 employees are observers and technicians. There are eight trained weather forecasters, of whom four are stationed in NPT, and there are six hydrological specialists.

Education and training has been a high priority for DMH, and overall the department has a high level of expertise, which is continually refreshed through international training opportunities offered by partners (including the World Meteorological Organization [WMO], Asian Disaster Preparedness Center, and Regional Integrated Multi-Hazard Early Warning System for Africa and Asia [RIMES], along with Norway, Japan, China, and Korea). Compared with other regions, then, staffing is not a significant limitation to modernization of services, although new skill sets are needed.

The modernization efforts are all in an early stage of implementation. It would therefore be premature to expand on these efforts before DMH has begun to operate its new capabilities. The current radar network of three radars will be fully operational within 18 months. The expanded in situ hydrological and meteorological networks will be operational within two to three years.

In the meantime, several things can be done to accelerate improvements in DMH's capabilities through closer cooperation and partnership with more advanced national meteorological and hydrological services. At the request of DMHI, WMO has initiated this process and will facilitate twinning arrangements with the Indian Meteorological Department and secure support for numerical

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<sup>161</sup> GOM 2012, 9.

weather prediction from the UK Met Office, the China Meteorological Administration, and the European Centre for Medium-Range Forecasting. This effort can be extended to include twinning arrangements with hydrological centers capable of providing DMH with operational flood-forecasting guidance. Preference should be given to those working closely with the numerical weather prediction centers to drive the hydrological forecast models. Some resources are available to initiate this process through WMO, but additional funding could be used effectively to support the operational partnership until DMH's own capabilities come on line (in approximately three years).

The government of Myanmar is already engaged in a hydromet modernization program with the support of a few key development partners. The Norwegian government is helping DMH improve its numerical weather prediction guidance; and the Japanese government is significantly increasing DMH's capacity to observe hazardous weather events through the installation of three Doppler weather radars and a network of high-quality automatic weather stations. In addition, the government of India is supporting an expansion of the real-time hydrological and meteorological networks and the integration of all donor-supported observations into a single system that can support more accurate, more timely, and higher-resolution forecasting of meteorological and hydrological events. Efforts related to longer-lead flood forecasts for the Ayeyarwady, Chindwin, and Sittoung basins are taking place through RIMES, while the Ayeyarwady River Basin Management Project is taking place through the World Bank. The project also seeks to improve the services provided to stakeholders by focusing on the impact of weather and hydrological extremes—that is, on so-called impact-based forecasting and warning services. Several other efforts are under way to improve early warning, but generally these are preliminary pilot studies that need to be scaled up to the whole country. Norway and the Asian Disaster Preparedness Center have assisted with the digitization of climate records and downscaling of climate information. Climate information services through Monsoon Forums at national level have been a primary institutional arrangement for information sharing, and currently they are being expanded to subnational level.

## Annex 6. Poverty and Social Impact Assessment

### I. DESCRIPTION OF DATA SOURCES FOR THE POVERTY AND SOCIAL IMPACT ANALYSIS

**Poverty and social impacts were identified based on a combination of qualitative and quantitative evidence.** The primary data sources are a review of baseline data sources, the existing post-flood secondary assessments and data, lessons from two large-scale longitudinal studies, and small-scale field verification conducted for the poverty and preliminary social impact analysis. For the numerical data analysis, census and Integrated Households Living Condition Assessment (IHLCA) 2009–2010 household data were used. For both of these data sets, most-affected, less-affected and unaffected areas were identified, as follows:

- The IHLCA-2 allows a detailed description of the poverty and socioeconomic profile of the areas affected by floods; note that the description refers to the areas in 2009–2010. We divide the IHLCA sample into three parts: households that reside within townships that were among the most affected by floods; households that reside within townships that were less flood; and households who reside within unaffected townships. Of the IHLCA sample, 13,699 households were in areas affected by the floods; of these, 3,191 households were in the most severely affected areas, and 10,508 were in less-affected areas.<sup>162</sup>
- We additionally draw upon the 2014 Population and Housing Census. We match the list of affected townships to the township level Census tabulations. The census tabulations at a township level reflect the characteristics of the enumerated population.

The two longitudinal studies we drew on looked at life in rural Myanmar and were conducted between 2008 and 2015. The Social Impacts Monitoring (SIM) studies, conducted between 2008 and 2013 included four rounds of qualitative research to document the long-term social and socioeconomic impacts of Cyclone Nargis across 40 villages in Ayeyarwady region. The Qualitative Social and Economic Monitoring (QSEM) studies, conducted by the World Bank in partnership with the Livelihoods and Food Security Trust Fund (LIFT) between 2012 and 2015, have covered five rounds of qualitative research on livelihoods, social relations, aid, and village governance in 54 villages in Ayeyarwady, Chin, Magway, Mandalay, Rakhine, and Shan. Combined, these studies have involved interviews and focus group discussions with over 7,000 participants.

In order to understand the post-flood context, we draw on a review of existing post-flood assessments and data and a review of media reports since the floods, triangulated by a small-scale qualitative assessment conducted in September 2015 for the chapter on poverty, social impact, and social protection in this Post-Floods and -Landslides Needs Assessment. The qualitative research was conducted in six villages in Magway, Rakhine, and Sagaing that were purposively selected to cover different levels of flood damage. The research involved in-depth interviews and focus group discussions covering approximately 130 participants and representing people from farming, fishing, casual labor, and small business households, including poorer and more vulnerable households. The purpose of the qualitative assessment was to conduct some limited field verification of the findings from the secondary data and assessments in order to triangulate existing socioeconomic findings and be better able to predict social risk.

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<sup>162</sup> Of the 126 townships in the IHLCA, 88 were in flood-affected areas, of which 21 were in the most-affected areas and 67 were in less-affected areas. Note that the IHLCA cannot be used to make inferences about individual townships; this exercise defines groupings of townships based on flood outreach in a manner that is consistent with the sampling approach used in the IHLCA. The IHLCA-2 had 62 strata at a district level; within these, two townships were selected with probability proportionate to the estimated size with replacement. Because of the highly geographically clustered impact of the floods, there is strong clustering within districts of flood-affected townships. In 42 districts, all the townships within the district were categorized as flood affected (177 townships), and in a further 10 districts more than half the townships were classified as flood affected (38 township). With the exception of the two townships in Kachin and Bago, the same case can be made for the most-affected townships.



## II. PRE-FLOOD PROFILE OF AFFECTED AREAS

### Welfare levels in affected areas

**The areas that were most affected by the disaster were worse off in 2009–2010 and in 2014 than those that were less affected and unaffected by the floods.** Half of the most-affected townships are found in the two poorest states in Myanmar: Rakhine and Chin. These states have the country's highest poverty rates. Analysis from the IHLCA for 2009–2010 suggests that the most-affected areas had a 50 percent higher poverty incidence than the national average in 2009–2010. The floods are therefore affecting a population who was more likely to be poor or vulnerable to poverty before the disaster struck.

**The analysis conducted is robust to the consumption aggregate used.** The analysis was conducted using two different aggregates to ensure that it was robust to methodological assumptions.<sup>163</sup> Both sets of analysis showed that the flood-affected areas have higher rates of poverty than the national average, and also showed very similar results for the socioeconomic profile of population in the bottom two quintiles (the bottom 40 percent). We are therefore confident that the analysis in this note reflects the nature of poverty in flood-affected areas.

**The analysis of relative well-being was verified using data from the census; flood-affected townships were found to be worse off before the floods hit than other areas.** Although the census does not include the information that is needed to measure poverty, it contains a number of indicators that are associated with poverty. Comparing average characteristics of the 40 most-affected townships with characteristics of townships that were less or not affected by the disaster shows that—across a range of household characteristics associated with being better off (such as housing facilities, communications, and transport)—affected townships were relatively worse off prior to the flooding than the rest (Figure 46).

**The housing stock in some of the most-affected areas was less resilient prior to the floods.** Households in these townships are more likely to have roofs made of more permeable and easily damaged *dhani*, *theke*, and leaves (Figure 52). Similarly, fewer households in these areas reported having quality walls and quality sanitation (Table 90).

### Village socioeconomic profiles

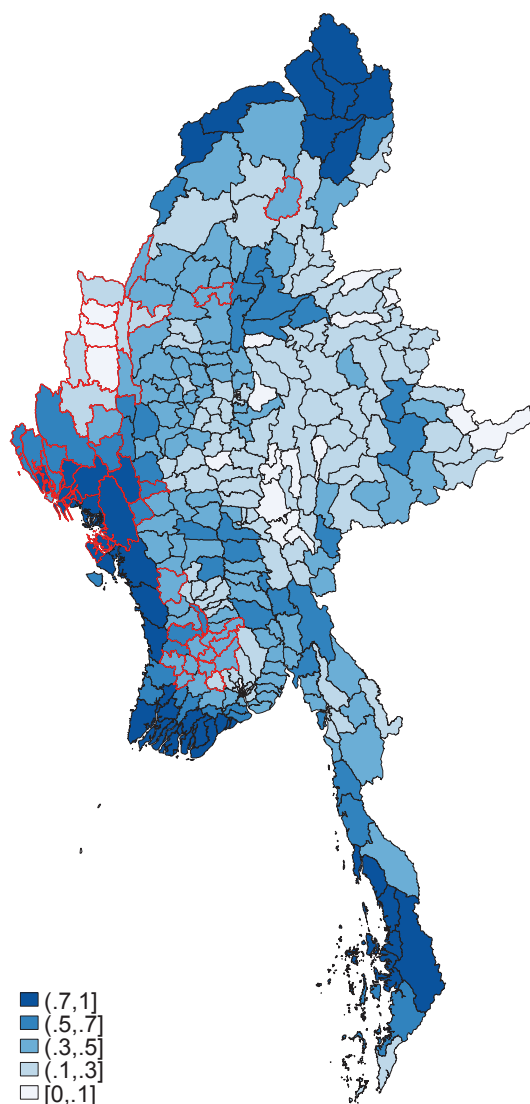
Understanding the social and economic structures of villages in rural Myanmar can help guide external actors, including government and development partners, on how communities are likely to react to flood and landslide damage and how best to support recovery.

**Although farming patterns and types of crops produced vary significantly, farmers face vulnerability across much of the country.** Some areas, in particular Ayeyarwady Region, focus on producing paddy, and have sizeable populations of landless households who depend on casual agricultural labor opportunities at particular points of the agricultural cycle. A number of other areas, including Chin State and the dry zone regions of Sagaing and Magway, have higher rates of land ownership and farmers who invest in a variety of crops. Across agro-ecological zones, farmers and casual laborers face ongoing vulnerability resulting from low levels of profitability, significant reliance on credit to finance investment in agricultural production, high debt levels, and a lack of steady labor or income-generating opportunities.

<sup>163</sup> Differences in the assumptions entering into the consumption aggregate will affect the degree of reported poverty. Detailed information on the aggregates is found in World Bank (2015).

**Figure 52.**

Share of households with simple (less resilient) roof



Data: World Bank ests. based on census, EOC 07/09/2015

Source: World Bank estimates based on census and data from Emergency Operations Committee, July 9, 2015.

**Table 90.**

Housing quality

	Household	Most affected	Less affected	Unaffected
Quality roof	Average	53%	62%	76%
	Bottom 40%	24%	34%	39%
Quality wall	Average	36%	48%	53%
	Bottom 40%	6%	10%	10%

Source: GOM 2015e (for average figures); IHLCA 2009–2010 (for figures for the bottom 40 percent).

**Rural households are increasingly attempting to diversify income sources.** Opportunities arising from the economic reforms that have taken place since 2011, combined with the risks associated with farming, have increasingly led rural households to diversify their sources of income in recent years. There is evidence to suggest increasing migration of family members; most seek work as unskilled laborers in Yangon but some leave the country. Recent years have also seen an increase in investment in rural, nonfarm businesses, which provide a secondary source of income for families

with surplus labor. The nature of these small enterprises varies significantly dependent on location, access to markets, and the natural resources available.

**Villages have traditionally been relatively self-reliant and socially cohesive.** A number of studies note that villages in rural Myanmar are characterized by strong social cohesion. Although there is considerable ethnic diversity across Myanmar, and some intergroup communal tension, village units themselves are often relatively homogenous.<sup>164</sup> This tradition of collective action has helped villages respond to previous disasters.

**In recent years, access to government services, mobile phone access, and rural-urban migration have increased, with a commensurate impact on village life.** Villages are becoming more connected with one another and the outside world. Increases in expenditure in health and education, along with new initiatives targeting rural development (including the National Community Driven Development Program and the Green Emerald Fund), have seen noticeable increases in government services at the local level, albeit starting from a low base. Mobile phone usage has rolled out across much of the country following the opening of the telecommunications market in 2014. Migration of predominantly young family members to urban areas has increased. Such changes are resulting in more complex and entrenched social networks beyond the village level.

**A minority of townships in flood-affected areas have experienced conflict and communal tension, which complicates the social risk of the flood response.** Although most flood-affected areas are outside conflict areas, there are some exceptions. In approximately a quarter of the 40 most-affected townships, residents have experienced some form of conflict in recent years. In several townships in northern Rakhine State, social conflict has resulted in a significant number of people (predominantly but not exclusively Muslims) living in internally displaced person (IDP) camps. (In these areas, Muslims face restrictions on movement and therefore disruptions in livelihoods, access to markets, and services.) A small number of flood-affected townships in Chin and Shan States have also been subject to conflict in recent years. The delivery of humanitarian and development assistance is particularly complicated in areas affected by conflict, as any perceived aid inequities have the potential to aggravate preexisting tensions.

### III. IMPACTS OF DISASTER ON HUMAN DEVELOPMENT AND LIVELIHOODS

#### Human development impacts

**In the aftermath of the floods, there is a risk of children being withdrawn from school to support the household's economic situation.** Education provision has been disrupted in several locations affected by the floods and landslides. Damages range from temporary school closures to a complete loss of infrastructure. In many schools, school furniture, learning materials, and supplies have been reported damaged.<sup>165</sup> This disruption to education may have long-term implications for enrollment, particularly among poorer families whose children drop out of school earlier.

**Qualitative research identified some families already considering removing children from secondary and college education.** In one heavily affected village in Sagaing, respondents claimed they would no longer be able to meet the transportation costs required to send their children to secondary school or the boarding costs for college education; these families said they would remove children from school in the coming months.

<sup>164</sup> EMR and World Bank 2014.

<sup>165</sup> OCHA 2015a.

**Compared to their peers, children in affected areas face a greater risk of suffering long-term impacts from disruptions to their physical development (due to limited nutrition) and from disruptions to their education (due to having to work).** Even before the flood, one-third of children in Myanmar suffered moderate underweight (Table 68); rates in the most-affected areas are even higher. This prevalence of underweight associated with limited nutrition can have long-term consequences because early childhood is a period of rapid brain development. When children spend their early years in a less supportive environment, brain development is affected and leads to cognitive, social, and behavioral delays. For example, high levels of adversity during early childhood have been linked to an increased risk of stress-related disease and learning problems later in life.<sup>166</sup> There is therefore a risk that even temporary food insecurity can have longer-term consequences for young children or unborn babies.

### Livelihood impacts

**Crop losses have been significant.** Assessments indicate that almost 9 percent of cultivated land was affected by the flood in the six most-affected states. There was significant variation both across regions and within regions. In Ayeyarwady, crops covering over 100,000 hectares of land, or 12 percent of cultivated land, were destroyed.<sup>167</sup> Elsewhere, for example in Rakhine, a greater proportion of crops could be replanted as the waters receded. Monsoon paddy was the most affected crop, accounting for almost 80 percent of all crops destroyed. Landslides in Chin, along with mud and sediment damage elsewhere, are likely to have longer-term impacts for farmers in affected areas. Although crop damage in Chin was mainly caused by landslides and was therefore less significant (affecting approximately 2 percent of overall cultivated land), it is likely to affect farming across multiple seasons.

**Small and medium farmers and casual laborers were particularly affected.** Small and medium farmers report crop losses. Debt burdens from loans taken to plant a monsoon harvest with little return will make it difficult for many to invest in a winter crop. In field research, small farmers reported turning to nonfarm casual labor opportunities to make ends meet. Casual laborers also face difficulty. The loss of the monsoon harvest will impact labor opportunities at harvest time in late 2015. Field research found in addition that there is greater competition from farmers for nonfarm casual labor work.<sup>168</sup>

**The impact on fisheries was felt by subsistence fishermen across a number of regions and by commercial fishermen mainly in Rakhine.** Approximately 70 percent of damage to aquaculture production was located in Rakhine.<sup>169</sup> Over the medium term, there is a need for capital to rebuild embankments for fish and prawn ponds and to restock fish and prawn farms. The floods also affected small-scale and subsistence fishermen by limiting their capacity to earn a living during the floods and by damaging boats and nets. In Rakhine, for example, an estimated 45 percent of fishing households experienced substantial damage to their equipment.<sup>170</sup> Even prior to the floods, subsistence fishermen had been identified as a particularly vulnerable socioeconomic group.<sup>171</sup> Although representing only a small proportion of the population across affected areas, they will require assistance to reestablish their livelihoods.

**Women-headed households suffered disproportionate housing loss and higher immediate post-disaster costs.** Vulnerable groups such as women-headed households tend to have less sturdy houses, and these houses experienced more significant damage. More analysis is needed, however, to assess whether the overall economic situation of women-headed households is worse

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<sup>166</sup> Grantham-McGregor 2007.

<sup>167</sup> FAO and WFP 2015.

<sup>168</sup> See also FAO and WFP 2015.

<sup>169</sup> FAO and WFP 2015.

<sup>170</sup> REACH 2015.

<sup>171</sup> EMR and World Bank 2014.

than that of male-headed households with similar characteristics. In one village visited by research teams, houses of all eight women-headed households were destroyed; in the aftermath of the floods, these households reported difficulties accomplishing certain tasks because there were no men to perform necessary work. Some households headed by women had to pay a laborer K 5,000 per day (for as much as five days) to clean up their houses, an expense that households with male labor did not need to bear.

**Investments in secondary income sources were also damaged.** Across a number of villages visited as part of the field research, machinery and assets used for small nonfarm businesses were damaged. In a village in Sagaing, for example, where women had previously generated income from sewing, the flood damaged 38 of 41 sewing machines. In addition, as electricity had not yet been restored to the village, orders could not be filled subsequent to the flood. On a village visited in Rakhine, one-fifth of the charcoal-making businesses were also damaged. The capital outlay required to rejuvenate these businesses will vary significantly from area to area.

**Potential risks due to cumulative pressure on livelihoods include high levels of food insecurity, high debt levels, and a range of negative coping strategies that households will use to respond to these pressures.** Examples of exploitative interest rates were already beginning to emerge in field research. In one instance, a villager in Magway described having to take a loan of K 10,000 to help repay another loan immediately following the flood. Interest was charged at K 500 per day, equating to approximately 15 percent per month.

## Land and resettlement

**Field research indicates that some villagers not identified by government for relocation will advocate for assistance in relocating all or parts of their village.** These villagers are likely those that have been subject to flooding on multiple occasions. In one village in Magway, for example, where households had been damaged by floods at least twice in recent years, villagers were requesting assistance from the government to relocate part of the village to higher ground within the village boundaries. However, in this instance no government land is available, so relocation would require the purchase of land from individuals.

## IV. COPING STRATEGIES: THE RISK OF INDEBTEDNESS AND FOOD SECURITY

**Households are employing a range of strategies to cope with the floods.** The Agriculture and Livelihood Flood Impact Assessment<sup>172</sup> conducted in Ayeyarwady, Bago, Chin, Magway, Rakhine, and Sagaing reports a variety of coping patterns (see Figure 47). However, some of these coping strategies are negative: they reduce assets and undermine the recovery over the longer term.

**Borrowing money is one of the most common coping strategies, but households risk becoming trapped in debt.** The United Nations Development Programme's REACH assessment in Rakhine shows that the three most common coping strategies households report using are taking out loans, buying food on credit, and reducing spending on basic goods. The assessment asked households about their potential coping strategies in three months in the absence of external support (such as food aid). By far the most likely coping strategy would be to take on more debt, either in the form of loans or the purchase of food on credit. In the IHLCA-2 data, more than one-third of households have debts, with rates being higher in rural area, where loans are often taken for agricultural inputs. For a quarter of households, debts count for more than a quarter of their (easily cashable) assets, a sign of overindebtedness.

<sup>172</sup> FAO and WFP 2015.

**Table 91.**  
Debt and over-  
indebtedness

	Union			Most-affected areas		
	Urban	Rural	Total	Urban	Rural	Total
Indebted households (%)	0.20	0.39	0.34	0.20	0.39	0.36
Overindebted households (%)	0.15	0.29	0.25	0.15	0.26	0.24

Source: IHLCA-2.

Note: Overindebtedness is defined as a debt-to-asset ratio higher than 0.4 and includes assets that can be liquidized easily. The indicator is based on Schicks and Rosenberg (2011) and Khandker, Faruquee, and Samad (2013).

**Research prior to the flood indicated a decline in debt burden of farmers in recent years.**

Some regions, for example Ayeyarwady, had benefited from a combination of reasonably positive agricultural outcomes and increase in availability of credit at lower interest rates. Where regions were affected by ongoing weather-related shocks, such as water shortages in Rakhine and Chin, there was less evidence of a reduction in debt levels.<sup>173</sup>

**Households also report borrowing for food, eating cheaper food, and eating less food, practices that can undermine health and well-being.**

The Agriculture and Livelihood Flood Impact Assessment found that up to 75 percent of villages reported using a variety of food-based coping mechanisms, including “borrowing food from friends and relatives, reducing the number of daily meals and reducing the quantity of food consumed.” There was some intrahousehold variation, with parents coping with insufficient food by allowing their children to eat first.<sup>174</sup>

**The cumulative effects of crop damage raise the risk of additional negative coping strategies in the medium term.**

These negative strategies potentially include withdrawing children from school so they can work and exploitative migration due to lack of job opportunities in the village. In field visits there were no indications that withdrawing children from school for work is a widespread problem, but as food security risks become more severe, additional school withdrawals are likely. Field research identified a few examples of migration immediately following the floods. These were limited to villages that had no clear livelihood opportunities following the flood and had preexisting networks guaranteeing jobs elsewhere. In one village in Sagaing, for example, a number of villagers moved temporarily to Chin to work on infrastructure projects, drawing on networks from work prior to the flood. Experience from Cyclone Nargis suggests that as agricultural job opportunities in the winter crop season fail to materialize, rural laborers will resort to migration in order to find work.<sup>175</sup>

## V. IMPACTS OF THE FLOODS ON SOCIAL RELATIONS

**The impacts of the floods and landslides on social relations and cohesion are likely to derive not from demographic changes, but rather from livelihood degradation and the nature of the flood response.**

The floods and landslides did not bring about the immense demographic changes seen in disasters with high death tolls. However, the significant degradation of livelihoods in highly affected areas is likely to have secondary, cumulative effects on poorer households and vulnerable groups. Social relations will also likely be influenced by how communities respond to these challenges, and by how external actors, including government and development partners, engage with communities in delivering assistance.

### Community coping mechanisms

**In rural areas, religious buildings were generally the primary point of relocation.** This was in part because communities had confidence that religious leaders could mobilize support for immediate needs. Assessments from Rakhine indicate that reliance on religious buildings was also

<sup>173</sup> EMR and World Bank 2015.

<sup>174</sup> FAO WFP 2015.

<sup>175</sup> World Bank/GFDRR 2014.

more prevalent in Buddhist communities, where building infrastructure was relatively safe and where monasteries tend to be located away from flooding.<sup>176</sup>

**The importance of community coping mechanisms continued into the medium-term recovery period.** Even in the small sample of villages visited to assess social impact, ongoing community mobilization in response to the disaster was evident. In one village in the Sagaing Region, different community working units were established to deal with the withdrawal of food and nonfood aid from township collection points, generate donations, and distribute aid within the village. In Magway, casual labor groups accepted more members and redistributed job opportunities to ensure more people could access paid work, even though it meant less income per person.

### Social relations, village leadership, and aid effectiveness

**The capacity for collective action within villages is likely to remain relatively strong.** The collective coping mechanisms exhibited by communities since the floods are similar to those seen after earlier disasters in Myanmar. Because there have been few recent demographic changes, relations between ethnic and religious groups at the intravillage level is not very likely to change—with the caveat that perceived inequities over aid distributed along ethnic or religious lines could affect social relations.

**There are unlikely to be significant changes to intergenerational relations in response to the floods, though the participation of young people in mobilizing assistance opens up avenues of youth leadership.** Several youth leaders in a village in Sagaing, for example, created a Facebook group to request aid from networks in urban areas as far as Yangon. Once the village had received enough immediate assistance, the youth leaders suggested redistributing the remaining aid to a neighboring village still in need. After the village committee established to oversee the response to the floods agreed, youth leaders organized villagers to transport the aid to the neighboring village.

**New village-level committees were created to distribute aid in heavily affected areas.** Field researchers in Sagaing and Magway reported that village-level emergency response committees were set up to respond to the floods. These committees were established at the direction of the township administration at the village level, effectively ensuring that responses were coordinated between townships and individual villages, bypassing the village tract. The committees were separate from existing village administration structures, and respondents perceived this as an explicit attempt to minimize the role of village administrators. All government assistance and the majority of NGO and private sector aid was collected and distributed by these committees. Exceptions were NGO assistance distributed through preexisting community-based organizations created by the NGO.

**In the small sample of villages visited, traditional leaders appeared to have significant influence over the recovery committees.** Village administrators did have some say in selecting community members for committees, but in the villages visited, the committees ultimately took direction from the senior monk in the village along with village elders and respected persons.

**There are risks of social tension over perceived aid inequity.** The experience of previous disasters in Myanmar suggests that an influx of post-disaster aid can create social tension—and undermine existing social capital and capacity for collective action—if community members feel left out of decision making and perceive that the benefits of aid are going to some groups and not others.<sup>177</sup> Assessments to date have focused almost exclusively on quantifying the level of damage across the country and the response by government and development partners. However, experience from previous disasters shows that to minimize risks of social tension, it is important to focus not only on the levels of aid, but also on the way in which aid is delivered.

<sup>176</sup> IOM 2015.

<sup>177</sup> TCG 2008, 2009, 2010.

**Field research identified some complaints relating to the distribution of aid.** These occurred primarily in areas that were more heavily affected by the floods and, as a result, were both more dependent on aid and in receipt of large enough amounts of aid to generate competition over how the aid was allocated. The types of grievances could broadly be categorized along two lines: intravillage grievances about the distribution of aid, and village grievances with external actors about aid delivery mechanisms.

**Prominent in the first category were tensions between those who thought aid should be distributed to the whole community and those who saw this approach as inequitable.** In all three states and regions visited, field researchers found examples where targeted aid had been redistributed to the community more broadly. Village administrators justified equal distribution on the basis of eliminating potential communal tension. This was particularly evident in the dry zone, where all food aid was distributed equally to all households, independent of need or vulnerability. Interviewees in Sagaing reported an antipathy toward aid targeting, with one (male) respondent saying “we should all get pregnant” when the prospect of aid specifically for pregnant women was discussed.

**Vulnerable populations did, however, voice some dissatisfaction with distribution systems at the village level.** When asked directly, vulnerable populations, particularly small farmers with high debt and landless laborers, expressed dissatisfaction with equal distribution. Although they understood village leaders’ wish to prevent social tension, they perceived it as unfair that rich farmers were receiving the same level of food aid as more vulnerable households.

**Also at the village level, aid can create competition between village elites that exacerbates social tensions.** This has been well documented in previous research on aid following Cyclone Nargis<sup>178</sup> and on general development assistance in rural Myanmar.<sup>179</sup> The only evidence of this competition following the flood response was in the establishment of new village-level committees to administer aid and the reaction of existing authorities to these committees. A result observed in one village was that village administrators felt discouraged from assisting in the recovery efforts and took on a more passive role.

**In order to minimize grievances between villages and external actors, villagers expressed a preference for open, participatory approaches to aid delivery.** Some village leaders expressed concern that they were given little information about external assistance and were unable to participate in and influence how aid was delivered to their communities. As the examples above suggest, recovery efforts that do not actively engage communities run the risk that communities will act on their own to alter how the aid is delivered. Field research also highlighted the importance of establishing effective mechanisms for voicing complaints so as to minimize the risk of escalation when disagreements arise.

## VI. RELIEF AND RESPONSE ACTIVITIES: SOCIAL PROTECTION

### Support from development partners

Before the floods, development partners provided social assistance through unconditional food and cash transfers, and through cash/food for work programs for vulnerable populations (Figure 53). Among development partners, the World Food Programme (WFP) and LIFT are the biggest financiers and are active in the dry zone, the delta, northern Rakhine, Shan, and Chin. Emergency support (cash and in-kind aid) has largely focused on the border states.<sup>180</sup>

**As part of the recent flood response, development partners have adapted their operations to focus on food distribution and essential nonfood items.**<sup>181</sup> Food support has been channeled

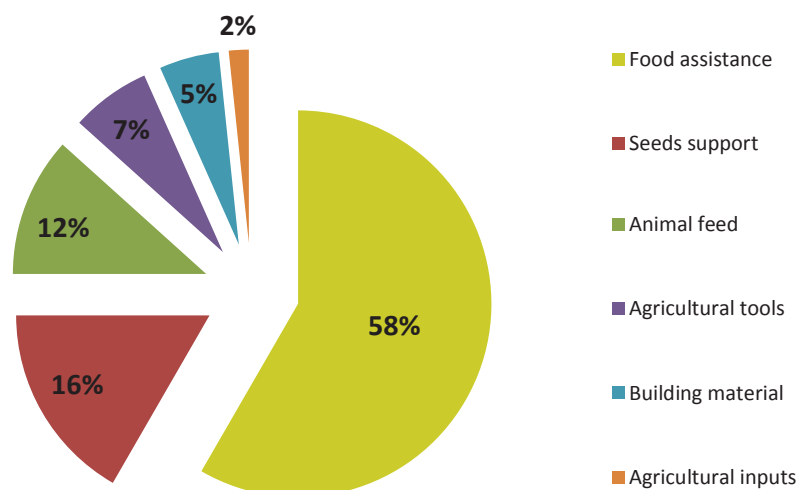
<sup>178</sup> World Bank/GFDRR 2014.

<sup>179</sup> EMR and World Bank 2015.

<sup>180</sup> Infante Villarreal 2015a.

<sup>181</sup> Nonfood items include “health, water, sanitation and hygiene, shelter, camp coordination and camp management, and . . . protection services, including child protection and gender based violence” (OCHA 2015b).





**Figure 53.**

Type of assistance as described by communities

Source: FAO and WFP 2015.

largely through the WFP and has reached nearly half a million people,<sup>182</sup> covering one-third of the people displaced by the floods. Several agencies, including OCHA and its partners, PACT Myanmar and Network Activities Group, have also provided food and non-food items. The Myanmar Red Cross Society (MCRS), International Organization for Migration, and Plan International have distributed reconstruction/shelter kits to more than 20,000 beneficiaries, while UNICEF and others have provided psychosocial support to affected households.

**Cash support has been more limited, with some regional variations.**<sup>183</sup> Cash accounts for 98 percent of the response provided in Rakhine, 49 percent in Magway, and 42 percent in Chin, while it makes up less than 4 percent in Ayeyarwady, Yangon, and Kayin. Adventist Development and Relief Agency (ADRA) and MCRS have provided cash for agricultural inputs, WASH (water, sanitation, and hygiene), food, and shelter, as well as cash for work in selected areas in Ayeyarwady, Chin, Magway, Rakhine, and Sagaing.

**Cash support is expected to become more prominent in the near future as part of early recovery activities.** CARE has plans to introduce a two-month cash support program for agricultural inputs in Rakhine, while WFP plans to provide unconditional cash or food transfers to 170,000 people in Ayeyarwady, Chin, Magway, Rakhine, and Sagaing before the end of 2015.<sup>184</sup> For an expected period of six months, the International Committee of the Red Cross and MCRS plan to offer cash grants for rebuilding livelihoods as well as cash for work to clean debris and enable use of basic infrastructure.<sup>185</sup> In the coming three months, WFP will also support 40,000 people and their households by providing daily labor opportunities under cash-for-work projects.

**Psychosocial support and awareness raising about protection issues have been part of the response.** The Department of Social Welfare (DSW), with support by UNICEF, deployed its existing cadre of nearly 100 case managers to provide psychosocial support in Chin, Rakhine, Sagaing, and Magway States and Regions.<sup>186</sup> UNICEF and local nongovernmental and community-based organizations have offered psychosocial support through 50 temporary child-friendly spaces in temporary evacuation centers, and have sent 30 mobile psychosocial support teams to hard-to-reach areas; so far they have reached 9,350 boys and girls. In total, the child protection subsector has reached around 15,000 children. The United Nations Population Fund (UNFPA) also provides psychosocial support to women and girls in these states and regions, with gender-based violence case workers operating out of mobile medical clinics. In addition to these activities, International

<sup>182</sup> WFP 2015.

<sup>183</sup> MIMU 2015a.

<sup>184</sup> GOM 2015c.

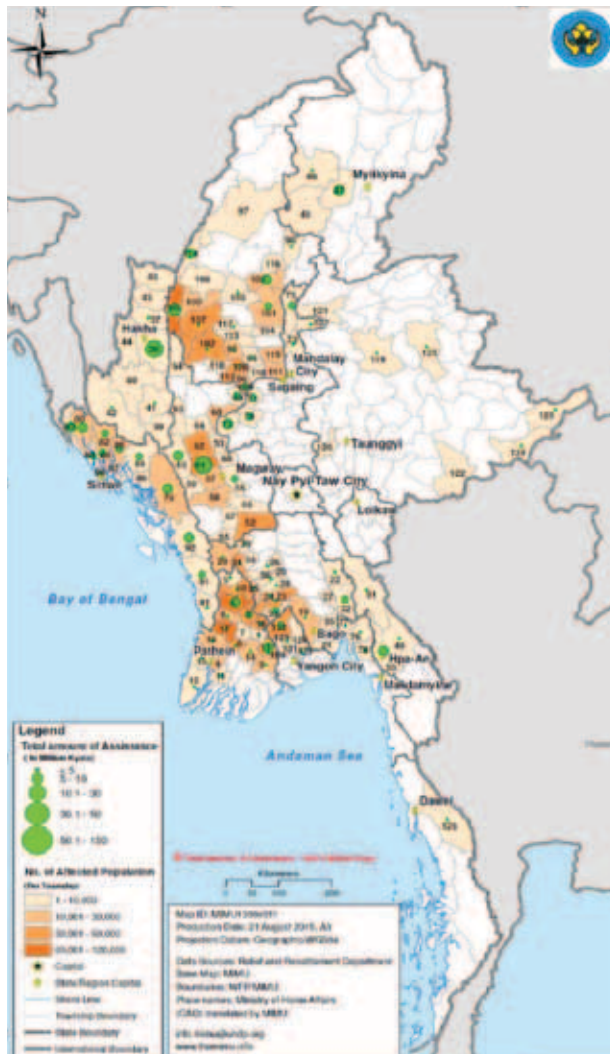
<sup>185</sup> ICRC 2015.

<sup>186</sup> UNICEF 2015.

Rescue Committee creates awareness of protection issues such as gender-based violence in Sittwe Township, Rakhine State, while Halo raises awareness about landmines moved by floods in Hpa An, Kayin State.

**The majority of people who were temporarily displaced by floods and landslides have since been able to return to their homes, as flood waters have receded in most areas;<sup>187</sup> but people living in temporary camps have special vulnerabilities that may call for additional and/or tailored support.** It may take internally displaced persons longer to restore their livelihoods, and they may need additional assistance in accessing services, as well as additional food and/or cash relief. For instance, in Chin camps 67 percent of IDPs said that the support they were currently receiving was insufficient.<sup>188</sup> The need may be particularly great for special groups such a pregnant and lactating women—present among Chin IDPs in large numbers—who lack access to supplementary feeding to cover their nutritional needs. In addition, many of the IDPs currently in camps may stay there for more than three months, since their houses were either severely damaged or else located in a hazardous area to which they cannot return. Longer stays mean changing needs that would have to be catered for during an early recovery phase, and potentially, beyond (e.g., temperature drops in the winter may call for winter clothes distribution). Longer stays may also strain available resources for IDP support and increase vulnerability to future shocks, as evidence from IDPs in Rakhine suggests.<sup>189</sup>

**Figure 54.** Relief items distributed by MSWRR and affected population as of August 21, 2015



Source: FAO and WFP 2015.

<sup>187</sup> GOM 2015c.

<sup>188</sup> IOM 2015.

<sup>189</sup> REACH 2015.

<sup>190</sup> MIMU 2015a.

## Geographic coverage

**Relief and Resettlement Department spending by township shows, for the most part, higher levels of response in townships with larger numbers of affected residents.**<sup>190</sup> For instance, Pwintbyu, Magway, has the highest number of affected people (115,478), as well as the highest level of response, among townships (K 137.3 million). Kalay in Sagaing region comes second in terms of population affected (85,124) with a response of K 47.2 million. However, challenges remain in terms of coverage of highly affected townships and hard-to-reach areas (e.g., Chin and Rakhine); for instance, Kyaunggon in Ayeyarwady had an estimated 55,140 people affected but only received K 1.1 million of support.



Source: FAO and WFP 2015.

**Figure 55.**

Flood response activities as of September 23, 2015; number of organizations by township

## VII. USING SOCIAL PROTECTION PROGRAMS FOR RECOVERY<sup>191</sup>

**Social protection programs are used around the world, including in the Association of Southeast Asian Nations (ASEAN) region, to help those affected by emergencies to cope with shocks, and to support them in meeting their basic needs and recovering and protecting their livelihoods.** Having social protection programs and delivery mechanisms in place can help households cope with and recover from disasters in the short, medium, and long term.

<sup>191</sup> This section is drawn from Stokkel (2015).

**Existing programs and delivery systems can enable quick response and help reduce the impact of natural hazards.** In the Philippines, the government scaled up its existing conditional cash transfer program and used the same delivery mechanisms to channel food and cash transfers to affected households in the program and to identify households for cash-for-work and cash-for-asset-rebuilding programs. The conditional cash transfer program was modified to make unconditional transfers available to help support disaster-affected families.

**Social protection programs can provide a common platform for pooling development partner funds to respond to disaster.** This is demonstrated by Ethiopia's Productive Safety Net Program, where the risk financing mechanism ensured financial commitments from donors were put in place before any crises occurred. In the Philippines, the government used the conditional cash transfer program to channel donor funding for emergency response efforts when Cyclone Haiyan hit.

**Social transfer programs can provide multi-year and predictable assistance that can help people accumulate assets to buffer disaster losses and can reduce the long-term economic impact of disasters.** Ethiopia's Productive Safety Net Program shows how an ad hoc emergency response can be transformed into a comprehensive, sustainable, and scalable social protection and disaster risk management program. The reforms have helped reduce response time from eight to two months and reduced the need for emergency response and human losses. Ethiopia's program consists of cash-for-work projects to improve environmental assets (60 percent of projects in soil and water conservation); unconditional food/cash transfers for the poorest 10 percent; an insurance-for-work scheme in a particularly disaster-prone area; a contingency budget to respond to sudden emergency needs; and a risk financing mechanism for use when the contingency fund is insufficient (see Figure 56). The program provides long-term support to chronically food-insecure rural households to help them cope with shocks, reduce disaster risk through asset creation and rehabilitation of their natural environment, and build household resilience. The financing mechanisms allow the program to scale up to provide assistance to risk-prone households when necessary. Long-term support offered by the program has helped reverse the trend of deteriorating livelihoods despite climatic shocks. Timely and predictable assistance has enabled households to manage risk more effectively and avoid negative coping strategies and food insecurity.

**Figure 56.**  
Ethiopia's Pro-  
ductive Safety  
Net Program  
(PSNP)



Source: World Bank 2014.

**Community-driven development (CDD) programs have also provided platforms for rapid response in short- and long-term resilience building by directly involving communities (see Box 1).** For example, following the Pakistan earthquake in 2005, the Pakistan Poverty Alleviation Fund was able to set up disaster relief centers and provide support in 2,000 communities within one day, and US\$220 million in cash transfers was delivered to households.<sup>192</sup> Indonesia's PNPM Mandiri CDD program was used to provide unconditional cash transfers to the poorest and most-affected households as part of response and recovery efforts after the 2004 tsunami in Aceh and other disaster events between 2005 and 2010.

CDD approaches help match supply and demand: CDD platforms can facilitate the flow of information from communities to program implementers. Thus needs can be met more easily through the support provided.

CDD approaches provide a common platform at local level: CDD structures can be the main decision-making structures for support provided, which saves time and effort for both implementers and villagers.

They strengthen social cohesion through participatory planning mechanisms, for instance in the identification of vulnerable groups or infrastructure needs: this is particularly important for cash-for-work schemes that sometimes use community-based targeting to ensure vulnerable households are reached by the program. Projects to be developed through cash for work can be more pro-poor when selected in a participatory and inclusive manner.

They enable greater distributional equity across villages: by minimizing the risk of leaving similar villages left underserved and providing a common platform to channel support to neighboring villages, CDD approaches can minimize intervillage rivalry after disasters.

They serve as information channels: CDD platforms can facilitate information sharing about local recovery efforts (beneficiaries, financial information) and keep communities updated about recovery efforts and decisions taken at more centralized levels.

Source: World Bank/ASEAN Discussion Note for the Livelihood Sector, "Community-Based Recovery in the Ayeyarwady Delta," draft October 26, 2008; Infante Villarroel 2015b.

#### Box 4.

How CDD approaches help build community empowerment in post-disaster recovery

## VIII. CASH TRANSFERS FOR RECOVERY<sup>193</sup>

### Description

The President's Instructions and the National Action Plan accordingly outline a variety of categorical benefits that would be delivered to specific vulnerable groups that were identified in the Strategy Plan, along with a household benefit that would be delivered to the poorest within the most-affected households (see Figure 57).

<sup>192</sup> Pelham et al. 2011.

<sup>193</sup> This proposal has been developed by the Department of Social Welfare, with technical inputs from UNICEF, Save the Children, and HelpAge International (see MSWRR 2015).

**Figure 57.**  
Cash transfer for vulnerable groups and poor households

Issue	Objective	Program	Coverage and duration	Financing and impact
<ul style="list-style-type: none"> <li>• High preexisting poverty and vulnerability (about 75% in some areas)</li> <li>• Extensive damage, shock to livelihoods, loss of household assets</li> <li>• Urgent necessity to procure basic needs (food, medicine, clothing, etc.)</li> <li>• High and increasing household indebtedness</li> <li>• Vulnerable groups face risk of trafficking and exploitation</li> </ul>	<ul style="list-style-type: none"> <li>• Operationalize equitable social protection response to meet basic needs quickly and efficiently</li> <li>• Build back better to strengthen the development of the social protection system over the medium to long term (including its ability to respond to future emergencies and disasters)</li> </ul>	<ul style="list-style-type: none"> <li>• Cash allowance for vulnerable groups:</li> <li>• Pregnant women (K 10,000/mo.)</li> <li>• Children up to 5 (K 5,000/mo.)</li> <li>• Age 70+ (K 10,000/mo.)</li> <li>• People with disabilities (K 5,000/mo.)</li> <li>• Monthly benefit for poorest and most-affected households: K 30,000 for those up to 4 members and K 50,000 for those with 5 or more</li> <li>• Psychosocial support (mobile teams)</li> <li>• Deployment of MSWRR/DSW offices in affected areas</li> </ul>	<ul style="list-style-type: none"> <li>• 43 flood- and landslide-affected townships</li> <li>• Provision of cash benefits for 6 months</li> <li>• Medium-term extension of cash benefits as envisaged in National Social Protection Strategy Plan</li> <li>• Long-term development and capacity building of social protection system through MSWRR/DSW offices managing social protection, social welfare, and DRM programs</li> </ul>	<ul style="list-style-type: none"> <li>• Four options costed after extensive analysis</li> <li>• Short term: US\$44 million required under preferred option that provides equitable coverage to beneficiaries</li> <li>• Medium to long term: US\$88 million per year to continue benefits on annual basis (about 0.1% of GDP)</li> <li>• Medium to long term: US\$1.1 million to build, staff and equip MSWRR/DSW offices in affected townships for long-term system building</li> <li>• Over 1 million beneficiaries under short-term scenario provided with support for basic needs</li> </ul>

### Financing proposal and justification

The government has identified roughly K 5 billion equivalent in (preliminary) financing sources for the categorical benefits listed above, and the need for another K 6.25 billion equivalent in financing for the household benefit. This preliminary financing has not been fully secured or agreed on. Limiting financing to these levels would raise significant issues of equity and exclusion. A detailed economic and demographic assessment demonstrates that financing at these levels would reach only about 10 percent of those in the affected categories, with the household benefit reaching at most 6.5 percent of affected households. This means that very large numbers of affected households will be excluded from support, given the high levels of preexisting income poverty experienced by a large majority of the affected population and the significant damage that was incurred in these areas. This problem is significantly ameliorated by higher levels of financing.

Table 92 presents four financing options and their implications for overall population coverage and expenditure level. The four options are as follows:

- **Option A (preferred):** Option A covers the full range of beneficiaries in the Action Plan in all 43 affected townships, with roughly 75 percent of affected categorical groups covered (with the additional household benefit covering up to 6.5 percent of households), leading to a high level of equity and inclusion in the delivery of assistance.

- **Option B:** Option B covers all of the groups in the President’s Instructions, but for fiscal reasons changes the eligibility criteria, and drops benefits for people with disabilities (who are listed in the Action Plan but not the Instructions). This option covers 65–70 percent of affected categorical groups, and the same level of households under the household benefit.
- **Option C:** Option C shows the fiscal impact of reducing the geographic scope of benefit to 20 townships. These can be selected from the 43 by direct economic losses and per capita GDP. While significant cost reductions can be achieved with high coverage, this option may not be attractive, as the 43 townships have already been identified as priority areas for engagement.
- **Option D:** Option D outlines the implications of moving forward at current funding levels.

It would not be fiscally feasible to offer all households in these affected areas a blanket benefit (estimated at approximately K 1,300 million to K 1,400 million equivalent over six months if each household receives the equivalent of a minimum food basket, or approximately K 13,000 per person per month).

	<b>Option A (preferred)</b>	<b>Option B</b>	<b>Option C</b>	<b>Option D</b>
Beneficiary groups covered	<ul style="list-style-type: none"> <li>• Children 0–2</li> <li>• Pregnant women (6 months+)</li> <li>• Persons with disability</li> <li>• Elderly age 70+</li> </ul>	<ul style="list-style-type: none"> <li>• Children 0–2</li> <li>• Pregnant women (6 months+)</li> <li>• Elderly age 75+</li> </ul>	<ul style="list-style-type: none"> <li>• Children 0–5</li> <li>• Pregnant women (6 months+)</li> <li>• Persons with disability</li> <li>• Elderly age 70+</li> </ul>	<ul style="list-style-type: none"> <li>• Children 0–5</li> <li>• Pregnant women (6 months+)</li> <li>• Persons with disability</li> <li>• Elderly age 70+</li> </ul>
Targeting criteria	43 flood-affected townships	43 flood-affected townships	20 most-affected townships	GAD list of most-affected people in 43 flood-affected townships
Estimated no. of beneficiaries	1.0 million	499,281	396,403	105,765
Estimated % categorical populations covered	Up to 75%	Up to 65%	Up to 80%	11%
Estimated total cost (million K)	48,750	26,250	18,750	5,000
Transfer to “self-declared” poor households (million K)	6,250	6,250	6,250	6,250
<b>Total funding required (million K)</b>	<b>55,000</b>	<b>32,500</b>	<b>25,000</b>	<b>11,250</b>
<i>Funding request as % total government expenditure (2015 est.)</i>	0.19%	0.09%	0.09%	0.04%
<i>Funding request as % estimated 2015 GDP</i>	0.05%	0.03%	0.03%	0.013%

Note: GAD = General Administration Department.

Methodology based on census data and the damage and loss file (GOM 2015b). Total population derived from aggregate township-level data. GDP estimates are from International Monetary Fund Memorandum; government budget is from Union Budget 2015/2016. Benefit amounts: K 10,000/month for six months for elderly + pregnant women; K 5,000/month for six months for children + persons with disability; K 30,000/month for “poor” households with four or fewer members; K 50,000/month for “poor” households with five or more members.

**Table 92.**  
Program option summary and financing requirements (six-month benefit regime)

Medium- to long-term continuation of these benefits would cost roughly **K 110 million** per year for Option A, **K 65 million** per year for Option B, **K 50 million** per year for Option C, and **K 22.5 million** per year for Option D. The medium-term needs include the development and capacity building of MSWRR/DSW offices in each of the affected townships. This deployment would establish the ability of the MSWRR/DSW to support its social protection and emergency relief mandates over the long term, and would be consistent with the measures outlined in the Strategy Plan. The related infrastructure and equipment costs are estimated at roughly **K 712.5 million** in the flood-affected townships. Staffing costs are estimated at roughly **K 570 million** per year for all of the offices. Operational costs would be approximately **K 56.25 million** per year for all of the offices, with total staffing/operational costs accordingly at roughly **K 625 million** per year (or roughly 1 percent of program costs under Option A).

### Operational arrangements: Flood recovery cash transfer

Detailed operational guidance has been developed to guide the implementation of the flood recovery cash transfers by the government.<sup>195</sup>

The Department of Social Welfare has the oversight of the overall program, and is responsible for the following key tasks: overall program coordination; budget management in coordination with the Ministry of Finance; training of all stakeholders involved in the implementation of the program at national and subnational levels; ensuring that beneficiaries, including those in remote areas, have access to benefit; preparation of communication materials for effective beneficiary mobilization; and monitoring and learning to improve efficiency in the delivery of the program as well as facilitate the transition into longer-term social protection programming.

The General Administration Department at township and village tract levels will play a lead role in the following areas: mobilization, identification, and registration of beneficiaries; consolidation and adjustment of beneficiary lists; and cash transit from state/region to village tract level and support to cash distributions.

The Myanmar Maternal and Child Welfare Association in close coordination with village leaders in all targeted townships will perform the following tasks: information dissemination at the village level and support to beneficiary identification and registration; cash distributions and records; and facilitation of local-level complaint mechanisms.

## IX. CASH-FOR-WORK FLOOD RECOVERY PROGRAM<sup>196</sup>

### Description

Cash/food for work **programs serve two objectives: (i) creation of jobs for persons facing temporary or seasonal unemployment, and (ii) creation and maintenance of small-scale community infrastructure. They provide temporary employment at low wages mainly to unskilled workers in rural areas.** Both the Social Protection Strategic Plan and the Rural Development Strategic Framework call for the introduction of a cash/food for work program in Myanmar.

**There is considerable experience of cash/food for work programs in Myanmar, with variations depending on local context.** In the dry zone, these programs focus on ensuring seasonal food and livelihood security (especially during the agricultural lean season); in the delta

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<sup>195</sup> MSWRR 2015.

<sup>196</sup> This proposal has been developed by the Department of Rural Development, with technical inputs from the World Bank, International Labour Organization, and World Food Programme.



they focus mainly on post-disaster recovery; and in conflict-affected areas in the border states they respond to multiple needs of communities, such as post-disaster recovery after Cyclone Giri (Rakhine) and reconciliation and social cohesion (Tanintharyi). These experiences yield important lessons in designing a government-led flood recovery cash-for-work program.<sup>197</sup> See Table 93 for the proposed flood recovery cash-for-work program.

Parameters	Short term	Medium term	Long term
<b>Objective</b>	Rebuild/repair damaged local infrastructure with labor-intensive strategies	Provide temporary employment and rebuild/repair damaged local infrastructure	Provide food and income security and build resilient local infrastructure
<b>Geographic scope</b>	Flood-affected areas	Selected flood-affected areas only (where infrastructure damage and economic losses can disrupt the agricultural cycle and increase food insecurity)	Selected rural areas with high levels of food insecurity, gradual expansion in a phased manner
<b>Timing</b>	3–6 months	One year	Annual; during lean season only
<b>Eligibility criteria</b>	As per Ministry of Construction norms	Self-selection of poor and vulnerable households implicit in design	Self-selection or community-based targeting prioritizing poor and vulnerable households
<b>Benefits: Nature, levels (defined based on rapid local market assessment)</b>	As per Ministry of Construction norms.	Cash, food, or combination. Average cash benefit of K 4,000 per day (differentiated for skilled and unskilled workers). Men and women to receive equal benefits. Maximum 100 days of work per household.	Predominantly cash. Cash benefit of K 4,000 per day (differentiated for skilled and unskilled workers). Men and women to receive equal benefits. Maximum 60 days per household; no more than 20 days per month. Provide child care facilities at work site. Provide training for selected skills.
<b>Assets to be created</b>	Focus on reconstruction (using build back better principles): Clearing debris from farmlands and villages (through a clean-up campaign); repairing damaged infrastructure	Focus on reconstruction (using build back better principles): Repairing and reconstructing local infrastructure (schools, health clinics, housing, fish ponds, WASH facilities, wells, and other water sources, etc.)	Focus on building hazard-proof infrastructure, promoting and strengthening community resilience to disasters.
<b>Implementation modality</b>	As per recovery plan of Ministry of Construction	Recovery plan of Department of Rural Development: Flood Recovery C/FFW Program	National Community Driven Development Program

**Table 93.**  
Proposed program design

*Source:* Design draws upon lessons from the experience of implementing cash/food for work programs in Myanmar (Infante Villarroel 2015b); Cash for Work Guidelines developed by the Cash Working Group after the floods; minutes of the Cash Working Group meetings September–October (CWG 2015); and estimates of damage to rural infrastructure and estimated needs (from DRD).

Note: Average cash benefit based on minimum wage of K 3,600 for unskilled labor, with a 70:30 ratio of unskilled to skilled workers; lower benefits would be considered based on market wages for unskilled labor, minimizing distortions to local labor markets. Workday is defined as 5–6 hours/day.

<sup>197</sup> See Infante Villarroel (2015b).

## Financing

Table 94 provides an estimate of costs, depending on geographic coverage. Table 95 provides cost estimates in the medium term (for option 1) and the long-term.

**Table 94.**

Options for the medium-term flood recovery cash-for-work program

Medium-term scenario	Option 1: 40 townships	Option 2: 20 townships
Number of people aged 14–64 (thousands)	7,048	3,935
Affected population (14–64) (thousands)	1,276	948
Take-up rate	15%	15%
Number of people taking up the program	191,471	142,245
Daily cost of labor (average 30% skilled, 70% unskilled)	4,000	4,000
Number of days of work	100	100
<b>Total benefit cost of the program (million K)</b>	<b>76,588</b>	<b>56,898</b>

**Table 95.**

Cost of the flood recovery cash-for-work program (medium and long term)

	Medium term	Long term (5 years)				
	2016	2017	2018	2019	2020	2021
Total population aged 14–64 (thousands)	39,282	39,569	39,866	40,175	40,495	40,674
Total rural population aged 14–64 (thousands)	27,262	27,263	27,268	27,279	27,294	27,211
Target group (thousands)	27,262	27,263	27,268	27,279	27,294	27,211
Take-up rate (%)	0.70%	1.20%	1.70%	2.20%	2.70%	3.20%
Target group covered by this scenario (thousands)	191	328	464	601	738	871
Benefits per person per year (K) (K 4,000 per person, max. 60 days a year <sup>a</sup> )	400,000	254,717	268,283	280,828	293,959	307,705
Total cost of providing benefits (million K)	76,588	83,494	124,538	168,714	216,815	268,132
<b>Cost (million K)</b>	<b>76,588</b>	<b>83,494</b>	<b>124,538</b>	<b>168,714</b>	<b>216,815</b>	<b>268,132</b>
<b>Cost as % of GDP</b>	<b>0.09%</b>	<b>0.09%</b>	<b>0.12%</b>	<b>0.14%</b>	<b>0.17%</b>	<b>0.18%</b>
<b>Cost as % of government expenditures</b>	<b>0.33%</b>	<b>0.31%</b>	<b>0.41%</b>	<b>0.49%</b>	<b>0.56%</b>	<b>0.61%</b>
<b>Coverage as % of poor rural population</b>	<b>2.4%</b>	<b>4.1%</b>	<b>5.8%</b>	<b>7.5%</b>	<b>9.3%</b>	<b>11.0%</b>

Source: a. Medium-term benefits are set at a maximum 100 days per household.

## Assumptions and implementation

- **Wage setting.** Minimum wage in Myanmar is K 3,600 per workday (8 hours). In the calculations, this rate was integrated as the base wage for unskilled labor, while 30 percent more was added for skilled labor (i.e., approximately K 5,000 per day). As the program will require both skilled and unskilled labor, the average daily wage is set to be K 4,000 per day (accounting for 70 percent of unskilled workers and 30 of skilled workers). This is consistent with reports on the average market wage (for men; women typically receive less, according to the Cash Working Group October 9 minutes). These amounts may need to be readjusted at the onset of the program depending on (i) local market rates for daily wages and average cost of the food basket (to avoid disrupting the labor market, wages should be set to ensure minimum income security without destroying regular job opportunities); and (ii) working time in the program (whether 8 hours or 5–6 hours).
- **Take-up rate.** The number of people who would take up the program is estimated at 15 percent of the affected active age population for the medium-term scenario, representing 191,471 people. At this first stage, though all affected townships would be targeted, not all

villages would be covered by the program, depending on the extent to which villages were affected/the extent of damages and food insecurity. The number of people who would take up the program is estimated to increase up to 3.2 percent of the whole rural active age population for the long-term scenario, which is in line with international practice.<sup>198</sup> The program should be implemented progressively, focusing on the most food-insecure areas.

- **Projections.**<sup>199</sup> Sources of data include population projections from United Nations Department of Economic and Social Affairs, government expenditure from International Monetary Fund, GDP and inflation forecasts, and poverty data from the IHLCA-2.

### Other costs:

- **Equipment and material costs.** In Myanmar, these costs are already covered by reallocations to the reconstruction budgets. In the medium-term scenario, a part of this reconstruction budget can be reallocated for labor costs under the cash-for-work program. In the long-term scenario, the government would need to assess the budget already allocated to infrastructure work that can be delivered through the cash-for-work program. If the program is based on the CDD platforms, budget allocation for equipment and material is already there.
- **Administrative costs.** In Myanmar, government social protection programs have administrative costs of 15–30 percent on average. These costs vary depending on whether existing government structures are used, and they will fall as new technologies (i.e., mobile money) emerge. The Department of Rural Development (DRD) already has an established presence on the ground that is integrated into the government budget.
- **Child care and training components.** The long-term scenario integrates child care facilities and vocation training, which respectively can enhance women's participation and foster graduation from poverty. These options would need to be further developed at the onset of the program.

In the medium-term, implementation through DRD structures can follow a scaled-down version of the model followed for the CDD program, where DRD structures at union and township levels are supported by union technical advisers and local implementing partners such as NGOs. Union-level technical advisers support DRD with procurement, financial management, training, and administration roles, if need be. At township level, technical advisory teams provided by implementing partners assist DRD township officers with planning, operations, training, and monitoring. These teams also support communities in project planning and implementation, and they work directly with villages and village tract-level structures.

In summary, DRD would be responsible for overall program management, oversight, grievance redress, and monitoring, with or without the support of union-level advisers. Implementing partners would support implementation of program processes at the local level by generating awareness, mobilizing the community for project selection, managing the work site (including beneficiary management and payments), and providing technical advice. In the long term, implementation of the cash/food for work program could be embedded in the CDD program. The role of private sector banks would also grow as cash payments evolve into electronic payments in the long term.

<sup>198</sup> In India and Ethiopia, public employment programs for rural areas cover 4–8 percent of the rural population once fully scaled up.

<sup>199</sup> The ILO Rapid Assessment Protocol is being used; see <http://www.social-protection.org/gimi/gess/ShowResource.action?ressource.ressourceId=26693>.







# MYANMAR

POST-DISASTER NEEDS ASSESSMENT  
OF FLOODS AND LANDSLIDES  
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